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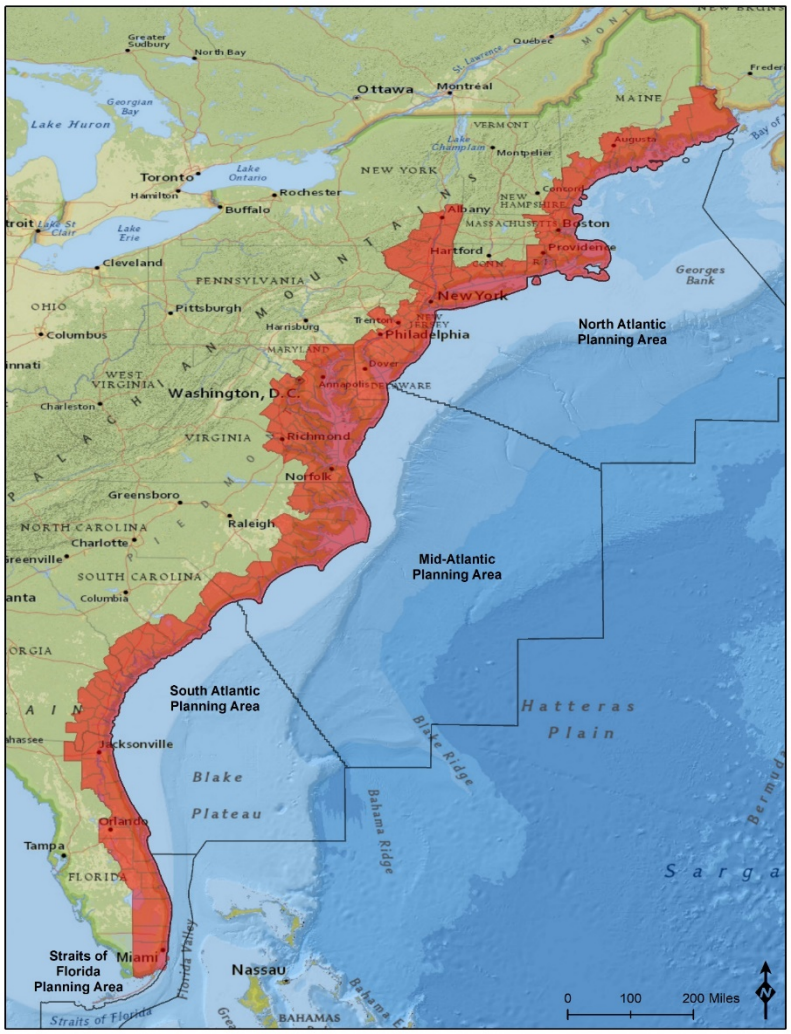
Coastal Land Use in the Atlantic Region: General Social and Economic Baseline Information for Environmental Impact Statements



U.S. Department of the Interior
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Abbreviations and Acronyms

ACS	American Community Survey
AMT	Alternative Minimum Tax
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BOEM	Bureau of Ocean Energy Management
BTC	Brownfields Tax Credit
C&D Canal	Chesapeake & Delaware Canal
CAMA	Coastal Area Management Act of 1974
CBIA	Connecticut Business and Industry Association
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGS	Connecticut General Statutes
CIRCA	Connecticut Institute for Resilience and Climate Adaptation
CWA	Clean Water Act
CZM	coastal zone management
CZMA	coastal zone management Act
DDOT	District Department of Transportation
DECD	Department of Economic and Community Development
DelDOT	Delaware Department of Transportation
DNREC	Department of Natural Resources and Environmental Control
DRS	Department of Revenue Services
EDIP	Economic Development Incentive Program
EDR	Florida Legislature Office of Economic and Demographic Research
EO	Executive Order
EOAC	Economic Opportunity Area Credit
FAS	Floridan Aquifer System
FDEP	Florida Department of Environmental Protection

FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FTZ	Foreign Trade Zone
GIS	geographic information system
I-	Interstate
ICIS	Integrated Compliance Information System
IPCC	Intergovernmental Panel on Climate Change
KSDZ	Keystone Special Development Zone
MaineDOT	Department of Transportation
MDOT	Maryland Department of Transportation
mgd	million gallons per day
MPO	Metropolitan Planning Organizations
MSA	metropolitan statistical areas
msl	mean sea level
NAD83	North American Datum 1983
NEPA	National Environmental Policy Act
NHDOT	New Hampshire Department of Transportation
NHFN	National Highway Freight Network
NHPA	National Historic Preservation Act
NHS	National historic site
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NYSDOT	New York State Department of Transportation
OCS	Outer Continental Shelf
PAD-US	Protected Areas Database of the United States

PHFS	Primary Highway Freight System
QJTC	Quality Jobs Tax Credits
REDO	Regional Economic Development Organization
RISPP	Rhode Island Statewide Planning Program
SCDOT	South Carolina Department of Transportation
SDTSA	State Designated Tribal Statistical Area
SoVI	Social Vulnerability Index
SR	State Road
SVI	Social Vulnerability Indicators
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U. S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VEDA	Virginia Economic Developer’s Association
VEDP	Virginia Economic Development Partnership
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1 Introduction

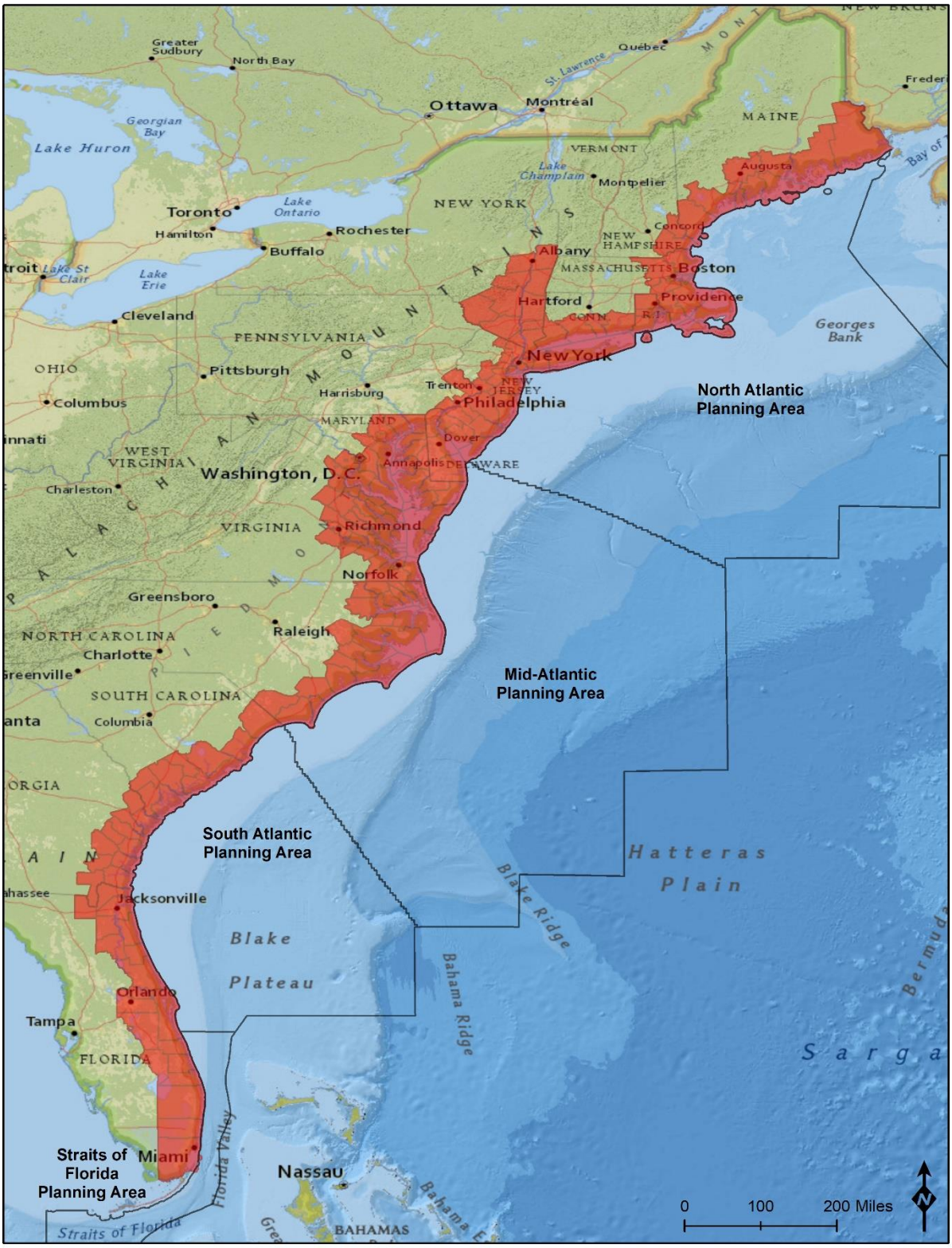
1.1 Introduction

The Draft Proposed Program for the 2019-2024 National Outer Continental Shelf (OCS) Program (January 2018) proposed to open the entire Atlantic OCS to oil and gas leasing. With this interest in oil and gas development in the Atlantic and the more recent push to develop renewable energy projects on the Atlantic OCS, the Bureau of Ocean Energy Management (BOEM) must prepare to address socioeconomic issues in its environmental analyses and environmental justice determinations as required by the Outer Continental Shelf Lands Act as amended, the National Environmental Policy Act (NEPA), the Coastal Zone Management Act (CZMA), the Council on Environmental Quality (CEQ), and Executive Order (EO) 12898. The descriptions and data throughout these chapters are applicable to both any potential oil and gas development and any renewable energy projects occurring on the Atlantic OCS.

Many of the social and economic effects of OCS activities occur onshore. The Atlantic OCS is a frontier area connected to the enormous, complex, and diversified economies and societies of the coastal counties and independent cities of 15 coastal states and the District of Columbia. The region boasts significant natural, economic, and recreational resources. BOEM requires a better understanding of social and economic baseline conditions in the Atlantic coastal areas to prepare its environmental impact analyses.

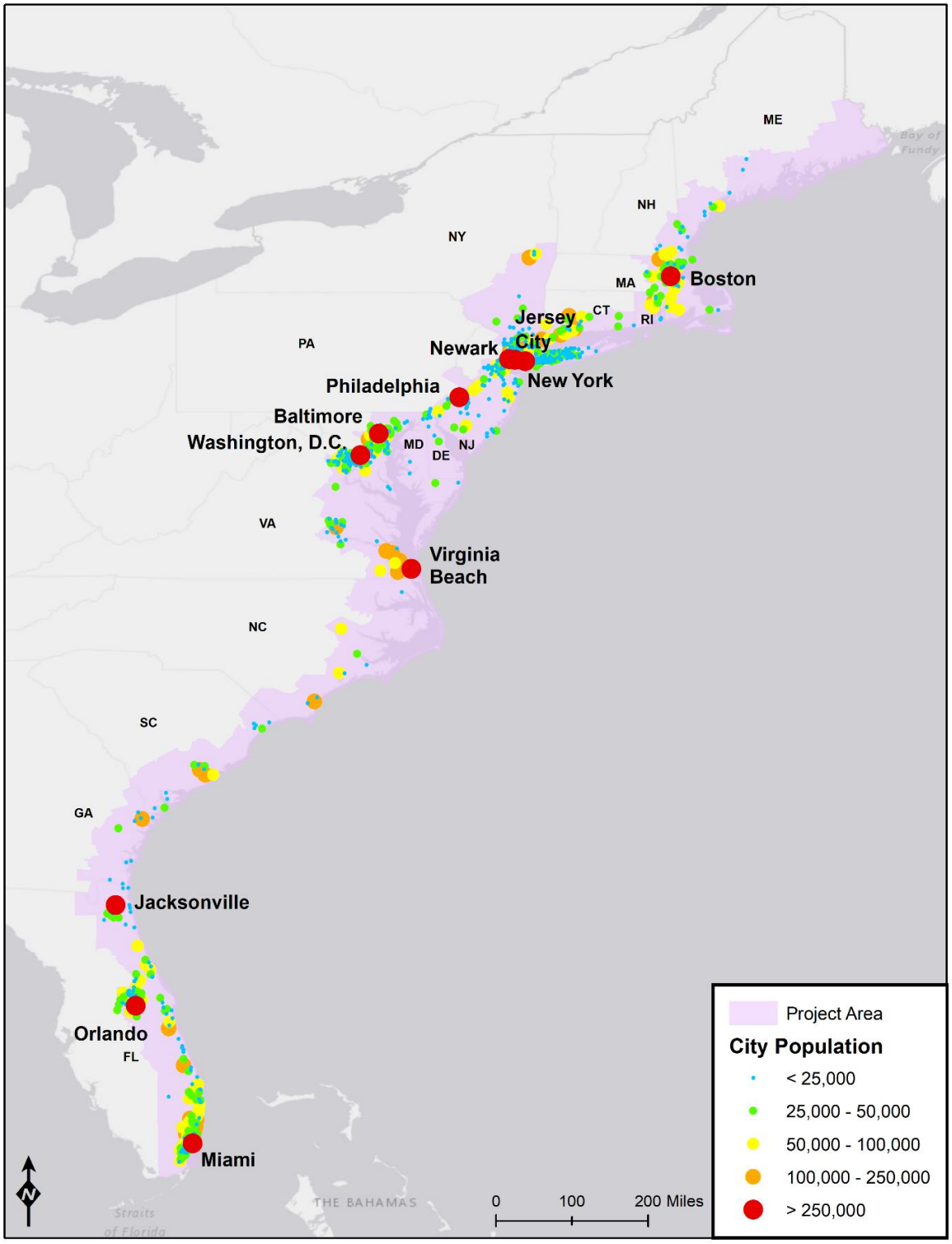
The 15 coastal states adjacent to the Atlantic OCS include, from north to south, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida. Together, these 15 states and the District of Columbia are hereafter referred to the "Atlantic Coast Project Area (or Project Area)" as shown in Figure 1-1 and Figure 1-2. The coastal counties (and where relevant independent cities) within each State make up separate, State-specific Study Areas. A list of the 199 coastal counties and independent cities included within the overall Project Area, and the 16 specific State Study Areas are presented in Table 1-1. The counties selected for this study are coastal zone management (CZM) counties and the National Oceanic and Atmospheric Administration's (NOAA's) designated coastal shoreline counties[1] located along the Atlantic coastal area. This selection of Atlantic coastal counties excludes counties in BOEM's Economic Impact Areas for the Gulf of Mexico OCS region (Varnado and Fannin 2018, NOAA 2020g).

[1] NOAA-designated Coastal Shoreline Counties are a subset of Coastal Watershed Counties. A NOAA Coastal Watershed County meets one of the following criteria: (1) at a minimum, 15% of the county's total land area is located within a coastal watershed; or (2) a portion of a county, or an entire county, accounts for at least 15% of a coastal United States Geological Survey's (USGS) 8-digit cataloging unit. This "15-percent rule" intends to identify counties that have a substantial watershed-based impact on coastal and ocean resources. Coastal Shoreline Counties are Coastal Watershed Counties directly adjacent to the open ocean, major estuaries, and the Great Lakes. The Coastal Shoreline Counties, due to their proximity to these waters, bear the most direct effects of coastal hazards and host the majority of economic production associated with coastal and ocean resources (NOAA 2017a).



Sources: ESRI 2019a, DOI 2020b

Figure 1-1. Atlantic Coast Project Area Counties and Independent Cities



Source: ESRI 2019a

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Table 1-1. State Study Areas, Counties, and Independent Cities within the Atlantic Coast Project Area

State Study Area	Geographic Unit	OCS Planning Area
Connecticut	Fairfield County Middlesex County New Haven County New London County	North Atlantic
Delaware	Kent County New Castle County Sussex County	Mid-Atlantic
District of Columbia	District of Columbia	Mid-Atlantic
Florida	Baker County Brevard County Broward County Clay County Duval County Flagler County Indian River County Martin County Miami-Dade County Nassau County Okeechobee County Orange County Osceola County Palm Beach County Putnam County Seminole County St. Johns County St. Lucie County Volusia County	South Atlantic
Georgia	Brantley County Bryan County Camden County Charlton County Chatham County Effingham County Glynn County Liberty County Long County McIntosh County Wayne County	South Atlantic
Maine	Cumberland County Hancock County Kennebec County Knox County Lincoln County Sagadahoc County Waldo County Washington County York County	North Atlantic

Table 1-1. State Study Areas, Counties, and Independent Cities within the Atlantic Coast Project Area

State Study Area	Geographic Unit	OCS Planning Area
Maryland	Anne Arundel County Baltimore city Baltimore County Calvert County Caroline County Cecil County Charles County Dorchester County Harford County Howard County Kent County Prince George's County Queen Anne's County Somerset County St. Mary's County Talbot County Wicomico County Worcester County	Mid-Atlantic
Massachusetts	Barnstable County Bristol County Dukes County Essex County Middlesex County Nantucket County Norfolk County Plymouth County Suffolk County	North Atlantic
New Hampshire	Rockingham County Strafford County	North Atlantic
New Jersey	Atlantic County Bergen County Burlington County Camden County Cape May County Cumberland County Essex County Gloucester County Hudson County Mercer County Middlesex County Monmouth County Ocean County Passaic County Salem County Somerset County Union County	North Atlantic

Table 1-1. State Study Areas, Counties, and Independent Cities within the Atlantic Coast Project Area

State Study Area	Geographic Unit	OCS Planning Area
New York	Albany County Bronx County Columbia County Dutchess County Greene County Kings County Nassau County New York County Orange County Putnam County Queens County Rensselaer County Richmond County Rockland County Suffolk County Sullivan County Ulster County Westchester County	North Atlantic
North Carolina	Beaufort County Bertie County Brunswick County Camden County Carteret County Chowan County Columbus County Craven County Currituck County Dare County Gates County Hertford County Hyde County Jones County New Hanover County Onslow County Pamlico County Pasquotank County Pender County Perquimans County Pitt County Tyrrell County Washington County	Mid-Atlantic
Pennsylvania	Bucks County Delaware County Philadelphia County	North Atlantic
Rhode Island	Bristol County Kent County Newport County Providence County Washington County	North Atlantic

Table 1-1. State Study Areas, Counties, and Independent Cities within the Atlantic Coast Project Area

State Study Area	Geographic Unit	OCS Planning Area
South Carolina	Beaufort County Berkeley County Charleston County Colleton County Dorchester County Georgetown County Hampton County Horry County Jasper County	South Atlantic
Virginia	Accomack County Alexandria city Arlington County Caroline County Charles City County Chesapeake city Chesterfield County Colonial Heights city Essex County Fairfax city Fairfax County Falls Church city Fredericksburg city Gloucester County Hampton city Hanover County Henrico County Hopewell city Isle of Wight County James City County King and Queen County King George County King William County Lancaster County Manassas city Manassas Park city Mathews County Middlesex County New Kent County Newport News city Norfolk city Northampton County Northumberland County Petersburg city Poquoson city Portsmouth city Prince George County Prince William County Richmond city Richmond County	Mid-Atlantic

Table 1-1. State Study Areas, Counties, and Independent Cities within the Atlantic Coast Project Area

State Study Area	Geographic Unit	OCS Planning Area
Virginia (continued)	Spotsylvania County Stafford County Suffolk city Surry County Virginia Beach city Westmoreland County Williamsburg city York County	

Land use is a key factor that will influence where and how effects of OCS actions are realized. Land use practices may encourage or curtail onshore development of OCS-related activities, including support services, such as staging and transportation of materials, fabrication, environmental consulting, catering, or diving. Patterns of land use, including housing utilization, zoning, industrial incentives, vacancy rates, land cover change, and focus on recreation will all shape how new OCS activity will influence life in coastal communities. Also, ethnic, linguistic, or cultural minorities; low income groups; and populations with particular vulnerabilities, such as children, the elderly, and those who depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses.

1.2 Purpose and Scope

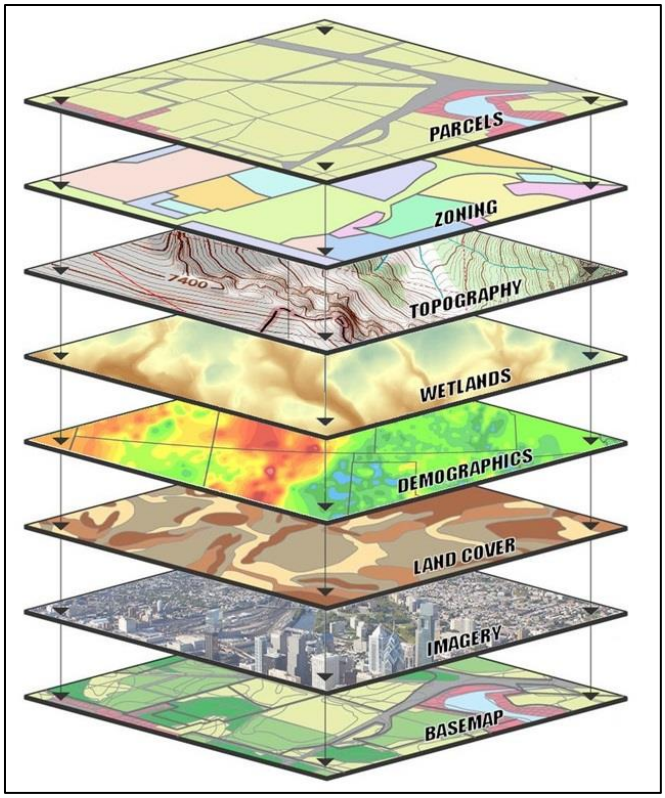
BOEM developed this report to conduct an in-depth data collection and analysis to establish a coastal land use baseline for Atlantic coastal areas in states from Maine to Florida to support development of future BOEM environmental impact assessments related to prospective Atlantic OCS development within the Atlantic OCS planning areas.

1.2.1 Methodology

This coastal land use and socioeconomic baseline analysis included the collection and analysis of publicly available data gathered from various national, State, county, and local sources across the Atlantic Coast Project Area. Datasets useful in preparing for environmental review of potential onshore projects were collected, cataloged, and summarized for analysis. The following sections detail the data collection effort including the datasets, metadata, and summarization method. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly.

1.2.2 Datasets

Data collection initiated with identification of nationally available Geographic Information System (GIS) datasets containing coastal land use and socioeconomic resource information that could be used to display and analyze information regarding various coastal land use and socioeconomic resource topics. The use of GIS analysis allows the combination or layering of data, which assists in identification of potential issues and opportunities by showing the interaction of the natural and built environment with socioeconomic characteristics of the population as shown in Figure 1-3.



Source: USGS 2016a

Figure 1-3. Example of GIS Data Layering

Many datasets useful in environmental reviews are available nationally and are especially useful for consistency covering a large study area such as the Eastern seaboard. The first datasets collected were from national sources including:

- Bureau of Ocean Energy Management (BOEM)
- United States (U.S.) Geological Survey (USGS)
- U.S. Fish and Wildlife Service (USFWS)
- Federal Emergency Management Agency (FEMA)
- U.S. Department of Agriculture (USDA)
- U.S. Global Climate Change
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Environmental Protection Agency (USEPA)
- National Park Service (NPS)
- U.S. Forest Service (USFS)
- U.S. Census Bureau (USCB)
- East Coast Greenway
- U.S. Department of Transportation (USDOT)
- Bureau of Labor Statistics (BLS)
- Bureau of Economic Analysis (BEA)

A full list of the data sources utilized in this analysis is included in Appendix A. The collected data included information such as:

Physical Characteristics	Land Cover and Land Use	Demographics and Socioeconomics
• Water resources (bays, rivers, floodplains, wetlands) • Wild and scenic rivers • Hydrography • Watershed boundaries • Critical habitat • Floodplains • Sea level rise • Storm surge	• Land cover • Land management • Land utilization • USEPA facilities • Toxic release inventory • Brownfields • Structures (hospitals, schools/colleges/universities, medical facilities, public facilities, etc.) • Impervious surface • Historic places/districts • Protected area database • Parks • Landmarks • Recreation areas • Transportation facilities • Roads • Railroads	• Census data (current and recent for trend analysis) • State demographer data (current and future projections as available) • Census tract and block group boundaries • Employment and unemployment rates • Income • Educational attainment of the workforce • Social and health indices • Vulnerability characteristics • Environmental Justice • Resource-dependent populations (fishing communities, subsistence communities, religious populations) • Tribal data • English language ability

After canvasing nationally available data sources, State, county, and local datasets and information were also examined for each state to the extent feasible. Data were obtained from relevant State, county, and local non-government organizations and agencies for each state within the Atlantic Coast Project Area. The availability and applicability of county and local information, such as information from county GIS, planning, assessors, or other departments, varied across the Project Area. Specific details regarding the collection of State, county, and local information is discussed in the individual chapters for the respective states. Future analyses would benefit from more detailed examination of State, county, and local datasets and information once site-specific information is known for specific projects.

1.2.3 Metadata

Metadata is data about data. It provides information about where certain data came from, how it was collected, when it was collected, how it should be used, and what types of attributes it contains. The Metadata database was updated throughout the data collection and analysis process. Metadata collected for this study included:

- Source of the data (typically the agency or organization from which the data originated)
- Website (URL from which the data was obtained)
- Date the data was acquired and/or published
- Version
- Citation

- Attributes (columns or fields that describe the data. For example, in a dataset that contains county boundaries, attributes might include county name, state in which it is located, region in which it is located, land area and water area, population, year of population data, etc.)
- Notes on data use, scale, or other relevant information

Appendix A contains the metadata database for the relevant national GIS information that was utilized for all State Study Areas within the entire Atlantic Coast Project Area.

1.2.4 Data Preparation

Once the raw data were collected, organized, stored, and cataloged, each data point was projected in GIS, as needed, to the standard geographic projection: North American Datum 1983 (NAD83). The data were then clipped to each state boundary or the data were selected based on location within the respective Study Area boundary (e.g., census block groups). The data were stored in geodatabase format for summarization and analysis using maps and tables.

1.2.5 Data Summarization and Analysis

Each dataset was summarized using the following units of measure as appropriate; in some cases, more than one method was used to process and summarize the data:

- Acres, square feet, linear feet, or other units of measurement
- Counts
- Percentage
- Density

The gathered data were analyzed and presented in maps and tables based on the most appropriate geography for the analysis. For example, data may be analyzed and presented based on one or more of the following geographies:

- Census block group or tract (for socioeconomic data only)
- County or independent city
- State
- Study area (eastern seaboard, study area counties and independent cities)

The data summarization and analysis process was an iterative process with the subject-matter experts and GIS team working collaboratively to determine the most appropriate method for isolating, comparing, contrasting, summarizing, and displaying the data from various datasets to complete the analysis of the resource in question. Various figures and tables were produced to present the results of the analysis, after which the subject-matter experts developed the supporting discussion. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly.

1.3 Organization

This report is organized in the following chapters summarizing the key findings for the overall Atlantic Coast Project Area:

- *Chapter 1 – Introduction* includes a discussion of the project purpose, need, methodology, and a summary of the various resource areas that will be discussed for each State Study Area. The resource areas discussion includes overview information explaining the resource, the regulatory

environment relevant to the resource, and where feasible, trends observed at the Atlantic Coast Project Area or national level relevant to the discussion in the State Study Area chapters.

- *Chapters 2-17* present the physical characteristics, land cover and land use, and demographics and socioeconomics data gathered for each of the State Study Areas. The State Study Area chapters are organized geographically from north to south as follows:

  Chapter 2 – Maine
  Chapter 3 – New Hampshire
  Chapter 4 – Massachusetts
  Chapter 5 – Rhode Island
  Chapter 6 – Connecticut
  Chapter 7 – New York
  Chapter 8 – New Jersey
  Chapter 9 – Pennsylvania
  Chapter 10 – Delaware
  Chapter 11 – Maryland
  Chapter 12 – District of Columbia
  Chapter 13 – Virginia
  Chapter 14 – North Carolina
  Chapter 15 – South Carolina
  Chapter 16 – Georgia
  Chapter 17 – Florida
- *Chapter 18 – List of Preparers* presents the contributors to this report.
- *Appendix A – Geographic Information System (GIS) Database (electronic files)*
- *Appendix B – Links to the Study Areas' Comprehensive Plans and Zoning Ordinances/Guidelines*

1.4 Physical Characteristics

This section provides a brief description of the physical characteristics discussed throughout the Study Area chapters. Physical characteristics include water resources, floodplains, wetlands, and physical vulnerability.

1.4.1 Water Resources

Water resources are prevalent throughout the Atlantic Coast Project Area including bays, rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. Given the diversity of water resources throughout the Project Area, the individual details of various water resources are described in the subsequent chapters for each respective State Study Area and not discussed at the level of the Project Area. The following sections provide a summary of the relevant regulations associated with water resources, which should be considered when conducting environmental impact analyses for specific proposed OCS-related projects to be located within or adjacent to the Project Area.

1.4.1.1 Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act or CWA) regulates water quality standards for surface waters and regulates discharges into the waters of the United States. The CWA is the principal Federal statute protecting navigable waters and adjoining shorelines from pollution. The CWA is administered by the USEPA and the U.S. Army Corps of Engineers (USACE). The CWA authorizes the USEPA to establish water quality standards and oversee permitting for

otherwise prohibited waste and pollutant discharges from "point sources," that is, sources from industrial facilities, sewage treatment plants, and stormwater drains. Large amounts of sediment in streams from one or more upslope erosion areas ("non-point sources") may also qualify as pollutants under the CWA. The CWA also grants to the USEPA the authority to delegate to State governments the implementation of CWA provisions.

The USACE is responsible for regulating the discharge of fill material into waters of the United States. Waters of the United States include lakes, rivers, streams and their tributaries, as well as wetlands. Since its enactment, the CWA prohibits the discharge of pollutants into waters of the United States without a permit. Section 404 of the CWA provides that whenever any person discharges dredged or clean fill material into waters of the United States including, without limitation, wetlands, streams, and bays (e.g., while undertaking road construction, bridge construction, or streambed alteration), a permit is required from the USACE.

1.4.1.1.1 Clean Water Act § 401 | Certification

Section 401(a)(1) of the CWA requires any applicant for a Federal license or permit for an activity that may result in a discharge to navigable waters to provide the licensing or permitting agency a certification, or a waiver of certification, by the state where the discharge would originate, that any resultant discharges will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA. The certification must come from the state in which the discharge originates or will originate, or in certain instances the interstate water pollution control agency with jurisdiction over navigable waters. If no waiver is issued by the State, its certification must indicate that applicable State water quality standards will not be violated as a result of the discharge (33 United States Code [U.S.C.] § 1341).

1.4.1.1.2 Clean Water Act § 402 | National Pollutant Discharge Elimination System (NPDES)

Under Section 402 of the CWA, the National Pollutant Discharge Elimination System (NPDES) regulates the discharge of pollutants from point sources into waters of the United States. The NPDES issues permits that contain limits on constituents within the discharge, monitoring and reporting requirements, and other provisions to protect water quality. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. General permits are established to address issues associated with multiple dischargers, each of whom can apply for coverage under the general permit. An example of a common general permit is to address erosion and sedimentation issues caused by stormwater discharges during construction on one acre or greater of land. These general permits typically require the permittee to develop a Stormwater Pollution Prevention Plan that describes how they will limit erosion and sedimentation during construction. Individual permits are issued directly to an individual discharger, usually industrial facilities, based on the specific source and type of discharge.

1.4.1.1.3 Clean Water Act § 404 | Permitting Discharges of Dredge and Fill Material

Section 404 of the CWA regulates the discharge of dredged and fill material from a project's construction into the waters of the United States, including wetlands (33 Code of Federal Regulations [CFR] part 323). The USEPA delegates to the USACE implementation of Section 404. Activities in waters of the United States regulated under this program include fill for development, water resource projects (e.g., dams) and infrastructure development (e.g., stream crossings, culverts, visitor centers). Section 404 also requires a permit before dredged or fill material may be discharged into waters of the United States unless the activity is exempt (e.g., certain farming and forestry activities). No discharge of dredged or fill material may be permitted if a practical, less damaging alternative exists, or if waters would be significantly degraded. For most discharges with only minimal adverse impacts, a general permit may suffice. Specific

categories of activities receive general permits on a national, regional, or State basis. The general permitting process eliminates individual review and allows some activities such as minor road activities, utility line backfill, and bedding to proceed with little or no delay once general or specific conditions for the general permit are met.

1.4.1.2 Coastal Zone Management

The CZMA of 1972 (16 U.S.C. § 1451 *et seq*.) grants states authority to determine if activities by government and private entities maintain consistency with the coastal management program that is adopted by states. States that choose to adopt the program become eligible for federal funding assistance and gain consistency determination authority over any activity that could affect their coastal zones. Consistency determinations are required for activities that are federally funded, licensed and/or permitted, including offshore infrastructure in U.S. navigable waters, including waters in the exclusive economic zone that may impact coastal waters. A request for consistency review is initiated by the USACE as part of a Section 404/10 application to the USACE for a permit to construct and operate a facility. The project must file a copy of determination of consistency before proceeding with construction.

1.4.1.3 Rivers and Harbors Act § 10 | Construction in Navigable Waters

Section 10 of the Rivers and Harbors Appropriation Act of 1899 regulates the construction of potential obstructions, such as wharves, piers, or other structures, that may interfere with the navigable use of State and Federal waters. Section 10 requires that any project constructing structures in navigable waters obtain a permit from the USACE. Similarly, the Outer Continental Shelf Lands Act (Section 4f) grants the USACE the authority to regulate activities that would construct artificial islands, installations, and other devices on the seabed to the seaward limit of the OCS.

1.4.1.4 National Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. § 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a Federal or State agency. Each river in the National System is administered with the goal of protecting and enhancing the values that caused it to be designated. Designation neither prohibits development nor gives the Federal government control over private property. Recreation, agricultural practices, residential development, and other uses may continue. Protection of the river is provided through voluntary stewardship by landowners and river users and through regulation and programs of Federal, State, local, or tribal governments.

1.4.1.5 The Endangered Species Act

The Endangered Species Act (16 U.S.C. §§ 1531-1534) was established to conserve threatened and endangered species and their ecosystems. It defines an endangered species as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species that is likely to become endangered within the foreseeable future. The U.S. Fish and Wildlife Service and NOAA Fisheries have federal jurisdiction over species that have been listed as endangered or threatened. Critical habitat consists of specific areas that have been designated because they are within the range of an endangered or threatened species and provide physical or biological features that are essential to the conservation of the species and that may require special management or protection. Critical habitat designations affect only federal agency actions or federally funded or permitted activities and do not affect activities by private landowners if there is no federal involvement.

1.4.1.6 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a).

Federal agencies are subject to the requirements of EO 11988 (Floodplain Management). The objective of EO 11988 is "…to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (FEMA 2015). While EO 11988 does not prohibit all floodplain development it does require that agencies avoid the 100-year floodplain unless there is no practicable alternative. Future projects within the Project Area would be subject to EO 11988. Therefore, the locations of floodplains contribute to the understanding of land use in the study area and will likely shape site selection for proposed future OCS projects in the coastal region.

1.4.1.7 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. As described in Section 404 of the Clean Water Act, wetlands include ponds, river deltas, swamps, marshes, and bogs along with other low-lying areas that frequently flood. Wetlands or wetland fringe areas are frequently found along edges of natural and constructed waterways and impounded waters. In addition to providing opportunities for recreation and habitat for many aquatic species, healthy wetlands located in coastal or riverine floodplains can help temper flood impacts by acting as a holding area for excess water. Wetlands also trap and filter many pollutants, helping to improve water quality and providing erosion control.

In 1979, the USFWS adopted a wetland classification system developed by Cowardin et al., providing a clear definition and classification system for wetlands and deepwater habitats, thus allowing comparison of information over large areas (Cowardin et al. 1979). Reprinted with revisions in 1992 and adopted by the Federal Geographic Data Committee (FGDC) as a National Standard (FGDC-STD-004) in 1996, this was the governing document until 2013 when Cowardin et al. (1979) was adapted into the Second Edition (FGDC 2013). Using the Cowardin et al. Second Edition (2013) definition of wetland, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland specific species), and soil (hydric soils being most common in wetlands). The wetland acreage along with other water resources is tabulated for the Project Area using the FGDC groupings (FGDC 2013, USFWS 2019c).

- Estuarine and marine wetlands are tidal habitats, open to the ocean, with a mix of fresh and salt waters. Wetlands are part of estuarine systems. Estuarine and marine deepwater systems have deep tidal habitats with partly obstructed or occasional access to the ocean and occasional influence from fresh water.
- Freshwater emergent wetlands, sometimes called marshes or wet meadows, are characterized by perennial, upright plants during most of the growing season.
- Freshwater forest and shrub wetlands are described as forested swamps or shrubby bogs.
- Lakes are deepwater bodies, whereas freshwater ponds are shallow water bodies, possibly with marshy bottoms.
- Riverine systems are river or stream beds and channels (FGDC 2013, USFWS 2019c).

Additionally, EO 11990 (Protection of Wetlands) requires Federal agencies to avoid, to the extent possible, adverse impacts to wetlands and to preserve and enhance their natural and beneficial values. EO 11990 requires that Federal agencies prohibit construction or management practices that would adversely affect wetlands, unless an agency finds either that no practical alternative exists or that a proposed action has considered all practical measures to minimize harm to the wetlands.

1.4.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making, such as planning future development areas. The following sections discuss sea level rise, nuisance flooding, and storm surge from the perspective of the Atlantic Coast Project Area. These topics are discussed in greater detail in the respective State Study Area chapters.

1.4.2.1 Sea Level Rise

Global sea level has been steadily rising for the past several decades and has two primary causes: thermal expansion caused by warming of the ocean (driven by atmospheric warming) and increased melting of land-based ice, including both ice sheets and glaciers. At present, global sea level is rising approximately 1/8 inch on average (0.125 inches/year), although rates vary greatly depending on local geography (NOAA 2019a, NOAA 2019b, NOAA 2018b, Lindsay 2019).

Relative sea level, the combination of land motion and sea level motion, varies greatly by geography and is influenced by subsidence, topography, erosion, and ocean currents. For example, while ice melt and changing Gulf Stream currents are the two greatest contributors to Florida's sea level rise, sea level rise in Virginia is mainly due to geological land subsidence (SeaLevelRise.org 2020).

Throughout the U.S., NOAA measures relative sea level trends using tide gauges. Linear relative mean sea level (msl) trends are variable throughout the U.S. and the Atlantic Coast Project Area. Within the continental U.S., Pacific Coast sea level rise rates are the lowest (average 0.05 inches/year) while highest rates (0.21 inches/year) occur along the Gulf Coast. Linear relative msl in the Project Area on the Atlantic Coast falls in between these levels at 0.14 inches/year. Table 1-2 shows the average linear relative msl trends for the Project Area and comparisons to other U.S. regions (NOAA 2019a, NOAA 2019b).

Table 1-2. Average Linear Relative Mean Sea Level Trends for U.S. Regions

Geographic Area	Average Mean Sea Level Trend (feet per century)	Average Mean Sea Level Trend (inches per year)
Hawaiian/Pacific Islands	0.70	0.08
East Coast	1.12	0.13
Gulf Coast	1.76	0.21
Pacific Coast	0.43	0.05
Alaska	-1.72	-0.21
Atlantic Coast Project Area	1.15	0.14

Sources: NOAA 2019a, NOAA 2019b

Table 1-3 shows the average linear relative msl rate trends for gauges within the Atlantic Coast Project Area from lowest to highest (NOAA 2019a, NOAA 2019b). The lowest rates in the project area are in Maine, and the highest rates are in Maryland and Virginia.

Table 1-3. Linear Relative Mean Sea Level Trends for the Atlantic Coast Project Area from Lowest to Highest Rates

NOAA Tide Gauge Station							Mean Sea Level Trend	
Station ID	Station Name	Latitude	Longitude	First Year	Last Year	Years	Feet per Century[1]	Inches per Year[2]
8419870	Seavey Island, Maine	43.08	-70.74	1926	2001	76	0.58	0.07
8418150	Portland, Maine	43.66	-70.24	1912	2019	108	0.62	0.07
8659084	Southport, North Carolina	33.92	-78.02	1933	2008	76	0.66	0.08
8423898	Fort Point, New Hampshire	43.07	-70.71	1926	2019	94	0.67	0.08
8410140	Eastport, Maine	44.90	-66.99	1929	2019	91	0.71	0.09
8720030	Fernandina Beach, Florida	30.67	-81.47	1897	2019	123	0.71	0.09
8413320	Bar Harbor, Maine	44.39	-68.20	1947	2019	73	0.74	0.09
8516945	Kings Point, New York	40.81	-73.77	1931	2019	89	0.75	0.09
8721120	Daytona Beach, Florida	29.15	-80.96	1925	1983	59	0.76	0.09
8411250	Cutler, Maine	44.64	-67.30	1979	2010	32	0.77	0.09
8454000	Providence, Rhode Island	41.81	-71.40	1938	2019	82	0.77	0.09
8723170	Miami Beach, Florida	25.77	-80.13	1931	1981	51	0.78	0.09
8514560	Port Jefferson, New York	40.95	-73.08	1957	1992	36	0.8	0.10
8658120	Wilmington, North Carolina	34.23	-77.95	1935	2019	85	0.81	0.10
8461490	New London, Connecticut	41.36	-72.09	1938	2019	82	0.88	0.11
8720218	Mayport, Florida	30.40	-81.43	1928	2019	92	0.89	0.11
8452660	Newport, Rhode Island	41.51	-71.33	1930	2019	90	0.92	0.11
8443970	Boston, Massachusetts	42.35	-71.05	1921	2019	99	0.94	0.11
8518750	The Battery, New York	40.70	-74.01	1856	2019	164	0.94	0.11
8447930	Woods Hole, Massachusetts	41.52	-70.67	1932	2019	88	0.96	0.12
8467150	Bridgeport, Connecticut	41.18	-73.18	1964	2019	56	0.99	0.12
8545240	Philadelphia, Pennsylvania	39.93	-75.14	1900	2019	120	0.99	0.12
8574680	Baltimore, Maryland	39.27	-76.58	1902	2019	118	1.05	0.13
8656483	Beaufort, North Carolina	34.72	-76.67	1953	2019	67	1.06	0.13
8665530	Charleston, South Carolina	32.78	-79.92	1901	2019	119	1.09	0.13
8670870	Fort Pulaski, Georgia	32.04	-80.90	1935	2019	85	1.09	0.13

Table 1-3. Linear Relative Mean Sea Level Trends for the Atlantic Coast Project Area from Lowest to Highest Rates

NOAA Tide Gauge Station							Mean Sea Level Trend	
Station ID	Station Name	Latitude	Longitude	First Year	Last Year	Years	Feet per Century[1]	Inches per Year[2]
8510560	Montauk, New York	41.05	-71.96	1947	2019	73	1.11	0.13
8594900	Washington, DC	38.87	-77.02	1924	2019	96	1.11	0.13
8557380	Lewes, Delaware	38.78	-75.12	1919	2019	101	1.16	0.14
8573364	Tolchester Beach, Maryland	39.21	-76.25	1971	2019	49	1.19	0.14
8575512	Annapolis, Maryland	38.98	-76.48	1928	2019	92	1.2	0.14
8551910	Reedy Point, Delaware	39.56	-75.57	1956	2019	64	1.21	0.15
8449130	Nantucket Island, Massachusetts	41.29	-70.10	1965	2019	55	1.23	0.15
8632200	Kiptopeke, Virginia	37.17	-75.99	1951	2019	69	1.23	0.15
8638660	Portsmouth, Virginia	36.82	-76.29	1935	1987	53	1.23	0.15
8722670	Lake Worth Pier, Florida	26.61	-80.03	1970	2019	50	1.23	0.15
8637624	Gloucester Point, Virginia	37.25	-76.50	1950	2003	54	1.25	0.15
8571892	Cambridge, Maryland	38.57	-76.07	1943	2019	77	1.26	0.15
8577330	Solomons Island, Maryland	38.32	-76.45	1937	2019	83	1.27	0.15
8661070	Springmaid Pier, South Carolina	33.66	-78.92	1957	2019	63	1.3	0.16
8573927	Chesapeake City, Maryland	39.53	-75.81	1972	2019	48	1.34	0.16
8531680	Sandy Hook, New Jersey	40.47	-74.01	1932	2019	88	1.35	0.16
8534720	Atlantic City, New Jersey	39.36	-74.42	1911	2019	109	1.35	0.16
8519483	Bergen Point, New York	40.64	-74.14	1981	2019	39	1.46	0.18
8638610	Sewells Point, Virginia	36.95	-76.33	1927	2019	93	1.54	0.18
8536110	Cape May, New Jersey	38.97	-74.96	1965	2019	55	1.55	0.19
8651370	Duck, North Carolina	36.18	-75.75	1978	2019	42	1.56	0.19
8637689	Yorktown, Virginia	37.23	-76.48	1950	2019	70	1.59	0.19
8635150	Colonial Beach, Virginia	38.25	-76.96	1972	2010	39	1.6	0.19
8652587	Oregon Inlet Marina, North Carolina	35.80	-75.55	1977	2019	43	1.67	0.20
8635027	Dahlgren, Virginia	38.32	-77.04	1972	2019	48	1.78	0.21
8631044	Wachapreague, Virginia	37.61	-75.69	1978	2019	42	1.8	0.22

Table 1-3. Linear Relative Mean Sea Level Trends for the Atlantic Coast Project Area from Lowest to Highest Rates

NOAA Tide Gauge Station							Mean Sea Level Trend	
Station ID	Station Name	Latitude	Longitude	First Year	Last Year	Years	Feet per Century[1]	Inches per Year[2]
8635750	**Lewisetta, Virginia**	38.00	-76.46	1970	2019	50	1.82	0.22
8638863	**Chesapeake Bay Bridge Tunnel, Virginia**	36.97	-76.11	1975	2017	43	1.94	0.23
8570283	**Ocean City, Maryland**	38.33	-75.09	1975	2019	45	1.96	0.24

Sources: NOAA 2019a, NOAA 2019b
Note: 1 - Per NOAA data; 2 - Based on NOAA feet per century data

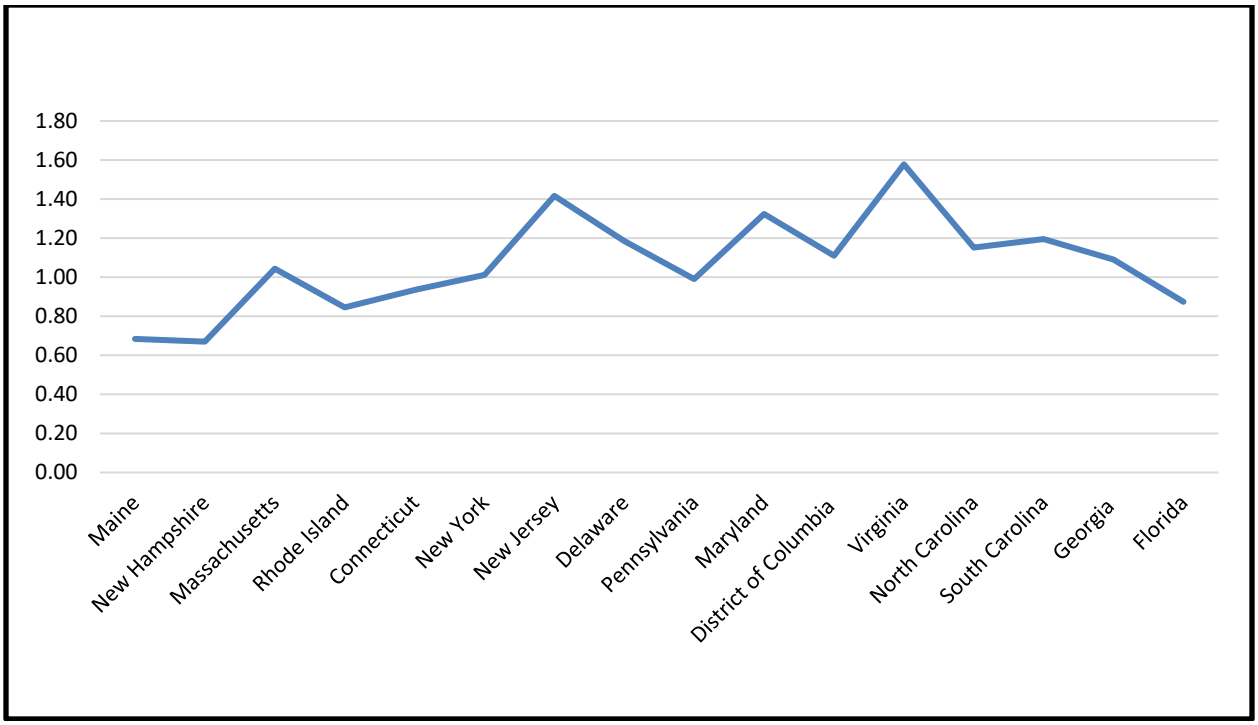
When gauge data are averaged for each state within the Atlantic Coast Project Area, averages range from 0.08 inches/year in Maine and New Hampshire to 0.19 inches/year in Virginia. Table 1-4 shows the average linear relative msl rate trends for gauges within the Project Area from lowest to highest (NOAA 2019b).

Table 1-4. Average Linear Relative Mean Sea Level Trends for Atlantic Coast Project Area States

Geographic Area	Number of Gauges	Average Mean Sea Level Trend (feet per century)	Average Mean Sea Level Trend (inches per year)
New Hampshire	1	0.67	0.08
Maine	5	0.68	0.08
Rhode Island	2	0.85	0.10
Florida	5	0.87	0.10
Connecticut	2	0.94	0.11
Pennsylvania	1	0.99	0.12
New York	5	1.01	0.12
Massachusetts	3	1.04	0.12
Georgia	1	1.09	0.13
District of Columbia	1	1.11	0.13
North Carolina	5	1.15	0.14
Delaware	2	1.19	0.14
South Carolina	2	1.20	0.14
Maryland	7	1.32	0.16
New Jersey	3	1.42	0.17
Virginia	10	1.58	0.19

Source: NOAA 2019b

Based on the State average calculations, Figure 1-4 shows the average linear relative msl change in feet per century for each of the states in the Atlantic Coast Project Area from north to south.



Source: NOAA 2019b

Figure 1-4. Average Linear Relative Sea Level Trend in the Atlantic Coast Project Area

As shown on Figure 1-4, linear relative msl change varies across the Atlantic Coast Project Area and there is not a clear regional trend. Linear relative msl for each State Study Area is also variable and, as described in the introduction to this section is dependent on and/or influenced by geography, subsidence, topography, erosion, and ocean currents. Therefore, site-specific details of potential OCS projects, once known, should provide for a more refined understanding of the influence of sea level change with regard to the evaluation of potential environmental impacts.

1.4.2.1.1 Nuisance Flooding

Increased periodic flooding from high tides is related to sea level rise, changes in wind and ocean currents, seasonal weather, rhythmic astronomical tides, land subsidence, and the loss of wetlands and other natural barriers. Frequently called "nuisance flooding," these events cause road closures, overwhelmed storm drains, and compromised infrastructure. Within the U.S., nuisance flooding has increased by about 50% in the last 20 years and 100% in the last 30 years (NOAA 2018a). As sea levels rise, the frequency and impact of such events will increase and expose more cities. Currently within the U.S., nuisance flood frequencies are increasing with relatively higher rates along the coasts of the Southeast Atlantic and to a lesser extent along the northeast Atlantic and the western Gulf of Mexico (Sweet et al. 2018).

Along the coasts of the northeast and southeast Atlantic, nuisance flood frequencies are becoming increasingly more frequent. Between 2000 and 2015, annual frequencies of nuisance flooding have increased by about 125% (from 1.3 days to 3.0 days/year) along the southeast Atlantic and by 75% (from 3.4 days to 6.0 days/year) along the northeast Atlantic. Based on global rise scenarios of the U.S. Federal Interagency Sea Level Rise and Coastal Flood Hazard Task Force, NOAA predicts annual high tide flood frequencies of between 45 and 130 days/year by 2050 in the northeast Atlantic, largely because of rising

sea level. Nuisance flooding could increase to 182 days per year (every-other-day) by 2100 within the northeast and southeast Atlantic (Sweet et al. 2018).

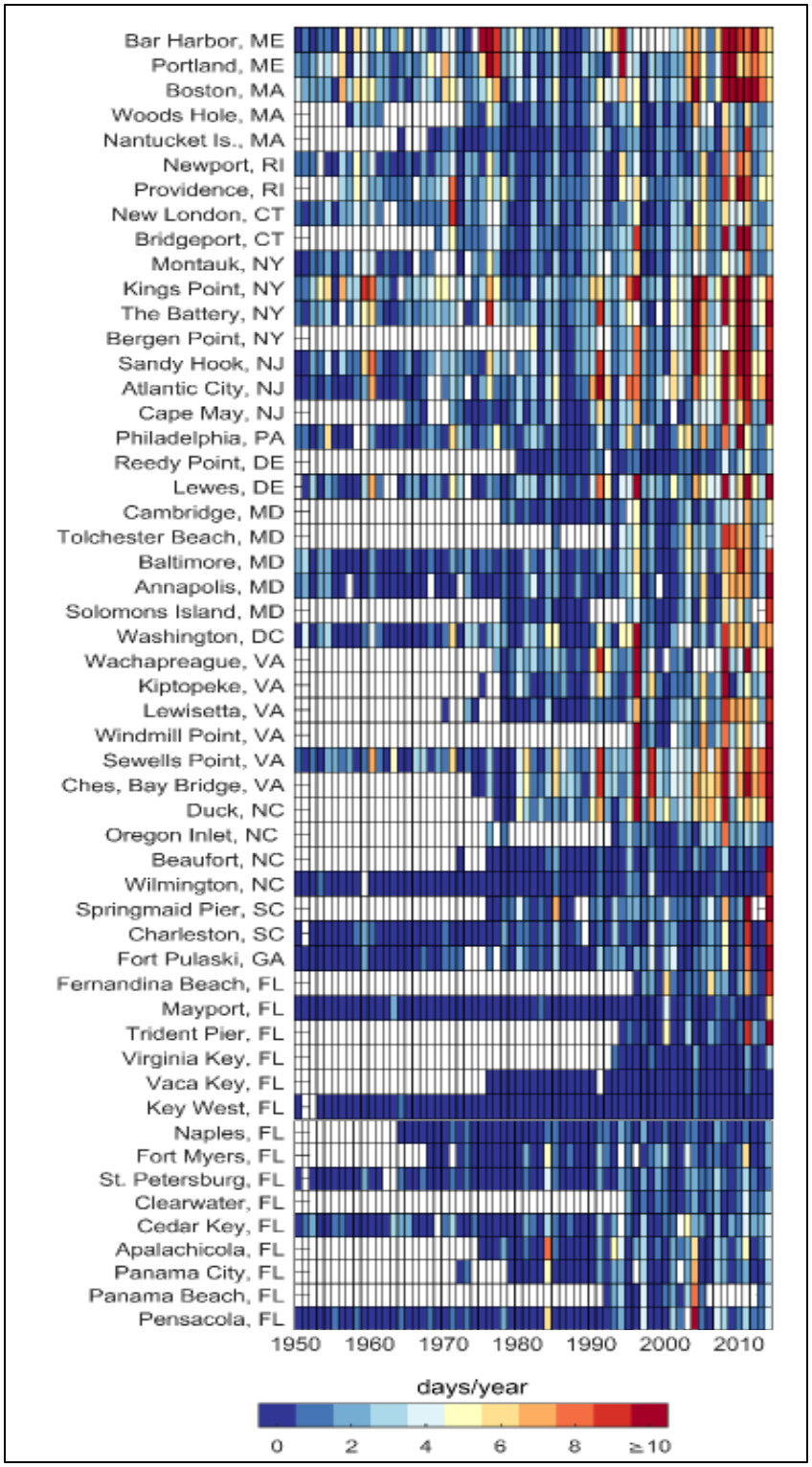
Figure 1-5 shows the annual number of days per year there were high tide floods at NOAA tide gauge locations within the Atlantic Coast Project Area. The white squares indicate no data were available or that hourly data were less than 80% complete for any given year. As can be seen, certain states within the Project Area, including Maine, Rhode Island, Connecticut, New York, New Jersey, Delaware, District of Columbia, Maryland, Virginia, and part of North Carolina, are experiencing increasing amounts of high tide flooding as compared to other parts of the Project Area. These trends are discussed in more detail in the respective State Study Area chapters.

1.4.2.2 Storm Surge

Storm surge is a temporary inundation caused by the storm winds pushing water onshore as the storm approaches land. The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b). Coastal storms within the Atlantic Coast Project Area include hurricanes, or tropical cyclones, and nor'easters. Hurricanes are more common and generally more intense to the south and occur between June and November, while nor'easters occur in winter in the North Atlantic.

Hurricanes are rotating systems of clouds and thunderstorms that form over tropical or subtropical waters. They are powered by warm ocean waters and a warm, moist atmosphere (NOAA 2019a). The warm, moist air over the ocean rises up and away from the surface, causing an area of low air pressure below. Air from surrounding areas with higher pressure pushes into the low-pressure area and takes its place. As warm air continues to rise, it cools off and forms clouds (UCAR 2020). Hurricanes continue to grow when the storm travels over areas with warm ocean water, low winds outside the storm, and high levels of moisture in the atmosphere. When winds reach 39 miles per hour (mph) it is called a tropical storm. When winds reach 74 mph, it is a hurricane. Hurricanes can range from a Category 1 with wind speeds of 74-95 mph and storm surges of 4-5 feet to a Category 5 with wind speeds over 157 mph and storm surges more than 19 feet. Hurricanes dissipate when they move over land or out of the tropics and into cooler latitudes (UCAR 2020). September is the month when most major hurricanes hit the U.S. mainland (Texas to Maine), followed by August and October (NOAA 2019b).

Nor'easters come from a low-pressure system offshore and can be intensified when high-pressure systems over northeastern New England or in the northern Atlantic block the northward movement of the low-pressure system (Delaware DNREC 2019d). Nor'easters are generally associated with smaller surges and weaker winds along the coast than hurricanes. However, impacts from nor'easters are magnified as a result of the longer duration of high winds typically blowing in one direction, high water, and wave action over multiple tidal cycles (NYSERDA 2011). In many North Atlantic States, the highest regional tides may occur during the winter season and if they correlate with nor'easters, can result in greater storm surge impacts, especially when combined with seasonal lunar cycles that cause higher than normal tides (SeaLevelRise.org 2019). Any coastal storms are most destructive when they persist over time and multiple high tides (Delaware DNREC 2019d).



Source: Sweet et al. 2018

Figure 1-5. NOAA Tide Gauge annual number of high tide floods (days per year) within the Atlantic Coast Project Area

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Within this report, NOAA's projections for storm surge are based on a Category 4 hurricane. Due to anthropogenic warming over the 21st century, global trends for tropical cyclones include increased rainfall rates, increased storm intensity, and increased proportion of Category 4 and 5 storms (Knutson 2020). Category 4 storms are more common than Category 5 storms. Category 5 storms north of the North Carolina/Virginia border are rare because the colder water temperatures generally do not allow storms to reach this higher level of intensity.

Storm surge in areas experiencing sea-level rise can result in flooding farther inland than may have been experienced during previous storms. This increases risk to life and property. This also results in increased damage to the built environment, creating greater economic strain on the impacted communities. As will be seen in several of the following state chapters, certain states such as New Jersey are still in the process of recovering from Hurricane Sandy, which occurred in 2012. Therefore, environmental reviews of potential future OCS projects should consider the project's potential to affect flooding, whether from sea level rise, nuisance flooding, storm surge, or combined effects.

1.4.2.3 Physical Vulnerability Preparedness

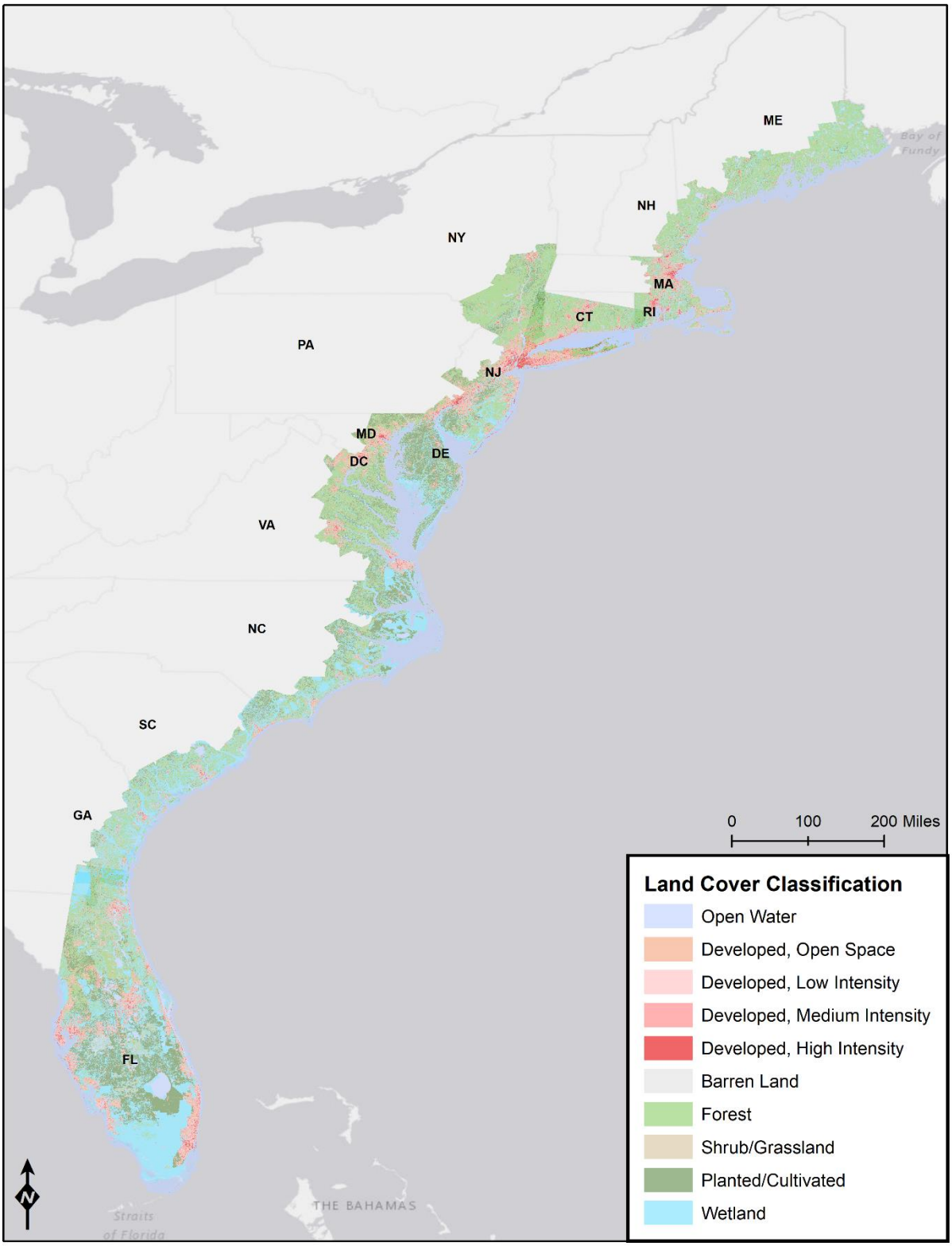
Many communities are already taking measures to adapt to changing climate conditions. These plans, where identified, are discussed in further detail in the State Study Area chapters. Communities that incorporate this kind of planning into their master/comprehensive plans for future land use will have an advantage. Future OCS project analysts would benefit from further site-specific research into the planning, and decision-making communities are engaging in dealing with the potential impacts of climate change once potential project locations are known. Preparedness and mitigation efforts offer economic opportunities for both developers and the affected communities.

1.5 Land Cover and Land Use

This section describes the basis for the land cover and land use analyses presented in the State Study Area chapters. The land use analyses include existing and future land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources. The land cover and land use characteristics will shape how new OCS-related activity could influence life in coastal communities.

1.5.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The 2016 National Land Cover Database (NLCD) is a comprehensive dataset at 30-meter (98-foot) resolution based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Atlantic Coast Project Area. Figure 1-6 shows the 2016 NCLD land cover for the Project Area. More detailed land cover maps and corresponding discussion regarding overall land cover patterns and land cover change are included in each respective State Study Area. This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available for future assessments.



Source: NLCD 2016a

Figure 1-6. NCLD Land Cover for the Atlantic Coast Project Area

1.5.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial. Existing and future land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation all must be considered when analyzing how new OCS activity could influence life in coastal communities. The following sections describe existing and future land use, zoning, housing utilization and vacancy rates, recreation resources, and industrial incentives within the Atlantic Coast Project Area.

1.5.2.1 Existing and Future Land Use

The NCLD data provide an initial assessment of potential land uses within a designated area; however, as described previously, because it is based on satellite data with a 30-meter (98-foot) resolution, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information on a more localized level where specific land uses can be identified.

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Many counties and cities within the Atlantic Coast Project Area have developed a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of five to ten or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as schools, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase existing land use and projected future changes in land use. Some, though not all, of these include publicly available GIS data that support the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Project Area or even on single maps of the State Study Areas.

In addition to locally developed plans, Opportunity Zones for future development have been identified nationally as a result of the Tax Cut and Jobs Act of 2017 (IRS 2019). These opportunity zones are located in economically distressed communities. Development in these opportunity zones may be eligible for certain tax incentives, such as rolling capital gains into Opportunity Funds. The hope is that the new investment in these communities will help "seed new startups, accelerate business expansions, create jobs, increase and improve housing options, and revitalize the built environment in distressed communities across the country" (Economic Innovation Group 2019). Therefore, these Opportunity Zones may become sites of future development. Opportunity Zones are nominated by the state in which they are located. The nomination is certified by the Secretary of the U.S. Treasury via his delegation of authority to the Internal Revenue Service (IRS 2019). Information on and a map of Opportunity Zones can be found at https://www.cdfifund.gov/Pages/Opportunity-Zones.aspx; additional information on Opportunity Zones can be found at https://eig.org/opportunityzones/facts-and-figures. It is assumed that these zones will change over time and these websites would be updated accordingly. Future OCS projects would benefit from an understanding of these Opportunity Zones and the associated tax incentives. Opportunity Zones are available throughout the Atlantic Coast Project Area.

Analysts of future OCS-related projects should review and consider the compatibility of proposed projects with regard to local land use and planning documents and Opportunity Zones once site-specific project information is known. Projects that are consistent with existing plans and that foster economic development in ways aligned with local goals are likely to receive greater community support.

1.5.2.2 Zoning

In addition to land management plans, many municipalities develop zoning ordinances and planning documents to control development and to keep similar land uses together. Zoning ordinances are rules that define how land in a particular area can be used and control the development of property in these areas. Land use areas are commonly divided into residential, commercial, industrial, agricultural, combination, and historic zones. Properties in each of these areas must conform to the zoning type (FindLaw 2020a).

- Residential zones typically include single-family homes, apartments, duplexes, trailer parks, co-ops and condominiums.
- Commercial zones typically include office buildings, shopping centers, nightclubs, hotels, warehouses, some apartment complexes, and vacant land that has the potential for commercial development.
- Industrial zones may be specific to the type of business and may be affected by noise concerns, industrial use, size and height of the building(s).
- Agricultural zoning may limit the density of development, restrict non-farm uses of the land, and protect farming communities from becoming fragmented by residential development; however, the density may be dependent upon the type of agricultural operation.
- Combination zoning allows for mixed-uses and may be unique to the community.
- Historic zoning includes homes and buildings over 50-years old and may prevent changing structures from their original condition other than repair and restoration. Historic zoning can include districts, sites, buildings, structures, and/or significant objects.

Within the three main zoning types (i.e., residential, commercial and industrial), there may be restrictions on the types of buildings allowed such as building size, building height, number of rooms, location of utility lines, restrictions on accessory buildings, and building setbacks from the street/boundaries. Zoning may be overseen by city and/or county governments, and usually a state law authorizes both the establishment of a zoning or planning commission and the creation of local zoning ordinances. State laws also typically require certain procedures be followed prior to the enactment of zoning regulations, such as comprehensive plans evaluating population and land use patterns, public notices, and holding public hearings (FindLaw 2020b). However, there are limitations on the government's authority to regulate land use and zoning ordinances can be challenged (i.e., zoning appeals) in front of a zoning board (FindLaw 2020c).

Zoning ordinances are designed to protect the welfare of the public and may also include zoning for potential flooding, hurricane damage, and building failures. Ordinances are also designed to improve and maintain the county population's quality of life, including economic development and aesthetic attributes. As such, utility-related ordinances often have requirements that include zoning, building, landscaping, and land disturbance in addition to buffers, setbacks, and screening regulations. Required county permits may include zoning, land disturbance, encroachment, landscaping, and building permits. Rural and undeveloped areas may have broader or no zoning ordinances as compared to urban areas. With the recent increase in renewable energy facilities, some municipalities may develop new ordinances to address development of this nature in unincorporated areas as well as towns and cities. In many States, renewable energy technology (e.g., solar panels or wind turbines) is not included in local zoning ordinances and are technically not prohibited, and not every municipality want these technologies in their communities.

Some municipalities (e.g., in New Jersey) may vary in their approach to zoning for renewable energy facilities depending on how they are categorized (Riker Danzig 2009). Therefore, communication with local planning and building officials is advised in the early planning stages to avoid conflicts during the design phase and understand specific applicable restrictions or planning processes that require approval from county officials.

1.5.2.3 Industrial Incentives

States within the Atlantic Coast Project Area offer a variety of tax credits, refunds, and other incentives to promote business development and job creation. Many of these incentives are restricted to certain industries, generally not including oil- and gas-related ventures. Additionally, as described in Chapter 1.5.2.1, development in Opportunity Zones is incentivized to encourage development in economically distressed areas throughout the Project Area. Once site-specific information is known for potential future OCS projects, local incentive programs can be identified.

1.5.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. The USEPA-tracked facilities are presented on figures within the respective State Study Areas. Given the scale of the individual facilities, an Atlantic Coast Project Area map would not provide useful information. Other industrial facilities not tracked by USEPA may also be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, the USEPA facilities figures give a good representation of the distribution of industrial properties across each State Study Area. Because this information can change quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on the respective State Study Area USEPA facilities figures include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant that could complicate the expansion, redevelopment, or reuse of these properties may be present.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*, which includes sites and facilities classified as:

  Air Emissions Classification Unknown
  Air Major
  Air Minor
  Air Monitoring Site
  Air Program
  Air Synthetic Minor
  Biosolids
  Base Realignment and Closure
  Conditionally Exempt Small Quantity Generator

Closed Criminal Enforcement Case
Combined Sewer Overflow
Community Water System
Compliance Activity
Compliance and Emissions Reporting
Compliance Assistance
Concentrated Animal Feeding Operation
Electric Generator
Electric Power Generator (Biomass Based)
Electric Power Generator (Gas Based)
Electric Power Generator (Oil Based)
Electric Power Generator (Wind Based)
Enforcement/Compliance activity
Federal Facility Hazardous Waste Docket
Formal Enforcement Action; Gasoline and Diesel Producers
Greenhouse Gas Reporter
Hazardous Waste Biennial Reporter
Integrated Compliance Information System (ICIS)-NPDES Major
ICIS-NPDES Minor
ICIS-NPDES Non-Major
ICIS-NPDES Unpermitted
Landfill Gas Recovery
Leaking Underground Storage Tank – American Recovery and Reinvestment Act
Large Quantity Generator
Non-Transient Non-Community Water System
NPDES Permit
NPDES Pretreatment Program
Other Hazardous Waste Activities
Pesticide Producer
Stormwater Phase II Final Rule municipal separate storm sewer systems (MS4)
Publicly Owned Treatment Works
Risk and Technology Review
Risk Management Plan Reporter
Small Quantity Generator
State Master
State Regulated Treatment, Storage, and Disposal
Storm Water Industrial
Transfer Facility
Transient Non-Community Water System
Transporter
Toxic Substances Control Act Submitter
Treatment, Storage, and Disposal
Unspecified Universe (The handler is not currently classified in any hazardous waste universe.)
Water Treatment Plant

The USEPA facilities figures help identify existing land use within the respective State Study Areas. In many counties and municipalities, there are frequently specific zones for industrial, commercial, and residential areas. Most potential future OCS projects would likely be industrial in nature; therefore, it is likely they would be more compatible with other industrial land uses. Therefore, these maps can be

helpful for analysts evaluating existing land use conditions in specific areas. Chapter 1.6.4 Employment describes the employment industry categories and job distribution across the Atlantic Coast Project Area.

1.5.2.5 Protected Areas

According to the International Union for Conservation of Nature, protected areas are defined as "geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural value" (IUNC 2020a). The International Union for Conservation of Nature further classifies protected areas based on their management objectives. Categories of protected areas include Strict Nature Reserves, Wilderness Areas, National Parks, Natural Monument or Feature, Habitat/Species Management Area, Protected Landscape/Seascape, and Protected area with sustainable use of natural resources. These categories are recognized internationally as the global standard for defining protected areas and, thus, are being incorporated into Federal and State government legislation (IUNC 2020b).

In the U.S., there are several terrestrial, aquatic, and marine protected areas dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses. The Protected Areas Database of the U.S. (PAD-US), published by the USGS Gap Analysis Project, is the official national inventory of parks and other protected lands. The PAD-US is a spatial database that was originally designed to support biodiversity assessments. However, the scope of the database was expanded to include all public and nonprofit lands and waters, which allows the database to support other communities including recreation, national resource management, wildfire, emergency management, transportation, research, and public health. Further, PAD-US also supports global conservation analyses to inform policy decisions in cooperation with the United Nations Environment World Conservation Monitoring Center (USGS 2018a, USGS 2018b). The PAD-US compiles the "best available" data from managing agencies and organizations regarding public land and other protected areas and uses the inventoried data to create maps and describe areas using over 25 attributes in nine feature classes. The feature classes include fee-owned lands, management designations overlapping fee lands, marine areas, proclamation boundaries, conservation and other easements and various combined feature classes (combing two or more of the other feature classes). Most lands in the PAD-US database are public lands owned in fee, but it does include long-term easements, leases, agreements, Congressional designations such as Wilderness Areas, Executive designations such as National Monuments, and administrative designations such as Areas of Critical Environmental Concern. Some lands can also be a combination of feature classes.

In the most updated version, PAD-US 2.0, the database contains data on all Federal lands, most State lands, and many areas at regional and local scales that are fee-owned open space, resource lands, and conservation easements (USGS 2019f). This database allows users (e.g., decision makers, planners, researchers, private interest groups) to easily know which lands in the U.S. are currently protected for conservation, land management, planning, and recreation. Use of this information can also aid in land management activities and make land use planning, acquisition planning, and mitigation easier and more accurate. This will also aid in better understanding land use change over time.

Because many of the protections are in place around these designated areas, proximity to protected areas needs to be considered during potential future OCS project analysis to determine the potential for impacts. Figures showing the protected areas are included within the respective State Study Area chapters. During potential future OCS project analysis, protected areas should be considered at a more localized level once site-specific information is known.

1.5.2.6 Cultural and Historic Resources

The National Historic Preservation Act (NHPA), 54 U.S.C. §§ 306108 *et seq*., established a national program to preserve the country's historical and cultural resources. Section 106 of the NHPA requires

Federal agencies to consider the effects of their actions on historic properties and provide the President's Advisory Council on Historic Preservation an opportunity to comment on a proposed action before it is implemented (36 CFR § 800). Regulations for implementing the Section 106 process are provided in 36 CFR § 800.

Both State and Federal guidelines for cultural resources recognize that buildings, structures, objects, districts, archaeological sites, and cultural landscapes can be historically significant. Under the implementing regulations of NHPA Section 106 (36 CFR § 800.16 (I)(1)), a historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (NRHP). To be eligible for the NRHP, these historic properties must be over 50 years old and meet at least one of the NRHP significance evaluation criteria (36 CFR § 60.4), and the property must also possess integrity. Specific aspects or types of integrity include location, design, setting, materials, workmanship, feeling, and association. The NRHP historic properties meet one or more of the following evaluation criteria:

- *Criterion A:* The property is associated with events that have made a significant contribution to the broad patterns of our history.
- *Criterion B:* The property is associated with the lives of persons significant in our past.
- *Criterion C:* The property embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.
- *Criterion D:* The property has yielded, or may be likely to yield, information important to prehistory or history.

Property of traditional religious and cultural importance to an Indian tribe may also be considered for the NRHP under the same criteria [36 CFR 800.4(b)].

Under the NHPA, Federal agencies are required to consider the possible effects of their undertakings on historic properties. An "undertaking*"* is any project, activity, or program with the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a Federal agency or is licensed or assisted by a Federal agency. The evaluation of an undertaking's possible effects on cultural resources and historic properties is accomplished through a four-step review process outlined in 36 CFR § 800, the implementing regulations for Section 106 of the NHPA including:

1. Initiation – defining the undertaking and the area of potential effect and identifying the parties to be consulted in the process;
2. Identification – studies to determine whether cultural resources are present in the area of potential effect and whether they qualify as historic properties;
3. Assessment – identifying adverse effects, if any (this includes making a determination of whether the undertaking would damage the qualities that make the property eligible for the NRHP; and
4. Resolution – addressing adverse effects by avoidance, minimization, or mitigation.

Throughout the process, the Federal agency must consult with the appropriate State Historic Preservation Officer, federally recognized American Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking including the Advisory Council on Historic Preservation when appropriate.

A variety of cultural and historic resources are present throughout the Project Area. The Atlantic coastal region of the U.S. was originally populated by Native Americans who occupied the area for thousands of years. This region was also the arrival point for many of the earliest European explorers and settlers. This region, which includes the entirety of the Atlantic Coast Project Area, was crucial in many ways for the

development of the Nation. All 13 original colonies, which declared independence from England, fought the American Revolution, and later formed the first states of the new United States of America, are included within the Project Area. Numerous battles of King George's War, the French and Indian War, the American Revolution, the War of 1812, and the American Civil War were fought within the Project Area. Key civil rights era events occurred throughout the Project Area, and many of the locations of these events are recognized as important cultural and historical places. Many cultural resources are also present underwater in rivers or under the ocean in the form of submerged sites or sunken ships. There are numerous additional locations and resources in the Project Area that have cultural and historical importance in association with other local, State, and national events or tribal cultural properties.

Cultural resources include anything from small individual archaeological findings to entire national park areas and everything in between. Because of the long history of human habitation throughout the Atlantic Coast Project Area, there are numerous known archaeological and historic sites throughout the states. Figures showing many of the cultural and historic resources present within the respective State Study Areas are included in the following chapters. It is not possible to represent these resources at the scale of the Project Area in any useful way. The data presented on the respective State Study Area figures are based on publicly available data such as NRHP-listed properties including historic buildings, sites, and districts; national parks system resources; as well as locally defined cultural resources. Most archaeological sites are considered protected resources because of the risk of theft or damage to these *in-situ* resources. Therefore, unless part of a public park or museum, the locations of most archaeological resources are not shared with public databases and, therefore, are not included in this analysis.

Any cultural site or resource over 50 years old could be considered a potential historic property. Many sites and resources of this age have yet to be evaluated as historic resources. Other sites and resources are completely unknown and are frequently found or identified during analysis in association with new construction projects. Unevaluated or unknown sites and resources could be potentially impacted by future projects and would need to be evaluated under the Section 106 Process to determine if there would be any effects. Likely this evaluation will require site-specific detailed cultural resource surveys of proposed project sites and the immediate vicinity to determine potential effects to these resources. Project analysts will need to ensure appropriate cultural resource evaluations are conducted in support of future environmental analyses for proposed future OCS-related projects once project locations are known.

1.5.2.7 Recreation

The Atlantic Coast Project Area has significant and diverse recreational resources and activities. Residents, visitors, and tourists typically participate in recreational activities on weekends or vacation periods. Although spring and summer are traditionally peak months for traveling and vacationing, recreational opportunities are available year-round in the Project Area and will vary based on the resources available and the climate of the region. Awareness of recreational opportunities available within each area is important for understanding how new OCS activity could impact life in these coastal communities. Natural and man-made recreational resources include parks, forests, wildlife management areas, rivers, lakes, wetlands, the ocean, museums, theaters, stadiums, and amusement parks. Recreational activities can include physical activities (e.g., hiking, biking, golfing, snow skiing), water activities (e.g., swimming, surfing, boating, canoeing, kayaking), hunting and fishing, camping, cultural activities (e.g., museums, historical landmarks), organized activities (e.g., sporting events, parades, festivals, concerts), and social activities (e.g., shopping, dining, amusement parks, theme parks).

Most states have published economic impact reports and studies for tourism, often categorized by region, county, and/or individual cities. These economic impact reports contain information on the number of visitors, visitor spending, business sales, employment, and taxes sustained by tourism in the area, and how these statistics have changed from past years. Information for the recreational activities available in the State Study Areas has been summarized in the following chapters. Much of this information was

obtained from the respective State's official tourism website, county or city tourism websites, or websites for specific recreational activities, organizations, or events. The tourism websites provide information on places to visit, activities, events and festivals, lodging, dining, and entertainment within various regions and/or counties within the state. Each state also has an official State Parks website for locating and identifying State Parks and State Forests within specific regions of the state. Websites for the individual parks provide information such as activities available at the park, trail maps, hours and season, camping reservations, fees, and rules. The National Park Services' websites are also useful for identifying National parks, seashores, wildlife preserves, monuments, memorials, sites, and trails in each State within the Atlantic Coast Project Area, as well as information on the history and culture of the park, things to do, places to eat and sleep, fees, and estimated number of annual visitors.

Because of the history of the area and the importance of several States and sites in the Atlantic Coast Project Area to U.S. history, tourists from around the Nation visit Atlantic states frequently throughout the year. The information presented in the respective State Study Area chapters presents an introduction to the recreational resources at State and county levels. However, given the numbers and diversity of recreational resources, future OCS project analysis will need to conduct a site-specific evaluation of local recreational resources once potential project locations are known. Such information will be needed to fully consider impacts to recreational resources in future environmental analyses.

1.5.2.8 Transportation Resources

There are a variety of transportation resources throughout the Atlantic Coast Project Area, including major interstate and State highways; national, international, regional, and local public airports; interstate railroads and some local railroad spurs; and waterways and ports. These transportation resources are used for both freight transport and personal travel, internationally and domestically. Within the U.S., the freight transportation industry moves the largest quantity of goods (62.7% of the tonnage and 61.9% of the value) via trucks on roadways, especially shipments moved less than 750 miles. Railway freight moves the most commodities by tonnage and ton-miles for shipments traveling between 750 and 2,000 miles. Over the past 50 years, freight railways and connecting facilities have developed ways to allow more cargo to be carried with fewer railcars. Air freight has become more common for shipments moving over 2,000 miles (USDOT and BTS 2018). Cost-effective transportation infrastructure for the efficient movement of freight is an important consideration for potential future OCS projects.

1.5.2.8.1 Roadways

The National Highway System and supporting roadways compose an extensive system of highways generally built around large population centers, such as those within the Atlantic Coast Project Area. In 2015, the Fixing America's Surface Transportation Act directed the Federal Highway Administration to establish a National Highway Freight Network to strategically direct Federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system. The National Highway Freight Network includes the following subsystems of roadways:

- *Primary Highway Freight System (PHFS):* This is a network of highways identified as the most critical portions of the U.S. freight transportation system.
- *Other Interstate Portions Not on the PHFS:* These highways consist of the remaining portion of interstate roads not included in the PHFS that provide important continuity and access to freight transportation facilities.
- *Critical Rural Freight Corridors:* Public roads not in an urbanized area that provide access and connection to the PHFS and interstate with other important ports, public transportation facilities, or other intermodal freight facilities.

- *Critical Urban Freight Corridors:* Public roads in urbanized areas that provide access and connection to the PHFS and Interstate with other important ports, public transportation facilities, or other intermodal freight facilities.

Interstate 95 (I-95) is the most significant PHFS route within the Atlantic Coast Project Area. I-95 is the main interstate highway on the East Coast of the U.S., running from U.S. Route 1 in Miami, Florida to the Houlton-Woodstock Border Crossing with New Brunswick, Canada. The highway runs largely parallel to the Atlantic Coast and U.S. Route 1, serving areas from Florida to Maine.

Within the U.S., total mileage of the highway system does not tend to increase although the number of vehicles using the system and vehicle-miles traveled continues to increase, which can contribute to congestion in urban areas over time (USDOT and BTS 2018). A University of Minnesota Center for Transportation Studies study of the top 50 most populous U.S. metropolitan statistical areas (MSA) looked at traffic congestion changes from 2013 to 2107 (USDOT and BTS 2018). Table 1-5 shows the congested hours from 2013 to 2017 for MSAs in the Atlantic Coast Project Area with populations greater than 1 million people. Compared to the average congestion for the 52 most populous MSAs in the U.S., MSAs within the Project Area experience more than 5 hours of congestion a day on average, as compared to 4.5 hours in the U.S. However, for the majority of the cities in Table 1-5, congestion times are actually decreasing over time. As these are some of the most populous cities, congestion has likely been being addressed for some time and various management plans and construction projects have been implemented to assist with congestion management. Many of these cities also have robust public transportation systems (buses, metro rail, subways, etc.).

Table 1-5. Congested Hours (MSAs in the Atlantic Coast Project Area with a population greater than 1 million) from 2013 to 2017

MSA name	Congested Hours; 2013 (hh:mm)	Congested Hours; 2017 (hh:mm)	Congested Hours; Change (hh:mm)
Baltimore, Maryland	5:58	6:01	+0:02
Boston, Massachusetts	6:30	5:13	-1:17
Jacksonville, Florida	3:03	3:23	+0:20
Miami, Florida	7:03	6:08	-0:55
New York, New York	8:56	7:03	-1:53
Orlando, Florida	5:17	3:48	-1:29
Philadelphia, Pennsylvania	6:00	4:46	-1:14
Providence, Rhode Island	3:47	4:34	+0:47
Richmond, Virginia	3:00	2:05	-0:55
Virginia Beach, Virginia	5:32	5:07	-0:25
Washington, DC	6:45	6:54	+0:09
Average for MSAs >1 million within the Atlantic Coast Project Area	**5:37**	**5:11**	**-0:26**
All 52 MSAs in United States	4:33	4:17	-0:16

Source: USDOT and BTS 2018

1.5.2.8.2 Railroads

The U.S. freight rail network plays a key role in the overall multimodal transportation system. In addition to moving large quantities of freight, it also provides other public benefits including reductions in road congestion, highway fatalities, fuel consumption and greenhouse gases, logistics costs, and public infrastructure maintenance costs. Of rail freight, 91% are bulk commodities, such as agriculture and energy products, automobiles and components, construction materials, chemicals, coal, equipment, food, metals, minerals, and paper and pulp. The remaining 9% is intermodal traffic that generally consists of consumer goods and other miscellaneous products. The primary Class I freight railroads within the Atlantic Coast Project Area are CSX Transportation and Norfolk Southern Combined Railroad Subsidiaries. An extensive network of regional and local railroads also exists within the Project Area.

Although railways are primarily used for freight in the U.S., the heaviest passenger ridership within the U.S. occurs in the Atlantic Coast Project Area. The Amtrak passenger rail and stations are presented in Figure 1-7 of the 35 Amtrak® train routes and 500 destinations throughout the U.S., 14 of the routes are partially or entirely in the Atlantic Coast Project Area. There are also five additional Amtrak® routes that originate in New York or the District of Columbia, but they primarily travel north or west, outside the Project Area (Amtrak 2020a). It is important to note that many of the routes overlap in segments, especially between Washington, D.C. and New York. (USDOT and BTS 2018) Of the top 25 busiest Amtrak stations in 2019, 15 stations were in the Project Area; New York (Penn Station), Washington DC, Philadelphia, and Boston (South Station) were among the top five busiest stations (Amtrak 2020b).

1.5.2.8.3 Ports and Waterways

Ports and waterways are important components of the Atlantic Coast Project Area's economy and freight network, as well as a resource for personal transportation and public recreation. The Atlantic Intracoastal Waterway extends over 1,100 miles from Norfolk, Virginia to Key West, Florida through natural inlets, tidal rivers, bays, man-made canals, and sounds. As authorized in the 1939 Rivers and Harbors Act, the USACE is responsible for maintaining the waterway. The Atlantic Intracoastal Waterway system serves Federal agencies, military vessels, shipping barge traffic, commercial and charter fishing vessels, cruise and tour boats, recreational vessels, and other important vessels (AIWA 2020).

Water is the leading transportation mode for U.S. international freight trade both in terms of weight and value. Although the Port of Los Angeles on the Pacific Coast was the leading U.S. international port by value, the Port of New York/New Jersey, within the Atlantic Coast Project Area, was the second, handling more than $187.3 billion in cargo. U.S. ports are increasingly being upgraded to serve Neo-Panamax (also known as New Panamax) ships (BTS 2017, USDOT and BTS 2018). The ports of New York/New Jersey, Savannah, Virginia, and Charleston are the leading container ports along the Atlantic Coast (BTS 2017).

The Maritime Administration's Marine Highway Program was established to reduce landside congestion through the designation of Marine Highway Routes with the goal of expanding the use of America's navigable waters. The primary route within the Atlantic Coast Project Area is Marine Highway M-95. The M-95 Route includes the Atlantic Ocean coastal waters, Atlantic Intercoastal Waterway, and connecting commercial navigation channels, ports, and harbors. It stretches from Miami, Florida to Portland, Maine and spans 15 states. It connects to the M-87 Route and M-90 Route near New York City and the M-64 Route at Norfolk, Virginia. The M-95 Route is also home to 15 of the largest 50 marine ports in the U.S and lined with less congested, smaller niche ports that can play a vital part in the developing marine highway service network (MARAD 2019a, MARAD 2019c).

Sources: USDOT 2019c, USDOT 2019d

Figure 1-7. Amtrak Passenger Rail and Stations in the Atlantic Coast Project Area

1.5.2.8.4 Airports

Air travel is important for both passengers and freight. Within the Atlantic Coast Project Area there is an extensive network of primary and nonprimary airports. Primary airports are defined as public airports receiving scheduled air carrier service with 10,000 or more passengers per year. Nonprimary airports primarily support general aviation aircraft. This category includes nonprimary commercial service airports, general aviation airports, and reliever airports. Many of the primary airports within the Project Area also provide significant air cargo services. In 2016, New York City's John F. Kennedy International airport was the top U.S. international air gateway by value, handling $183.9 billion in exports and imports (USDOT and BTS 2018). Global air travel has increased over the past 16 years. The U.S. has reached records in total boardings in 2015, 2016, and 2017 (USDOT and BTS 2018). The Project Area contains the fifth largest airport in the U.S. for passenger air travel. It is John F. Kennedy International Airport, behind Hartsfield-Jackson Atlanta Airport (Atlanta), Los Angeles International Airport (Los Angeles), O'Hare International Airport (Chicago), and Dallas/Fort Worth International Airport (Dallas) (John 2019).

The U.S. has 950 public urban transit agencies and more than 1,400 rural and tribal government transit agencies offering subway, rail, bus, and ferry options. Within the Atlantic Coast Project Area, public transportation ridership is greatest in major metropolitan areas in the northeast. Within the northeast, ridership is greatest in New York, New York (approximately 4 billion passenger trips in 2016), then Boston, Massachusetts; Philadelphia, Pennsylvania; and the Washington, DC area (approximately 500 million passenger trips in 2016). Farther south within the Project Area, only three areas support transit system ridership in the top 50 in the U.S.: Virginia Beach, Virginia and Orlando, Florida (less than 100 million passenger trips in 2016), and Miami, Florida (approximately 100 million passenger trips in 2016). (USDOT and BTS 2018).

1.5.2.8.5 Transportation Constraints

The largest transportation constraints within the Atlantic Coast Project Area are aging infrastructure, congestion, and vulnerabilities from climate impacts (i.e., flooding and sea level rise). Because of the heavy concentration of populations in coastal urban areas transportation infrastructure is also dense within the Project Area. Transportation resources and the economies supported by them are increasingly at risk from extreme weather events. Hurricanes Katrina, Harvey, Irma, Maria, Michael, Florence, and Sandy severely impacted large portions of the Nation's transportation system. Record flooding, damaged roads and bridges, and road and rail closures in impacted areas caused severe disruptions of the transportation system. Public transportation, major airports, and maritime ports were closed for several days or weeks, impacting travel and shipping (USDOT and BTS 2018). Many of the states within the Project Area are addressing these issues in their long-range transportation planning efforts along with completing vulnerability and risks assessments of their transportation infrastructure to address potential impacts of climate change.

Transportation resources are discussed in the following State Study Area chapters at a regional level. Future OCS project analysts will need to consider local transportation networks and resources once site-specific information for potential OCS projects is known. Congestion of transportation networks is common throughout the Project Area given the prevalence of urban centers throughout the region as well as overall population density. Therefore, potential impacts to the transportation network or individual transportation resources will be an essential consideration for future environmental impact analyses.

1.6 Demographics and Socioeconomics

This section includes a description of the general population demographics as well as the ethnic, linguistic, or cultural minorities, low-income, and populations with particular vulnerabilities, such as children, the elderly, and those who depend on subsistence resources and may have distinct cultural or economic relationships with coastal lands within the overall Atlantic Coast Project Area that require special attention in environmental impact assessment analyses.

Data throughout the demographics and socioeconomics section is typically presented at the census block group or census tract level. Census block groups and tracts are statistical divisions. Census block groups are a contiguous collection of typically between 300 to 3,000 individuals. Census tracts are generally defined by visible or identifiable features such as legal boundaries or incorporated place boundaries. Typically both census block groups and tracts are defined locally, though the census can help define these divisions if no local guidance is provided (USCB 2020a).

On March 11, 2020, the novel coronavirus COVID-19 pandemic was declared by the World Health Organization. The pandemic is ongoing as of August 2020 (CDC 2020a). The virus is having a significant impact on population and socioeconomics throughout the country. As of August 17, 2020, there have been 5,382,125 cases of COVID-19 in the U.S. And there have been 169,350 deaths caused by the virus (CDC 2020b). Governors and civic leaders from various municipalities have been forced to enact wide-spread closures of businesses and public spaces to minimize the spread of the disease and avoid overwhelming hospitals. As a result, many businesses have been forced to lay-off or furlough workers. During the initial stages of the pandemic response in the U.S., first time claims for unemployment nationwide were at 30.3 million from February through the end of April. For those still employed, personal incomes dropped (Tappe 2020). As States and municipalities began to reopen, first time unemployment claims have dropped. As of August 13, 2020, first time unemployment claims dropped below 1 million a week for the first time since March 14, 2020 and continuing claims had decreased to 15.5 million. The unemployment rate has improved from a peak of 14.4% in April 2020 to 10.2% in August, though this is still significantly higher than the pre-pandemic rate of 3.8% (Kochhar 2020, Cox 2020). Personal consumption has also dropped both as a result of people staying home and as a result of the income and job losses (Tappe 2020). The pandemic is an evolving situation at the time of this writing and final impacts to population and socioeconomics may not be known for several years. Some businesses may never reopen as a result of the financial fallout; others may reopen but face ongoing struggles resulting in later failure. Increases in numbers of bankruptcies and mortgage defaults are likely. There may be increases in the numbers of low-income populations. The U.S. government has taken several steps to ease the immediate financial impact of the pandemic on both individuals and businesses. These steps will result in long-term financial consequences that will likely persist for an unknown duration after the pandemic has ended. In addition to the direct effects of the pandemic, there may be indirect effects in the future if population migration patterns or numbers also change. For example, individuals may be forced to migrate for new jobs or may choose to leave areas that were particularly hard hit by the virus.

The following sections present the demographic and socioeconomic information that was available in 2019-early 2020 prior to the outbreak of the novel coronavirus COVID-19 pandemic. Analyses for potential future OCS projects will likely need to consider effects of the pandemic above and beyond the demographic and socioeconomic information presented in this report.

1.6.1 Population

1.6.1.1 Slow Population Growth in the Nation

The population of the U.S. continues to grow. However, growth is not distributed evenly throughout the Atlantic Coast Project Area. At the time this study began, population data were gathered for the Nation, the Project Area, and the respective State Study Areas from the USCB 2010 Decennial Census, and the USCB American Community Survey (ACS) 2013-2017 5-Year Estimates (2017 ACS). The 2017 ACS was the most recent intercensal population estimate available at the time. Population data between 2010 and 2017 were compared, and a cumulative growth rate was calculated for the purposes of this report (USCB 2017a, USCB 2017d).

Between 2010 and 2017, the population of the U.S. grew 4%, from 308.7 million to 321.0 million. Population growth and decline for the 15 coastal states and the District of Columbia and the independent cities and coastal counties within State Study Area counties are presented in the following chapters. The periodic cumulative growth rate was calculated for each Study Area (USCB 2017a, USCB 2017d).

Population estimates are updated by the USCB on a flow basis throughout the year. In December, the population estimates for the Nation and states are released, followed by additional national, State, and county updates by demographic characteristics during the following summer (USCB 2020b).

1.6.1.2 Components of Population Change

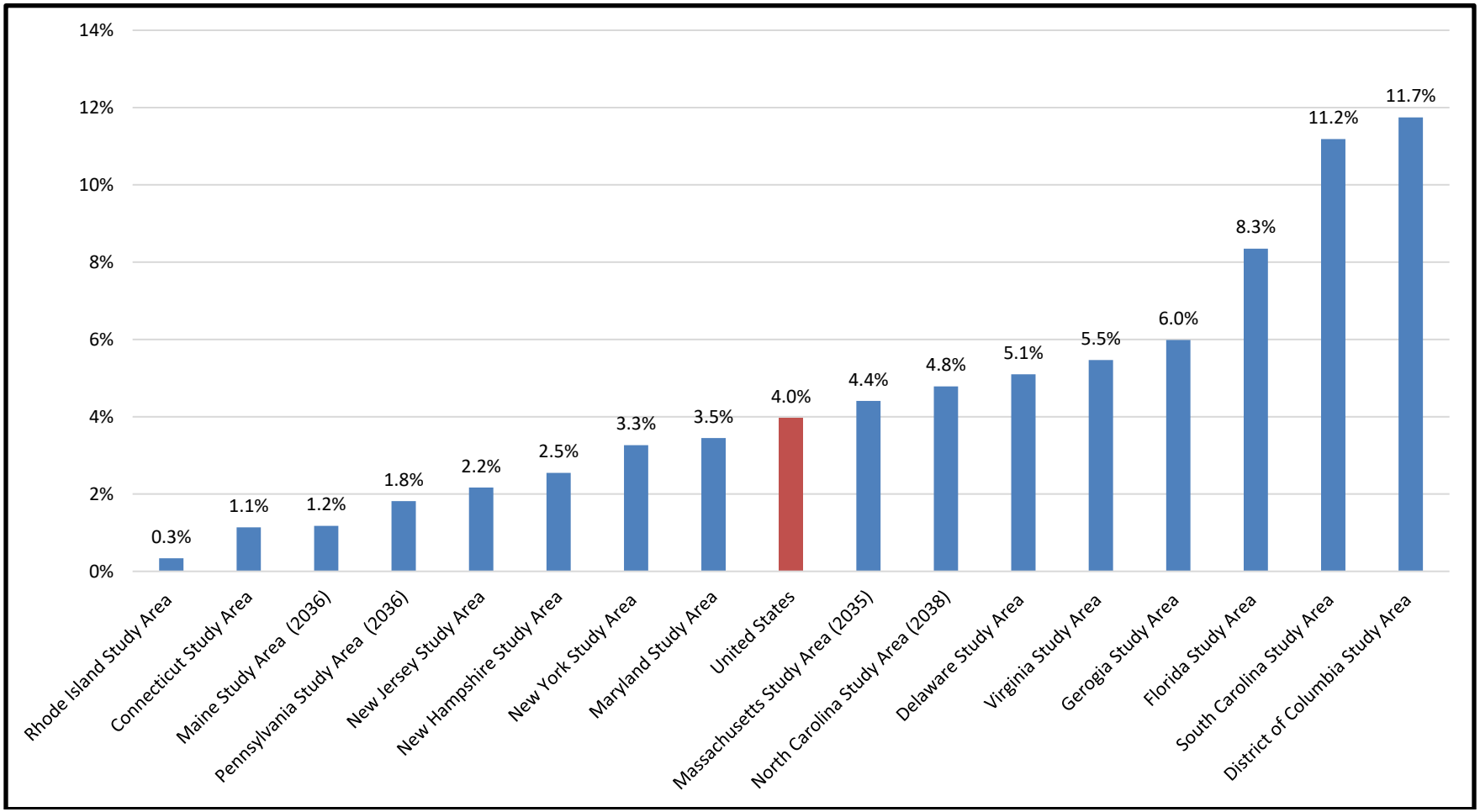
In order to understand the reasons for population change, it is necessary to examine components of population change. The main components of population change are births, deaths, and migration (both domestic and international). Natural increase (or decrease) is the difference between births and deaths in a population. Net domestic migration counts the number of residents relocating within the U.S.; net international migration counts the number of residents relocating to the U.S. from other countries. This information was sourced from the USCB release titled "Estimates of the Components of Resident Population Change for the U.S., Regions, States, and Puerto Rico." These estimates are updated annually each July by adding components of population change to the 2010 Census base. At the time the chapters for this report were written, the most recent available dataset was from the period July 1, 2017 to July 1, 2018. The population section for each state discusses the components of population change expressed as single year change between 2017 and 2018 as derived from this report (USCB 2019b).

It is also likely that rising sea level will contribute to new migration patterns as some areas may become uninhabitable over time. The full effects of sea level rise may not be known for some time. However, models project that some amount of landward shift in population is likely to occur (Hauer 2017).

1.6.1.3 Atlantic Coast Project Area Trends

Population Growth in the Atlantic Coast Project Area

Figure 1-8 and Table 1-6 show that, between 2010 and 2017, the fastest growing populations in State Study Areas were located in the southeast states; slowest growing populations in State Study Areas were located in the northeast states. The District of Columbia and South Carolina Study Areas exhibited the fastest growth at 11.7% and 11.2%, respectively. The Rhode Island and Connecticut Study Areas were the slowest growing at 0.3% and 1.1%, respectively (USCB 2017a, USCB 2017d).



Sources: USCB 2017a, USCB 2017d

Figure 1-8. Percent of Population Growth in State Study Areas and the United States Between 2010 and 2017

Table 1-6. Population and Population Change in State Study Areas and the United States in 2010, 2017, and Projected 2040

Geographic Unit	Historic Population (2010)	Total Population (2017)	Population Projection (2040) [1]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)[1]
Connecticut Study Area	2,219,037	2,244,337	2,245,406	1.1	0.0
District of Columbia Study Area	601,723	672,391	940,687	11.7	39.9
Delaware Study Area	897,934	943,732	1,076,165	5.1	14.0
Florida Study Area	10,557,750	11,439,302	14,848,881	8.3	29.8
Georgia Study Area	630,681	668,440	778,756	6.0	16.5
Massachusetts Study Area (2035)	4,924,916	5,142,008	5,563,130	4.4	8.2
Maryland Study Area	4,148,642	4,291,804	4,825,950	3.5	12.4
Maine Study Area (2036)	836,502	846,356	868,493	1.2	2.6
North Carolina Study Area (2038)	1,225,310	1,283,929	1,606,526	4.8	25.1
New Hampshire Study Area	418,366	429,031	468,442	2.5	9.2
New Jersey Study Area	7,913,312	8,084,939	9,316,679	2.2	15.2
New York Study Area	13,874,816	14,327,971	15,459,942	3.3	7.9
Pennsylvania Study Area (2036)	2,710,234	2,759,527	3,143,154	1.8	13.9
Rhode Island Study Area	1,052,567	1,056,138	1,070,104	0.3	1.3
South Carolina Study Area	1,241,048	1,379,874	1,707,100	11.2	23.7
Virginia Study Area	5,096,273	5,374,947	6,384,488	5.5	18.8
United States	**308,745,538**	**321,004,407**	**373,528,000**	**4.0**	**16.4**

Sources: USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018, Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d

[1]Note: Projection period is 2040 except for Maine (2036), Massachusetts (2035), Pennsylvania (2036), and North Carolina (2038).

The Impact of Migration on Population Gain and Loss

Population change may be attributed to natural increase (decrease) or migration. Aging of the population and the continuing decline in the rate of natural increase is a nationwide trend that affected the entire Atlantic Coast Project Area. As discussed in the following chapters, despite its decline, natural increase in all but one state (Maine) remained positive and continued to contribute to the State's annual population change. The degree to which the components of population change contribute to the overall population growth in each state is an indicator of the cause of growth. In 2018, Maine experienced a natural population decrease of 1,641 residents; however, the State had an overall population gain of 3,341 residents, as gains in domestic and/or international migration offset loss due to natural decrease. Many states relied on positive migration to offset the effects of population loss due to declining natural increase, most notably Florida, Massachusetts, North Carolina, South Carolina, and New Hampshire (USCB 2019b).

Migration from the Northern State Study Areas to the Southern State Study Areas

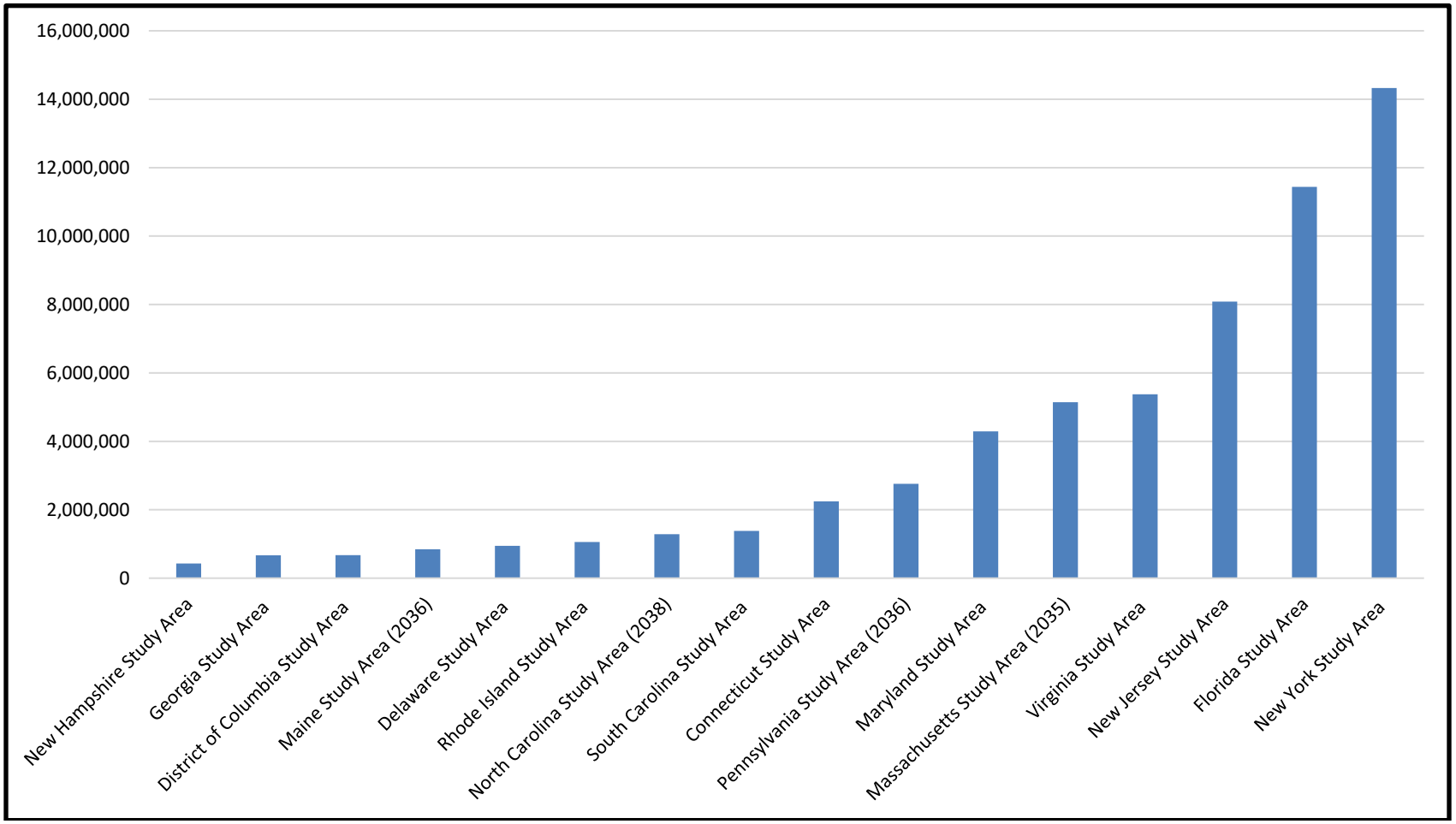
For years, the northeastern U.S. has lost a steady stream of residents to other parts of the country. Northeastern states have higher senior populations as compared to southern and western states. In particular, New York, New Jersey, and Connecticut are experiencing high senior migration losses as a result of the national migration pattern toward the southern and western parts of the U.S. Despite this, only two states – New York and Connecticut – had overall population loss in 2018, as population gains from natural increase and international migration were not great enough to offset the loss from domestic out-migration. Seniors are not the only ones moving south. Many people move for better employment and housing opportunities to avoid high property and income taxes, to achieve a lower cost of living, and/or to gain a greater quality of life. Places where the majority of people are relocating to and from may serve as an indicator of a state's economic outlook. Information about State-to-State migration flows are also presented in the following chapters. See further discussion in "National Migration Patterns and the Atlantic Coast Project Area" below (Governing.com 2018, USCB 2019c).

Population Concentration in Coastal Areas

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% of the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). Figure 1-9 shows 2017 population in the State Study Areas. This population trend is reflected in most of the Atlantic Coast Project Area, which is comprised of coastal counties that are also the location of major urban areas, most notably New York, Florida, and New Jersey. State Study Areas that present an opposing pattern are Georgia and North Carolina. In these states, major urban areas lie farther inland, outside the Project Area, therefore, the coastal counties within the Project Area have lower population density as compared to the state.

Rural-Urban Divide

Population is declining in rural areas while increasing in metropolitan areas. Within the Atlantic Coast Project Area, significant regional disparities of population density, age, education, and income exist between the respective State Study Areas and the rest of each state. This pattern is most notably apparent in Massachusetts, New Hampshire, New York, and Virginia. These differences are reflective of nationwide trends of urbanization and are indicative of a rural-urban divide.



Source: USCB 2017d
Note: The U.S. population in 2017 was over 321 million which is significantly higher than the population of any individual State Study Area. To preserve the scale for comparison between the State Study Areas, the U.S. population is not included on this figure.

Figure 1-9. Population in State Study Areas

National Migration Patterns and the Atlantic Coast Project Area

The history of the U.S. has been shaped by migration. However, national migration rates are at historic lows as most people who have moved tend to relocate relatively short distances away from their original residence. Trends throughout the Atlantic Coast Project Area are not consistent with the national trend. Instead, State Study Area trends display an opposing pattern, as northeastern states (most notably New York, New Jersey, and Connecticut) have been steadily losing population to southern states (most notably Florida and South Carolina).

According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather. This trend was stalled by the Great Recession (which lasted from 2007 to 2009) due to the housing crisis and unemployment (Rich 2013). Migration resumed slowly after the recession as the economy recovered. However, in comparison to previous migration flows of the 1940s and 1950s, the current migration rate is much slower. Mr. Frey further noted that "many areas hoping to attract members of two huge generations: the young adult millennial generation and the increasingly graying baby boomers. Millennials, a highly educated and diverse generation now squarely in their late 20s and 30s, are forming the backbone of various regions' emerging labor forces and consumer bases. Baby boomers, now all aged 55 and above, can reinvigorate communities that retain or attract their more affluent members" (Frey 2019).

Notably, millennials in the District of Columbia are driving growth in the city. According to the DC Office of Planning, millennials comprised approximately 35% of the District of Columbia's population as compared to the U.S. (23%) in 2015 (DCOP 2016a).

Population projections often assume the continuation of historical average rates of migration. However, migration rates are often more volatile than natural population increase rates as they are sensitive to changes in domestic economic conditions and changes to immigration policy. Report users should update projections with the latest datasets and be aware of any changes in U.S. immigration policy that may affect the number of immigrants in their area of interest. Skilled international workers generally migrate to large cities for the best jobs; if immigration is reduced, the flow of skilled workers could be dampened in smaller cities. The impacts of the COVID-19 pandemic may influence national migration rates in the near future.

1.6.1.4 Population Projections

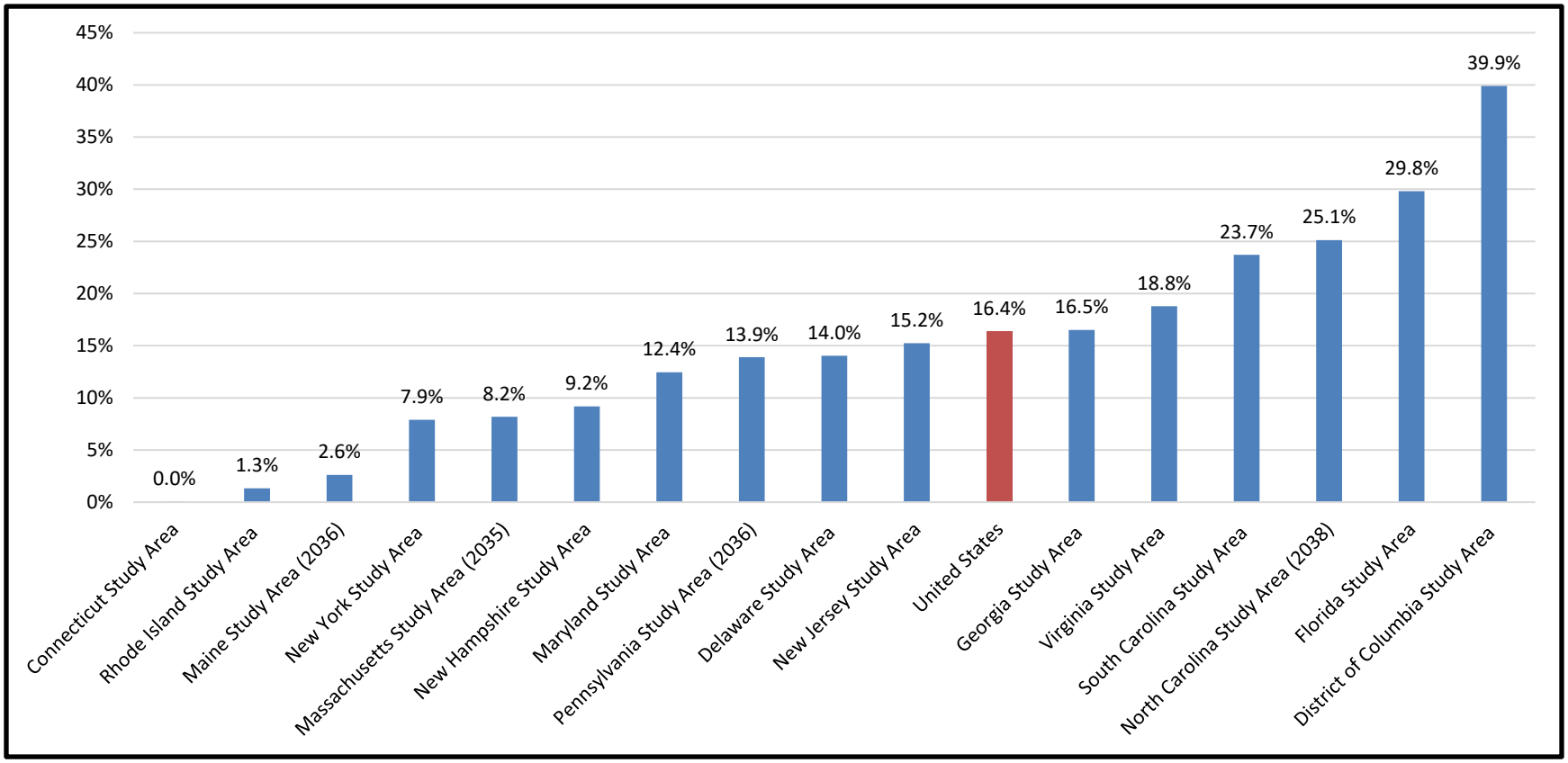
The U.S. population is projected to grow 16.4% between 2017 and 2040. Population projections were gathered from official state demographers and other sources as available for each state and State Study Area. Cumulative rates of growth were calculated between the 2017 ACS population estimate and by the year 2040 (or the latest projection year available). Projected growth rates for each State Study Area are presented in Table 1-7 and shown in Figure 1-10. State Study Areas in the northeastern states have the lowest projected growth rates. For example, projected growth in the Connecticut Study Area is flat (0.0%), and the projected growth rates for the Rhode Island and Maine Study Areas are 1.3% and 2.6%, respectively. State Study Areas in the southeast have the highest growth rates. The District of Columbia Study Area has the highest projected growth (USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018, (Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d).

In the 2030s, the primary driver of population growth is projected to change from natural increase to net international migration for the first time in U.S. history (USCB 2018d).

Table 1-7. 2017 and 2040 Population Density in State Study Areas and the United States

Geographic Unit	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)	Projected Percent Change in Population Density between 2017 and 2040 (%)
Connecticut Study Area	991.3	991.8	0.1
Delaware Study Area	484.4	552.5	12.3
District of Columbia Study Area	10,998.4	15,386.9	28.5
Florida Study Area	692.2	898.5	23.0
Georgia Study Area	119.1	138.8	14.2
Massachusetts Study Area (2035)	1,460.7	1,580.3	7.6
Maryland Study Area	652.2	733.4	11.1
Maine Study Area (2036)	97.9	100.4	2.5
North Carolina Study Area (2038)	112.7	141.0	20.1
New Hampshire Study Area	403.6	440.7	8.4
New Jersey Study Area	1,446.1	1,666.4	13.2
New York Study Area	1,687.9	1,821.3	7.3
Pennsylvania Study Area (2036)	2,991.4	3,407.3	12.2
Rhode Island Study Area	1,021.5	1,035.0	1.3
South Carolina Study Area	186.8	231.1	19.2
Virginia Study Area	610.6	632.6	3.5
United States	**90.9**	**105.8**	**14.1**

Sources: USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018, Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d
Note: Projection period is 2040 except for Maine (2036), Massachusetts (2035), Pennsylvania (2036), and North Carolina (2038)



Sources: USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018, Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d
Note: Projection period is 2040 except for Maine (2036), Massachusetts (2035), Pennsylvania (2036), and North Carolina (2038)

Figure 1-10. Projected Population Growth between 2017 and 2040 in State Study Areas and the United States

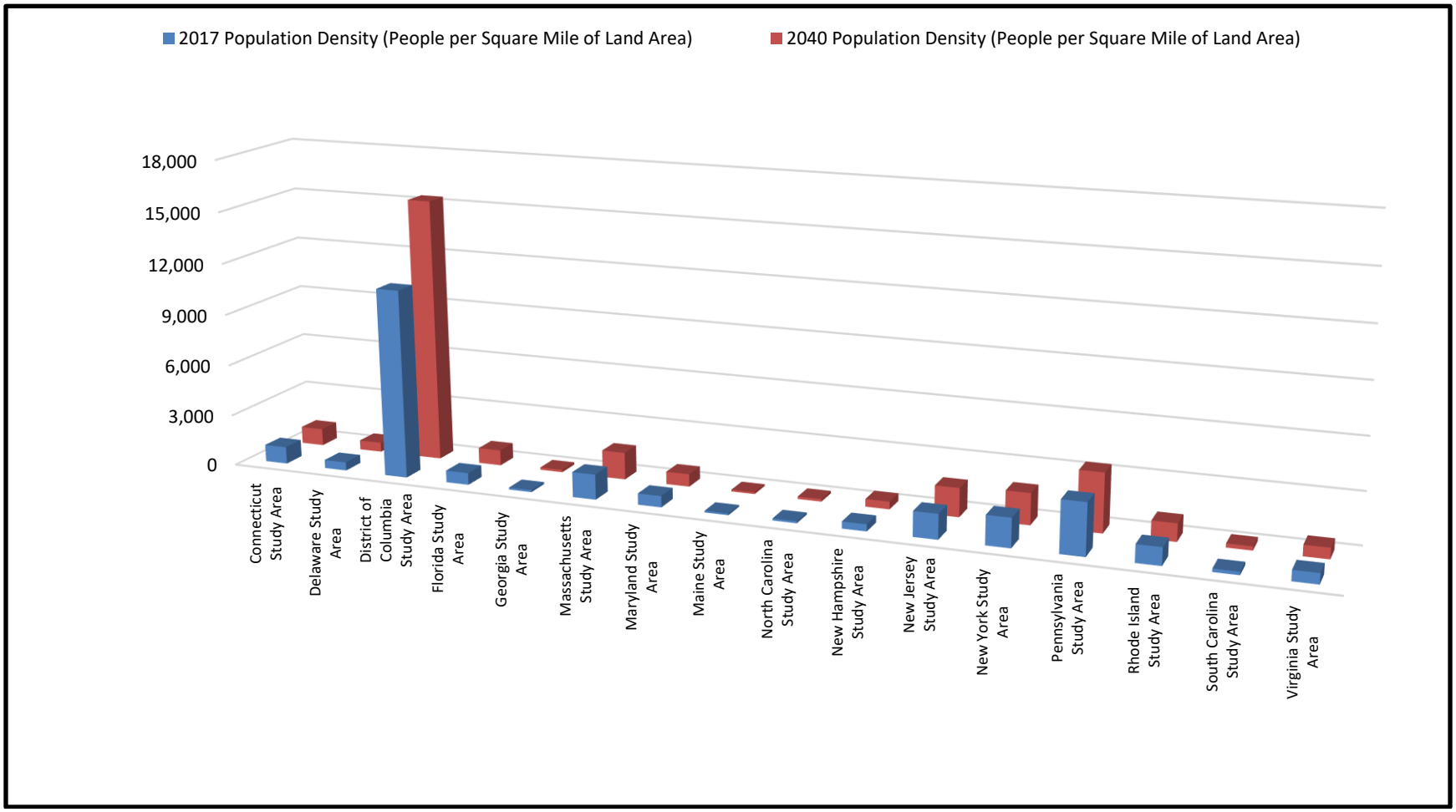
People Continue to Move to the Coasts

Population density projections for State Study Areas in 2017 and 2040 (or the latest projection year available) are shown in Table 1-7 and Figure 1-11. Between 2017 and 2040 the Nation's population density is projected to increase 14.1% from 90.9 people per square mile to 105.8 people per square mile. Population density is projected to increase in all State Study Areas ranging from relatively flat growth in Connecticut (0.1%) to 28.5% in District of Columbia. Population density is projected to increase in 11 of the 16 State Study Areas at a rate less than the national rate. Specifically, population density in the northeastern States Study Areas of Connecticut, Rhode Island, Maine, Virginia, New York, Massachusetts, New Hampshire, Maryland, Pennsylvania, Delaware, and New Jersey are growing at a slower rate as compared to the Nation. Population density of State Study Areas in Georgia, South Carolina, North Carolina, Florida, and District of Columbia are growing at a faster rate as compared to the Nation (USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018) (Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d).

1.6.2 Demographics

An Aging Nation Becoming More Diverse

The population of the U.S. continues to increase. However, the rate of increase has slowed over the last decade, resulting in slower population growth, as well as aging of the population. Information about the rate of population increase was sourced from the USCB release titled "Annual Estimates of the Resident Population for the United States, Regions, States and Puerto Rico," which is updated annually each July. At the time this report was written, the most recent available dataset was from the period April 1, 2010, to July 1, 2018. According to the 2018 estimates, the Nation's annual rate of population growth fell to 0.62% for the year ending July 2018, hitting an 80-year low possibly ushering in an "era of population stagnation" according to the Brookings Institute. The low annual growth rate was the result of further decline in the rate of natural increase. As Americans age, fertility rates decline and mortality rates increase. The lower rate of natural increase causes the mortality rate to steadily increase, which offsets how much births contribute to population growth. The combined effect of a declining birth rate plus aging population is the slower growth of the Nation's younger population. The 2018 USCB population estimates illustrate the effect. The U.S. added 2.0 million people, or 0.62%, in 2018 but growth has slowed since 2015 when the Nation grew by 0.73%. The number of births in the Nation has declined each year since 2015, while the number of deaths has risen. International migration has been declining since 2016. As a result, between 2010 and 2018, the Nation's under-age 18 population declined by 780,000 (1%), while the adult population grew by 19.2 million (8%) (Brookings Institute 2018, USCB 2018d). Correspondingly, projections indicate that the number of seniors in the population will outnumber children by the year 2034 (Luminary Labs 2019, Dimock 2019).

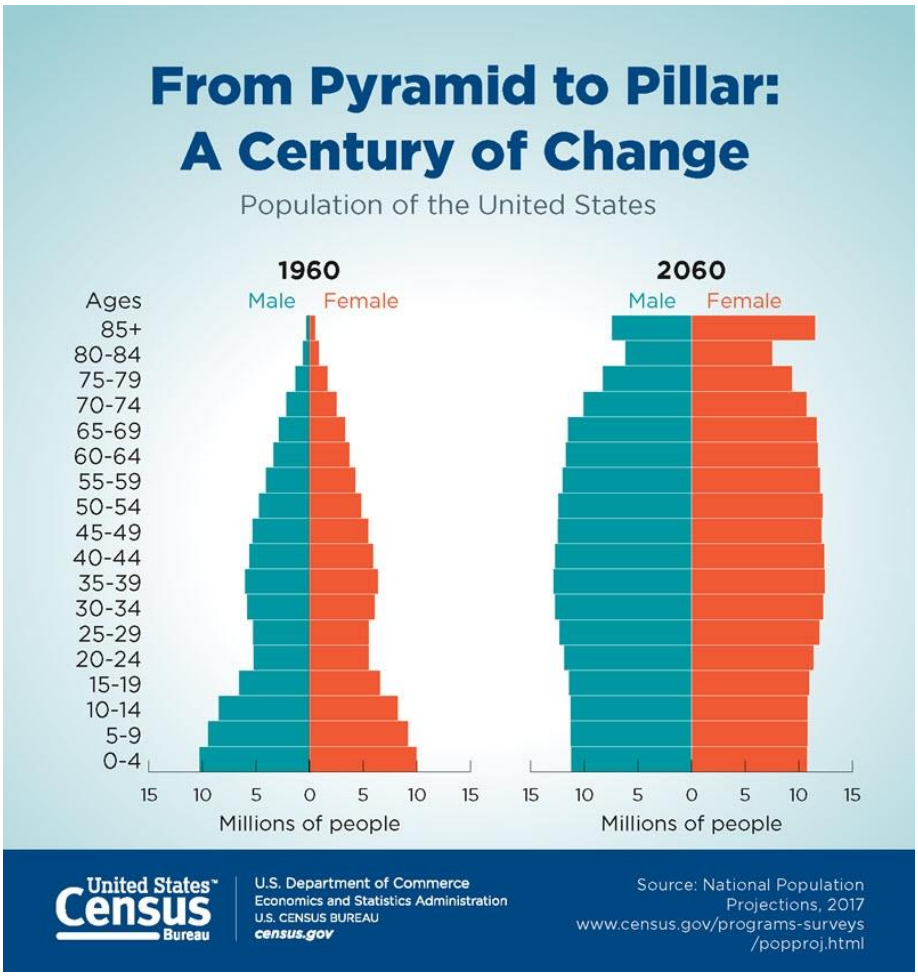


Sources: USCB 2017a, USCB 2017d, CTSDC 2017, mwcog.org 2018, Delaware Population Consortium 2019, BEBR 2018, Governor's Office of Planning and Budget 2019a, UMass 2015a, MDP 2017, ME OPM 2019, OSBM 2019, NH 2016, NJTPA 2013, SJTPO 2016, DVRPC 2016, Cornell 2018, Behney et al. 2014, RISPP 2013, SCRFA 2018, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, UVA 2019d
Note: Projection period is 2040 except for Maine (2036), Massachusetts (2035), Pennsylvania (2036), and North Carolina (2038)

Figure 1-11. 2017 and 2040 Population Density in State Study Areas and the United States

As a result of slow population growth, the shape of the U.S. population distribution is predicted to look more like a pillar by 2060, as compared to the pyramid shape of 1960, just 100 years earlier, as shown in Figure 1-12. By 2030, all baby boomers (individuals born in the U.S. between 1946 and 1964) will be older than age 65 according to current projections. This will expand the size of the older population so that 1 in every 5 residents will be retirement age. Within a few decades, older people will outnumber children for the first time in U.S. history. According to the USCB, this milestone is projected as soon as 2034, when 77 million people will be 65 years and older, compared to 76.5 million under the age of 18. The population is expected to grow at a slower pace, age considerably, and become more racially and ethnically diverse. Net international migration is projected to overtake natural population increase in 2030 as the primary driver of population growth in the U.S., another demographic first for the U.S. (Luminary Labs 2019, Dimock 2019). Thus, the racial makeup of America is also projected to shift, becoming more racially and ethnically diverse. Asian and Hispanic populations overall are growing more rapidly than whites (Luminary Labs 2019, USCB 2018d).

Because COVID-19 tends to more significantly impact the elderly and those with underlying health conditions, the pandemic may impact these population growth projections in ways that cannot yet be determined.



Source: Luminary Labs 2019

Figure 1-12. U.S. Demographic Changes from 1960 to 2060

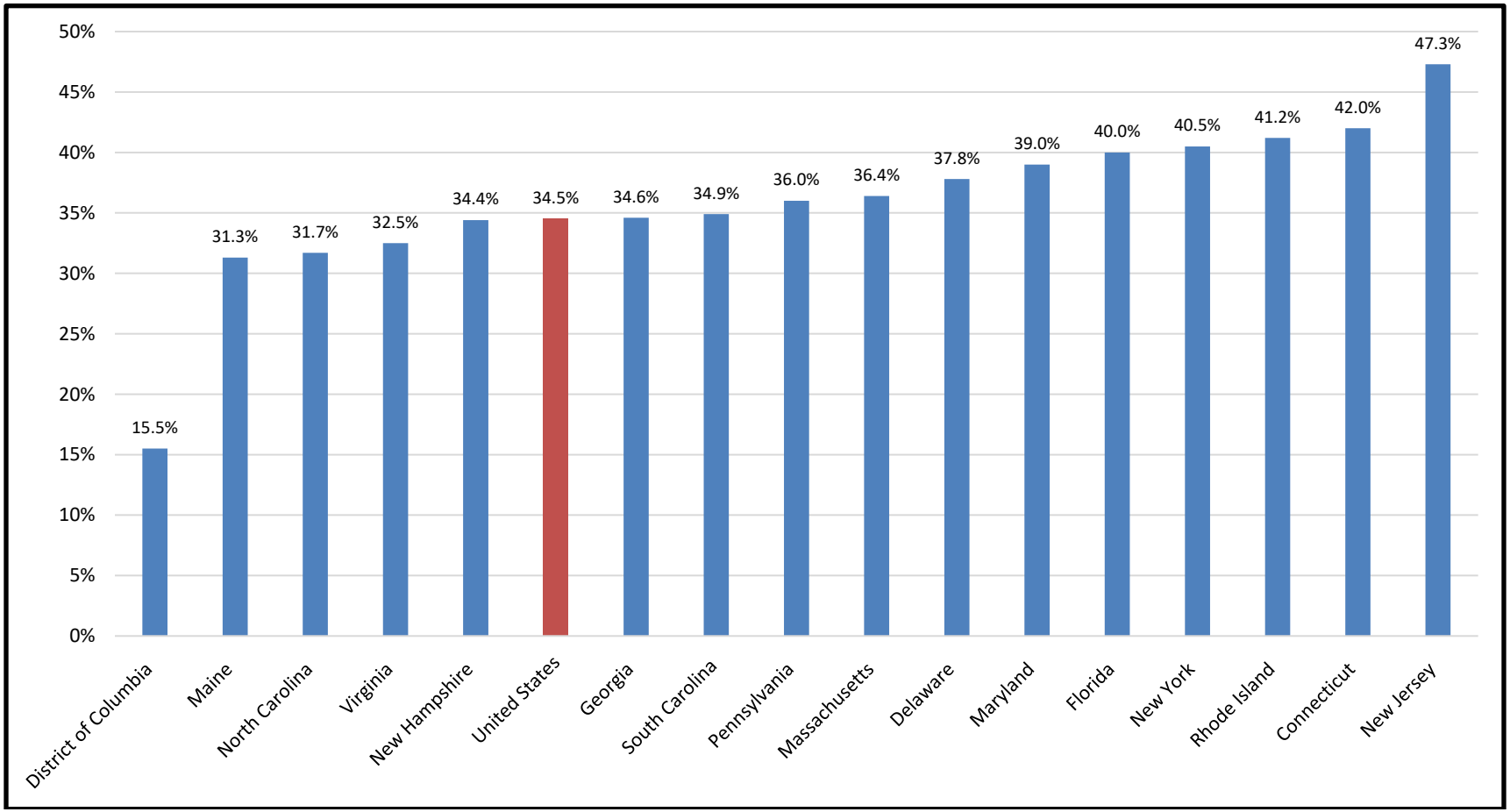
Young Adults Live with Parents

As a result of intermingled social and economic factors, an estimated 34.5% of young adults (18 to 34 years old) lived at home with their parents in 2017. Likely factors that contribute to this trend include high housing prices, student debt, inability to save for a down payment for a home, and delayed milestones such as marriage and having children. Table 1-8 and Figure 1-13 show the percent of young adults living at home in states that are located completely or partly within the Atlantic Coast Project Area in comparison with the U.S. As mentioned previously, the District of Columbia, which is a magnet for high earning millennials, had the smallest percentage of young adults living at home. States with high cost of living, such as New York, Rhode Island, Connecticut, and New Jersey, had the highest percentages of this group (Overflow Solutions 2019a). The COVID-19 pandemic has contributed at least to short-term closures of colleges and universities across the Nation, which has significantly increased the numbers of young adults living at home for the near term.

Table 1-8. Percentage of Young Adults Living at Home (2017) and Multigenerational Households (2018) in States within the Atlantic Coast Project Area and in the United States

State	Young Adults Living at Home[1]	Multigenerational Households[2]
Connecticut	42.0	3.3
District of Columbia	15.5	2.4
Delaware	37.8	3.6
Florida	40.0	4.0
Georgia	34.6	4.3
Massachusetts	36.4	3.6
Maryland	39.0	4.4
Maine	31.3	2.1
North Carolina	31.7	3.4
New Hampshire	34.4	2.9
New Jersey	47.3	4.4
New York	40.5	4.3
Pennsylvania	36.0	3.1
Rhode Island	41.2	3.6
South Carolina	34.9	3.9
Virginia	32.5	3.8
United States	**34.5**	**3.8**

[1] Overflow Solutions 2019a (sourced from 2017 data)
[2] Overflow Solutions 2019b (sourced from 2018 data)



Source: Overflow Solutions 2019a

Figure 1-13. Percent of Young Adults (18 to 34 years old) Living at Home in 2017 in States Located within the Atlantic Coast Project Area and in the United States

Multigenerational Homes

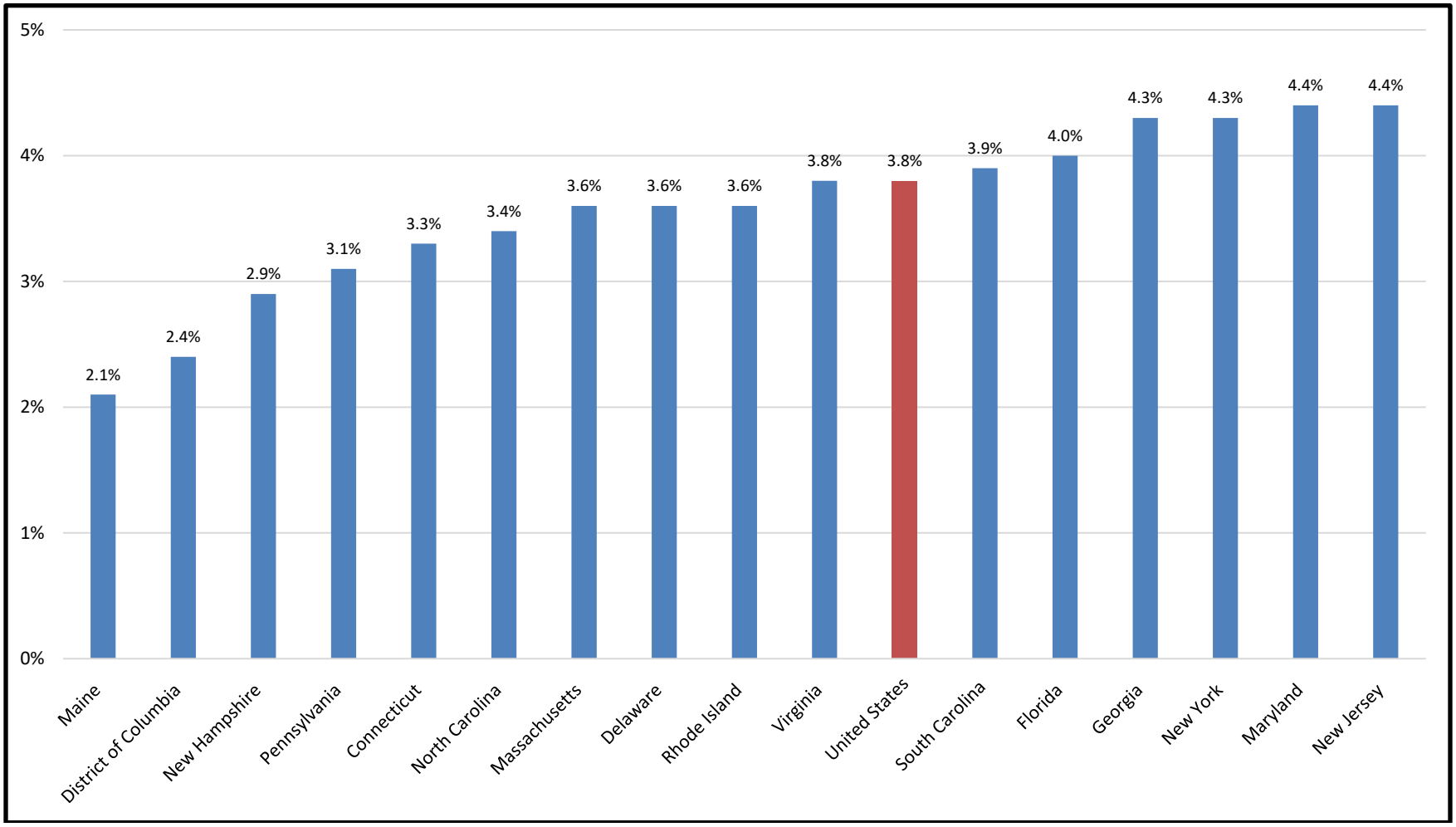
Multigenerational family living, defined as two or more adult generations of any age living in the same household, was popular in the 1950s, declined sharply by 1980, but rebounded during the Great Recession. An estimated 3.8% of households in the U.S. were multigenerational in 2018. This living arrangement continues to grow in popularity across age groups, gender, and racial groups but is particularly prevalent among Asians, Hispanics, and immigrants (Cohn and Passel 2018). As shown in Figure 1-14 and Table 1-8, in the Atlantic Coast Project Area, Maine and the District of Columbia had the least percentage of multigenerational homes (Overflow Solutions 2019b). Three of the states with the highest percentages of this group, New Jersey, Maryland, and New York, have high costs of living. New York and New Jersey also have higher populations of Asians, Hispanics, and immigrants. The reason for the trend in Georgia is unknown; it may be related to impacts of the Great Recession, to the number of rural counties with minority and low-income populations, and the presence of the Gullah Geechee population. It is likely the COVID-19 pandemic will contribute to additional increases in multigenerational family living for the immediate future as economic impacts are more fully realized.

1.6.3 Housing Utilization and Vacancy Rates

Perhaps the most basic need of any community is housing. Generally, demographics and incomes drive the demand for housing. An analysis of housing utilization (which refer to the number of units that are occupied) and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the respective State Study Areas, are presented in Table 1-9. These data are discussed in greater detail within each State Study Area chapter.

Homeownership Down; Renting Up

The national homeownership rate fell to 63.8 in 2017, the lowest level in two decades, indicating that Americans have been moving toward renting instead of owning homes (USCB 2017m). A number of factors are pushing the homeownership rate down, including the Great Recession, which triggered a massive housing crash, and migration of workers to urban areas, where renting is often the best option. According to Pew Research reports, while the number of U.S. households is growing, the number of households headed by owners continues to remain relatively flat despite low interest rates. Certain demographic groups – such as young adults, minorities, and the lesser educated – have historically been more likely to rent than others, and rental rates have increased among these groups over the past decade. However, rental rates have also increased among some groups that have traditionally been *less* likely to rent, including whites and middle-aged adults. The movement toward renting has also occurred across all levels of educational attainment. When asked about the specific reasons why they rent, a majority of renters, especially minorities, cited financial reasons. The typical amount of financial assets owned has decreased over the past decade for younger and lower- and middle-income prospective buyers. Homeownership remains out of reach for many due to stringent lending standards, lack of financial assets for a down payment, and price appreciation, which increases both the mortgage payment and required down payment. Declines in homeownership have been particularly steep among young, black, and lower-income households (Pew Research 2016, Pew Research 2017).



Source: Overflow Solutions 2019a

Figure 1-14. Percent of Multigenerational Households in 2018 in States within the Atlantic Coast Project Area and in the United States

Table 1-9. Housing Utilization and Vacancy Rates in State Study Areas and the United States

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Connecticut Study Area	933,127	838,872	94,255	10.1	553,238	66.0	285,634	34.0	$264,050	$1,116
District of Columbia Study Area	308,161	277,985	30,176	9.8	115,795	41.7	162,190	58.3	$537,400	$1,424
Delaware Study Area	423,489	352,357	71,132	16.8	251,098	71.3	101,259	28.7	$238,600	$1,076
Florida Study Area	4,911,811	4,078,784	833,027	17.0	2,542,546	62.3	1,536,238	37.7	$179,890	$1,040
Georgia Study Area	291,043	246,284	44,759	15.4	146,059	59.3	100,225	40.7	$132,655	$841
Massachusetts Study Area	2,172,767	1,956,452	216,315	10.0	1,206,981	61.7	749,471	38.3	$403,475	$1,317
Maryland Study Area	1,769,026	1,565,774	203,252	11.5	1,033,295	66.8	532,479	33.2	$272,900	$1,224
Maine Study Area	466,101	355,904	110,197	23.6	257,846	72.4	98,058	27.6	$199,600	$791
North Carolina Study Area	659,138	504,426	154,712	23.5	323,501	64.1	180,925	35.9	$152,550	$844
New Hampshire Study Area	183,296	168,498	14,798	8.1	123,870	73.5	44,628	26.5	$258,400	$1,091
New Jersey Study Area	3,245,756	2,877,162	368,594	11.4	1,803,826	62.7	1,073,336	37.3	$229,550	1,163
New York Study Area	5,689,970	5,119,598	570,372	10.0	2,457,151	48.0	2,662,447	52.0	$347,625	$1,251
Pennsylvania Study Area	1,152,518	1,032,059	120,459	10.5	631,931	61.2	400,128	38.8	$235,200	$1,032
Rhode Island Study Area	466,670	412,028	54,642	11.7	247,291	60.0	164,737	40.0	$242,200	$957
South Carolina Study Area	690,084	532,021	158,063	22.9	361,035	67.9	170,986	32.1	$166,500	$918
Virginia Study Area	2,142,747	1,964,010	178,737	8.3	1,246,578	63.5	717,432	36.5	$232,700	$1,073
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m

Table 1-9 and Figure 1-15, Figure 1-16, and Figure 1-17 show homeownership, rental, and vacancy rates in the State Study Areas and the U.S. The New Hampshire Study Area had the highest homeownership rate (73.5%); the District of Columbia Study Area had the lowest (41.7%). Conversely, the New Hampshire Study Area had the lowest rental rate (26.5%); the District of Columbia Study Area had the highest (58.3%). The New Hampshire Study Area also had the lowest vacancy rate (8.1%); the Maine Study Area had the highest (23.6%). Most State Study Areas with high homeownership rates have older populations, and the patterns in these states may be attributed to the baby boomer preference to own a home instead of renting (USCB 2017m, USCB 2017g).

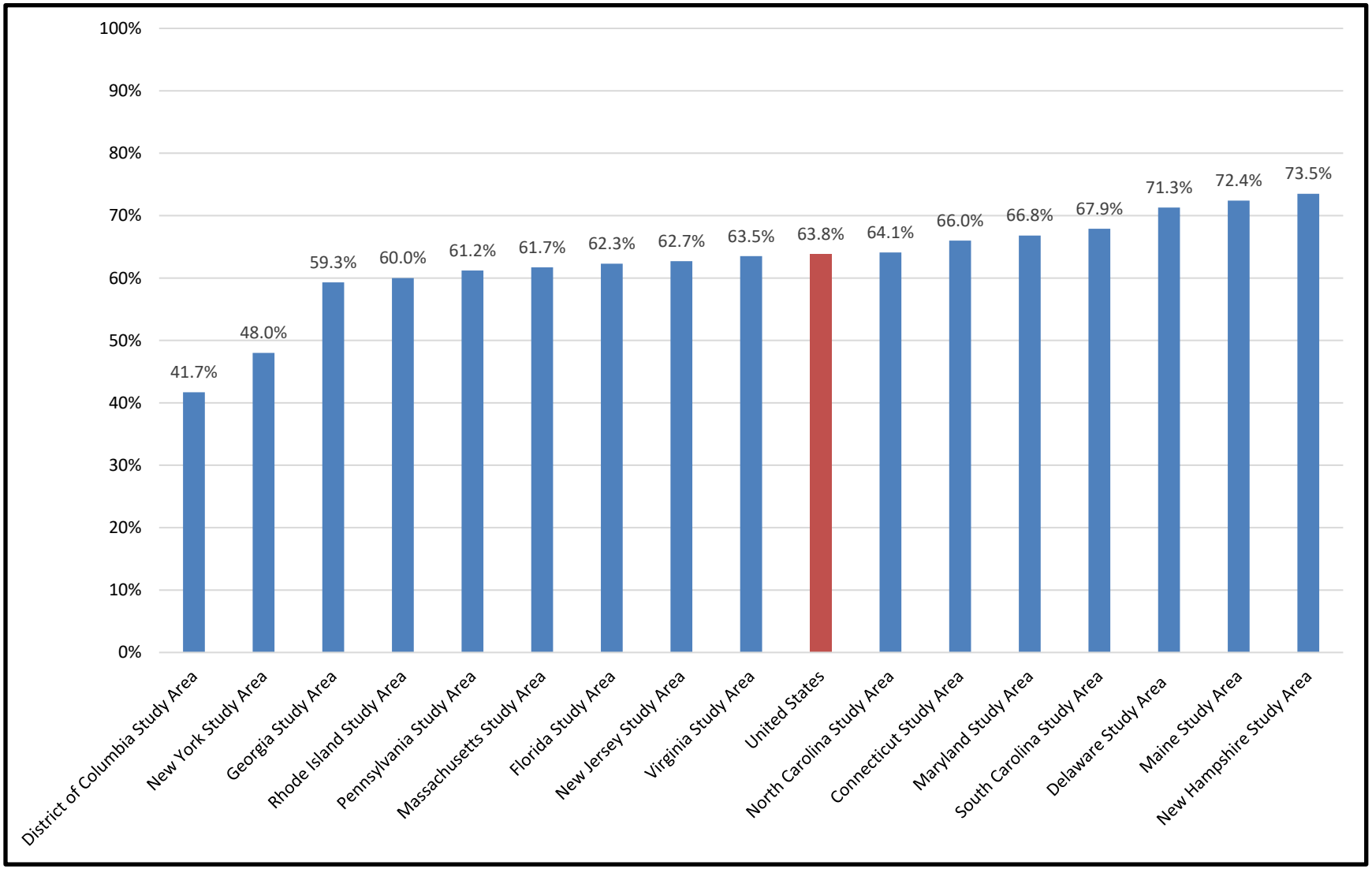
The COVID-19 pandemic is likely to contribute to a further decrease in homeownership nationwide in conjunction given the high rates of job losses, unemployment, business cutbacks, and business closures. Some states and localities have banned foreclosures and evictions. Housing impacts will depend on states individual response to the pandemic, the area and extent of other circumstances related to the pandemic response, such as rates of infection, the length of time pandemic lasts, and the availability of protective equipment and medical care (NCLC 2020).

Median Home Value and Median Gross Rent

Figure 1-18 and Figure 1-19 show median home values and median gross rent in the State Study Areas and the U.S. Median home value and gross rent in the Nation are $193,500 and $982, respectively. Within the State Study Areas, the Georgia Study Area had the lowest median home value ($132,655); the District of Columbia Area had the highest ($537,400). The Maine Study Area had the lowest median gross rent ($791); the District of Columbia Area had the highest ($1,424) (USCB 2017l). The COVID-19 pandemic will likely have significant impacts on home values and gross rent across the Nation as the scale of the economic impacts are realized.

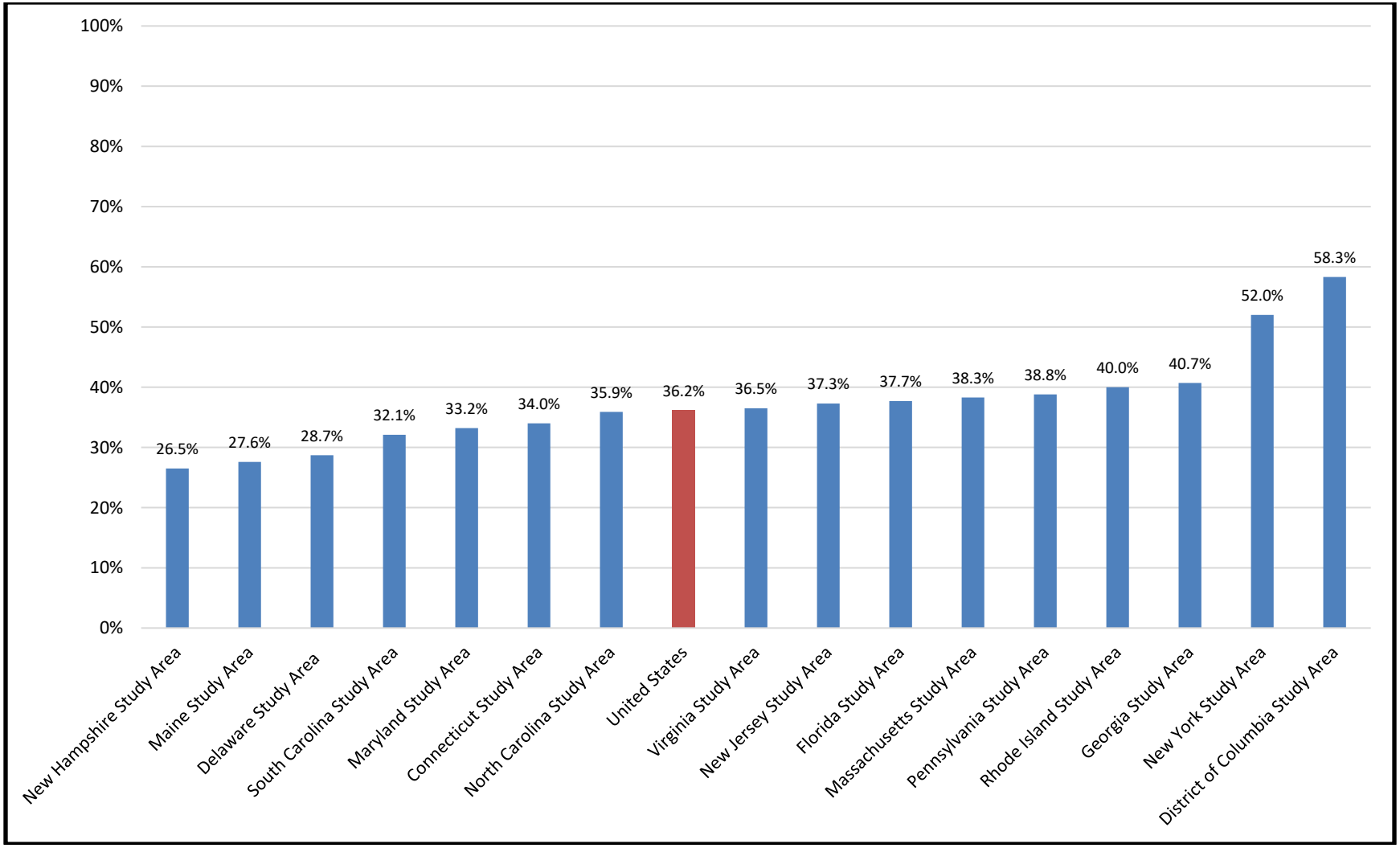
Home Prices Rising Faster Than Income

Each chapter provides details about the respective State Study Area's housing market, including metrics about MSA within the State Study Area. Zillow, an online real estate database company, provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Becker 2019). Zillow's Home Value Index gauges the market temperature of housing. The index indicated that home values increased 4.8% in the Nation during the 12-month period ending October 2019. Zillow characterized the national housing "market temperature" as "hot" (which indicates market conditions favorable to sellers) during the same period. Zillow's Home Value Index and market temperature information are provided for each State Study Area. In general, Zillow indices revealed that home prices in State Study Areas were rising. While the rise in prices is good news for sellers, rising prices make homeownership increasingly out of reach for more people, especially millennials (individuals born between 1981 and 1996) looking to purchase their first home (Zillow.com 2019b, Dimock 2019). GoBanking Rates stated that home prices are rising fast especially because available inventory is low throughout the Nation. In some cities, prices are reaching levels not seen since the before the 2008-2009 financial crisis. With wages remaining fairly steady, the rise in home prices is good news for investors but bad news for homebuyers (DePietro 2019). The impacts of the COVID-19 pandemic on the housing market remain to be seen; however, it would not be unexpected for there to be an overall decrease in home prices as demand for home ownership may decrease in conjunction with the increase in unemployment and other economic impacts.



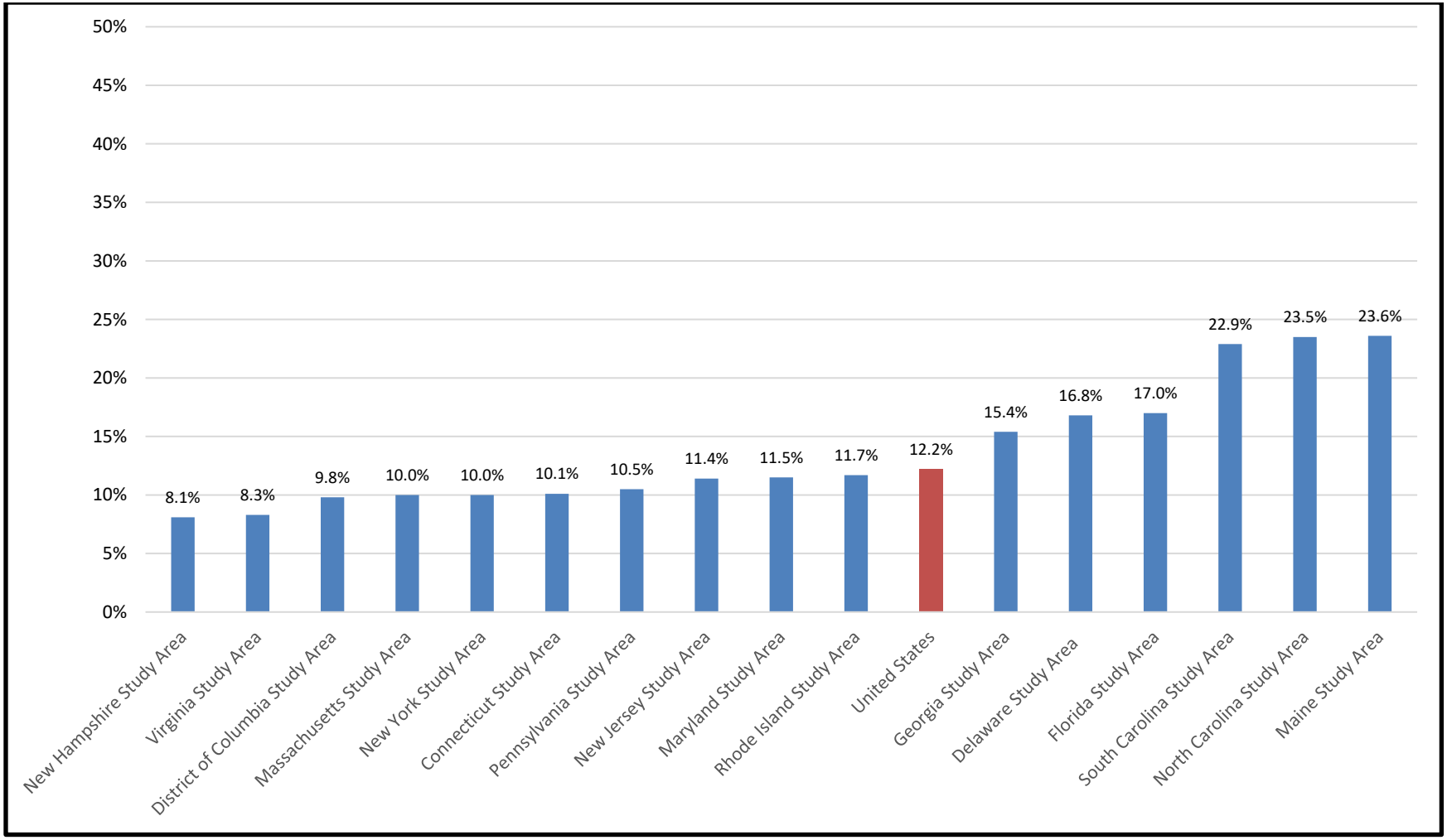
Source: USCB 2017m

Figure 1-15. Homeownership Rates in State Study Areas and the United States



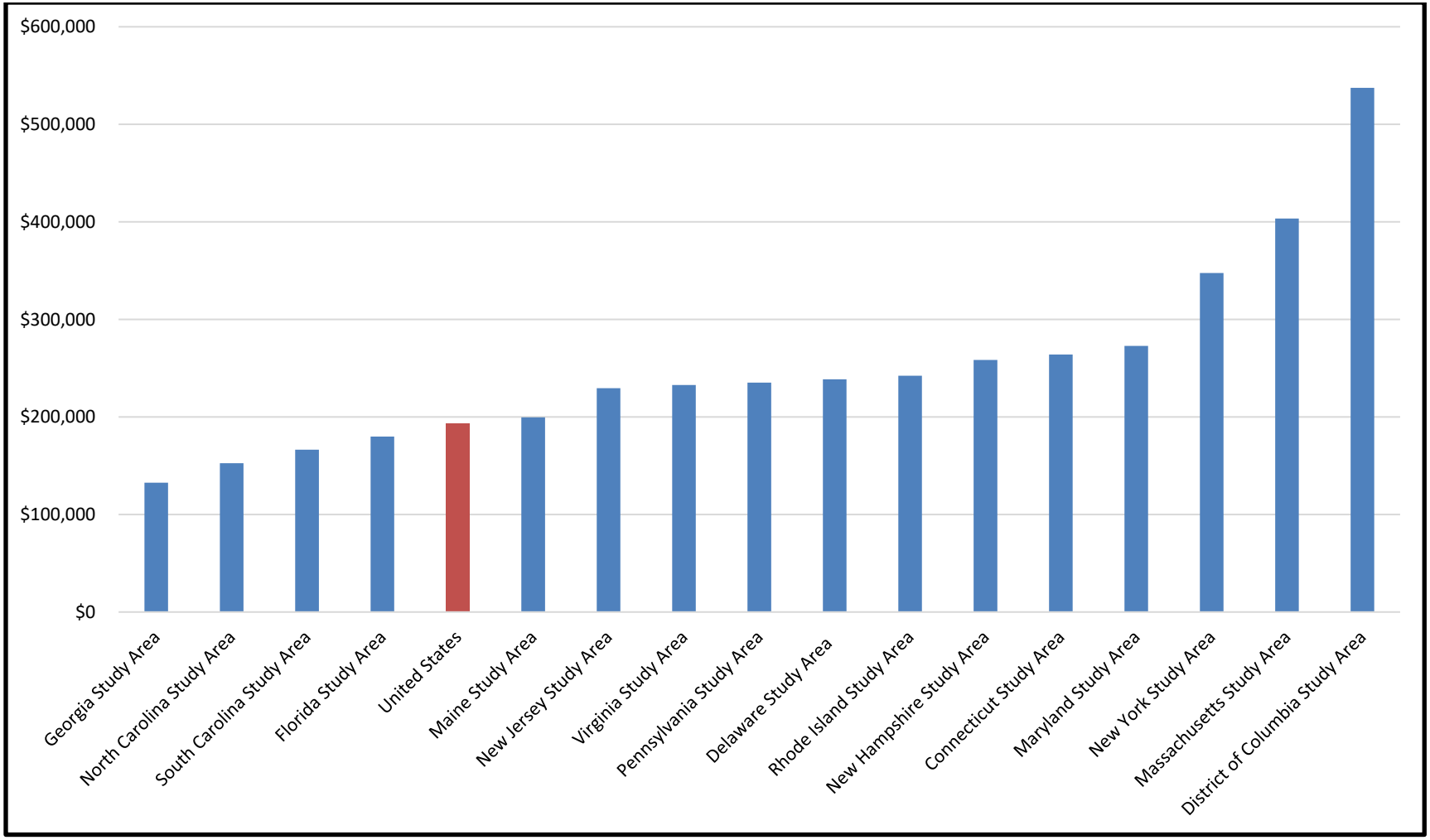
Source: USCB 2017m

Figure 1-16. Rental Housing Rates in State Study Areas and the United States



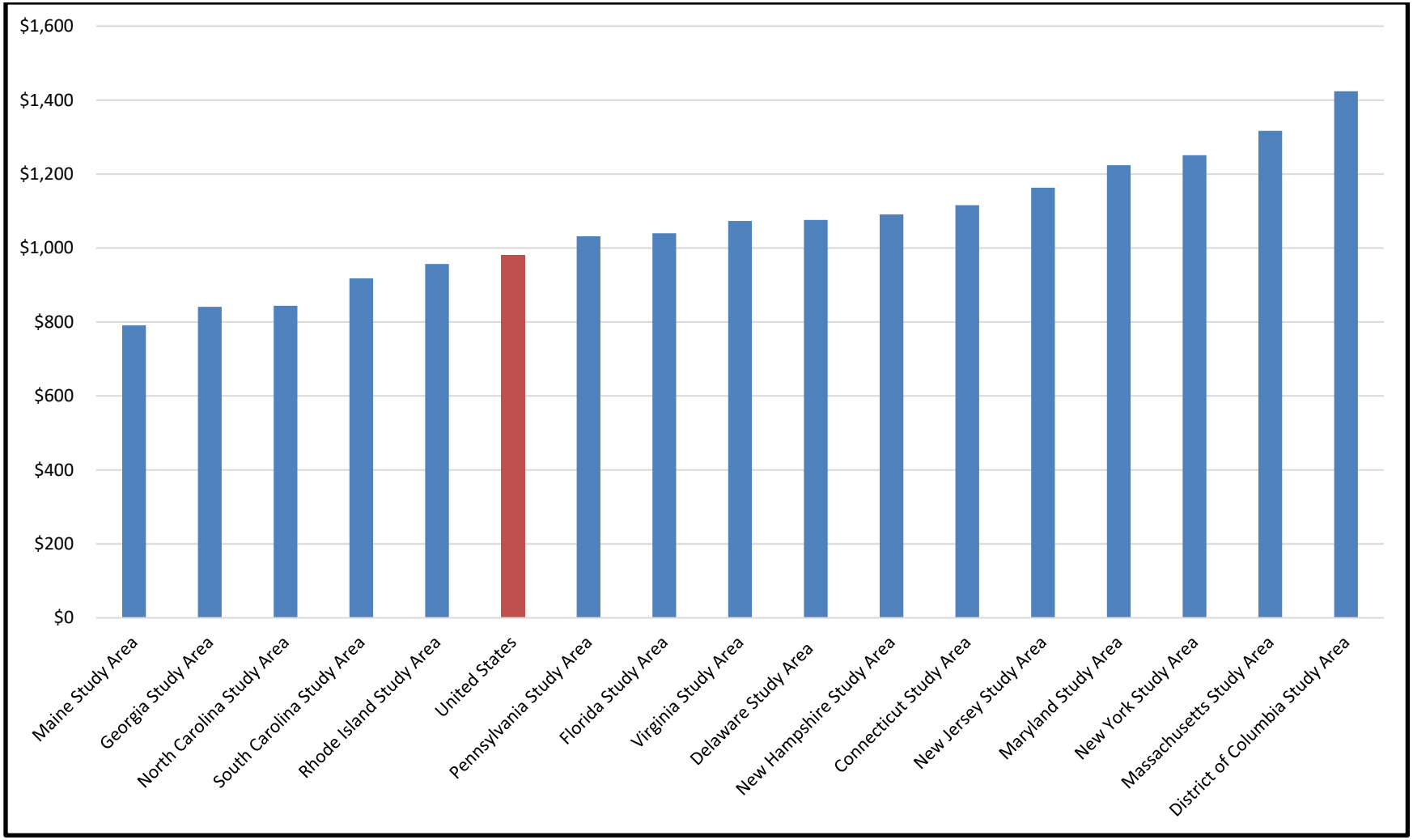
Source: USCB 2017g

Figure 1-17. Vacancy Rates in State Study Areas and the United States



Source: USCB 2017l

Figure 1-18. Median Home Value in State Study Areas and the United States



Source: USCB 2017l

Figure 1-19. Median Gross Rent in State Study Areas and the United States

National Affordable Housing Crisis

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every state and major metropolitan area, including the District of Columbia (National Low Income Housing Coalition 2018). Each chapter provides details about State Study Area housing affordability.

Housing affordability for low- and moderate-income workers is a problem within all State Study Areas. An inadequate supply of affordable housing impacts workforce housing. The affordable housing crisis is likely to be exasperated by the financial fallout from the COVID-19 pandemic.

1.6.4 Employment

Industry information, including dominant industry sectors for each state and State Study Area, are presented and discussed in detail in the following chapters. Employment data for all State Study Areas are presented in Table 1-10 for comparison.

Decline in Prime Working-Age Residents

Much of the U.S. is experiencing a decline in prime working age employees, the core of the Nation's workforce. As discussed above, population is increasing, but the Nation is aging. Retiring baby boomers are leaving the workforce. According to a recent study by Economic Innovation Group, between 2007 and 2018, the number of prime working age individuals (25 to 54 years old) increased just 1%, while the number of people age 55 and up increased over 34%. As a result, the proportion of prime age workers relative to other age groups decreased from 43% to 39% during the same time period. This decrease is affecting over two thirds of the Nation's large cities. Cities within the Atlantic Coast Project Area that display a pattern opposite the national trend are Miami, Florida; Orlando, Florida; Philadelphia, Pennsylvania; and Washington, DC. In these cities, the proportion of prime working age residents is growing faster relative to other groups. According to Economic Innovation Group, these urban locations attract prime age educated workers by offering employment in vibrant places with employment opportunities in service and knowledge-based sectors (Newman and Fikri 2019).

Within the Project Area, low unemployment rates, a tight labor market, and high housing costs were factors noted by State demographers as creating challenges in attracting and retaining prime age workers in New Hampshire and Maine.

The long-term effects of the COVID-19 pandemic on employment throughout the Project Area may not be known for some time.

Table 1-10. Employment Data for All State Study Areas

Geographic Unit	Total Labor Force (civilian and armed forces) (2017)	Civilian Labor Force	Employed (civilian labor force)	Unemployed (Civilian Labor Force)	Percent Unemployed (%)	Total Jobs
Connecticut Study Area	1,218,877	1,211,024	1,121,817	89,207	7.4	988,150
District of Columbia Study Area	392,421	388,980	357,701	31,279	8.0	565,727
Delaware Study Area	474,774	471,758	441,513	30,245	6.4	437,247
Florida Study Area	5,748,111	5,727,713	5,311,865	415,848	7.3	5,036,913
Georgia Study Area	329,418	315,300	288,313	26,987	8.6	241,862
Massachusetts Study Area	2,881,740	2,877,832	2,711,111	166,721	5.8	2,802,867
Maryland Study Area	2,329,000	2,305,410	2,157,935	147,475	6.4	1,812,464
Maine Study Area	456,761	455,282	433,470	21,812	4.8	390,475
North Carolina Study Area	633,791	585,224	535,701	49,523	8.5	423,489
New Hampshire Study Area	251,979	250,778	239,860	10,918	4.4	202,932
New Jersey Study Area	4,238,068	4,230,334	3,929,092	301,242	7.1	3,536,914
New York Study Area	7,432,021	7,423,416	6,909,369	514,047	6.9	6,888,361
Pennsylvania Study Area	1,391,862	1,391,321	1,267,769	123,552	8.9	1,195,895
Rhode Island Study Area	568,020	564,705	526,071	38,634	6.8	465,722
South Carolina Study Area	689,824	675,305	631,311	43,994	6.5	570,748
Virginia Study Area	2,968,936	2,862,568	2,703,400	159,168	5.6	2,489,511
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**

Sources: USCB 2017h, USCB 2017i, USCB 2017k, USCB 2017n, NOAA 2016b

1.6.4.1 U.S. Ocean Economy

Coastal and ocean resources are productive drivers for the Nation's economy. Oil and gas production provide energy. Seafood production and processing meet the demands of restaurants and households. Tourism and recreation support millions of part time and entry level jobs. Marine construction, marine transportation, and ship building provide access to global markets. According to a 2019 NOAA report on the Ocean and Great Lakes Economy, in 2016 U.S. businesses directly dependent on the ocean employed 3.3 million people (more than crop production, telecommunications, and building construction combined). The Nation's ocean economy generated $129 billion in wages and produced $304 billion in gross domestic product. In 2016, employment in the ocean economy increased 2.7% (adding 85,000 jobs), faster than the national average employment growth of 1.7%. The report includes 30 states from eight regions defined as the U.S. Ocean and Great Lakes economy (Northeast, Mid-Atlantic, Southeast, Gulf of Mexico, North Pacific, Pacific, West Coast, and Great Lakes Regions) (NOAA 2019c).

NOAA's report was produced as a result of a partnership between NOAA, the BEA, the BLS, and the USCB for the purpose of producing a dataset specifically about the ocean-dependent businesses that is not easily accessible in traditional employment information. Ocean-related businesses comprising the ocean economy include six economic sectors: living resources, marine construction, ship and boat building, marine transportation, offshore mineral extraction, and tourism and recreation. The database includes only those establishments located in shore-adjacent zip code areas, as well as self-employed commercial fishermen and other hard-to-find business that are ocean-dependent (NOAA 2019c, NOAA 2019e). The Bureau of Economic Analysis released ocean economy estimates to define and measure the U.S. ocean economy for the period 2014 – 2018. Data includes employment, compensation by industry, and industry contribution to gross domestic product (BEA 2020).

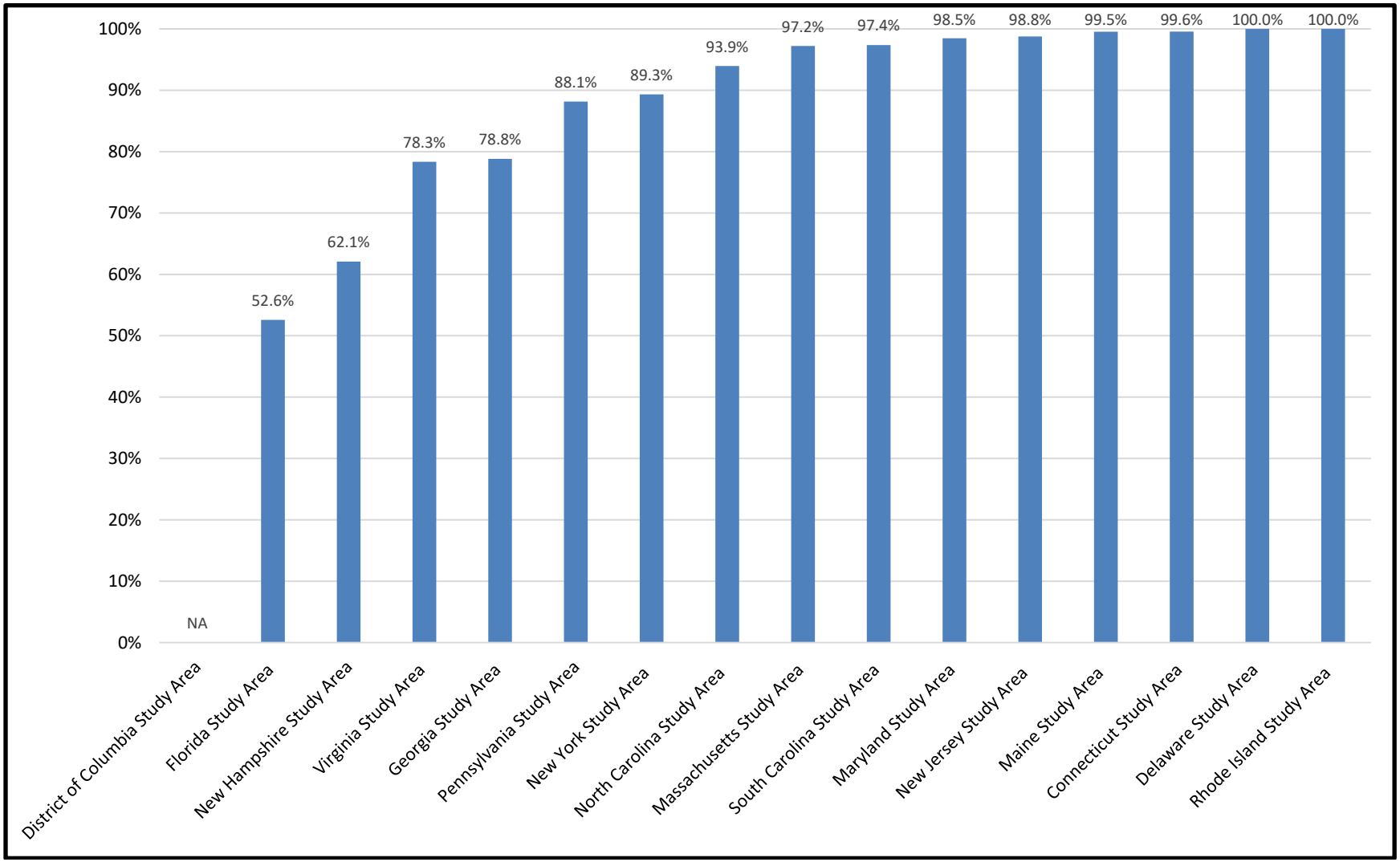
Maritime Jobs in the Atlantic Coast Project Area

Maritime jobs (employment derived from businesses directly dependent on the ocean or Great Lakes) are of great importance to the economy of each State Study Area. Figure 1-20 presents maritime jobs in the State Study Areas as a percentage of total maritime jobs in the state. With the exception of the District of Columbia Study Area (where there are no maritime jobs due to its distance from the ocean), maritime jobs in State Study Areas represent a great proportion of the total maritime jobs in the state, ranging from 52.6% in Florida to 100% in Delaware and Rhode Island where the State Study Areas encompass the entirety of the state) (NOAA 2016b).

1.6.4.2 Income

Wage Stagflation

Incomes are rising in the U.S., but the increases are not being felt equally by all Americans. According to the Brookings Institution, the U.S. economy has experienced long-term real wage stagnation. After adjusting for inflation, wages are only 10% higher in 2017 than they were in 1973, with annual real wage growth just below 0.2%. Higher wage jobs (that pay in the range of $38 to $48 dollars per hour) have been experiencing growth, while lower paying jobs (that pay less than $15 dollars per hour) are stagnant. Research indicates that globalization and technological change have likely put downward pressure on less-educated workers' wages, resulting in a persistent lack of economic progress for many workers (Brookings Institute 2017).



Source: NOAA 2016b

Figure 1-20. State Study Area Maritime Jobs as a Percent of Total State Maritime Jobs

Income stagnation is a problem shared by all the State Study Areas. It is particularly acute in State Study Areas that have yet to recover from the Great Recession (such as Rhode Island) and extreme weather events (such as southern New Jersey). High housing costs exacerbate the problem. It is likely the COVID-19 pandemic will contribute further to wage stagflation.

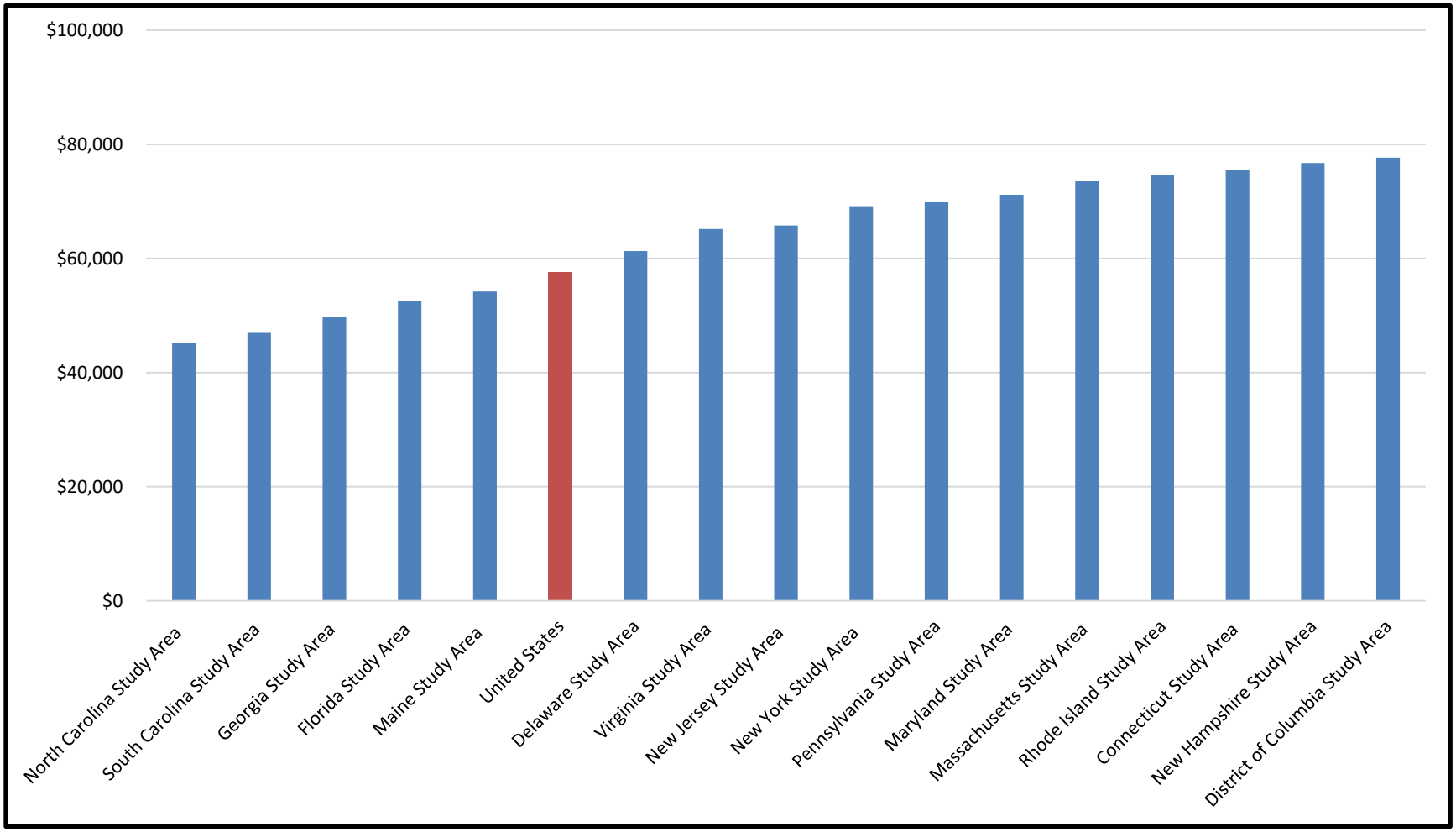
Median Household and Per Capita Income in the State Study Areas

Median household income often indicates the relative wealth of a geographic area, that is, the higher the median household income, the wealthier the area. Median household income is the middle number in a sorted list of income numbers; half the numbers are higher, and half are lower. As a result, median household income represents the middle value, and more accurately reflects the typical household of a geographic area than per capita income, which is calculated by dividing income by population. Per capita income may be skewed by households with incomes that are drastically high or low compared to the majority but is useful when comparing the wealth of large geographic areas (Harness 2019). According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. The North Carolina Study Area had the lowest median household income ($45,211) in 2017; the District of Columbia Study Area had the highest ($77,649). The Georgia Study Area had the lowest per capita income ($24,045) in 2017; the District of Columbia Study Area had the highest ($50,832). Table 1-11, Figure 1-21 and Figure 1-22 show median household and per capita incomes in the State Study Areas (USCB 2017k, USCB 2017n). It is unknown what, if any, effect the COVID-19 pandemic will have on median household income and per capita income.

Table 1-11. Median Household Income and Per Capita Income in the State Study Areas and the United States

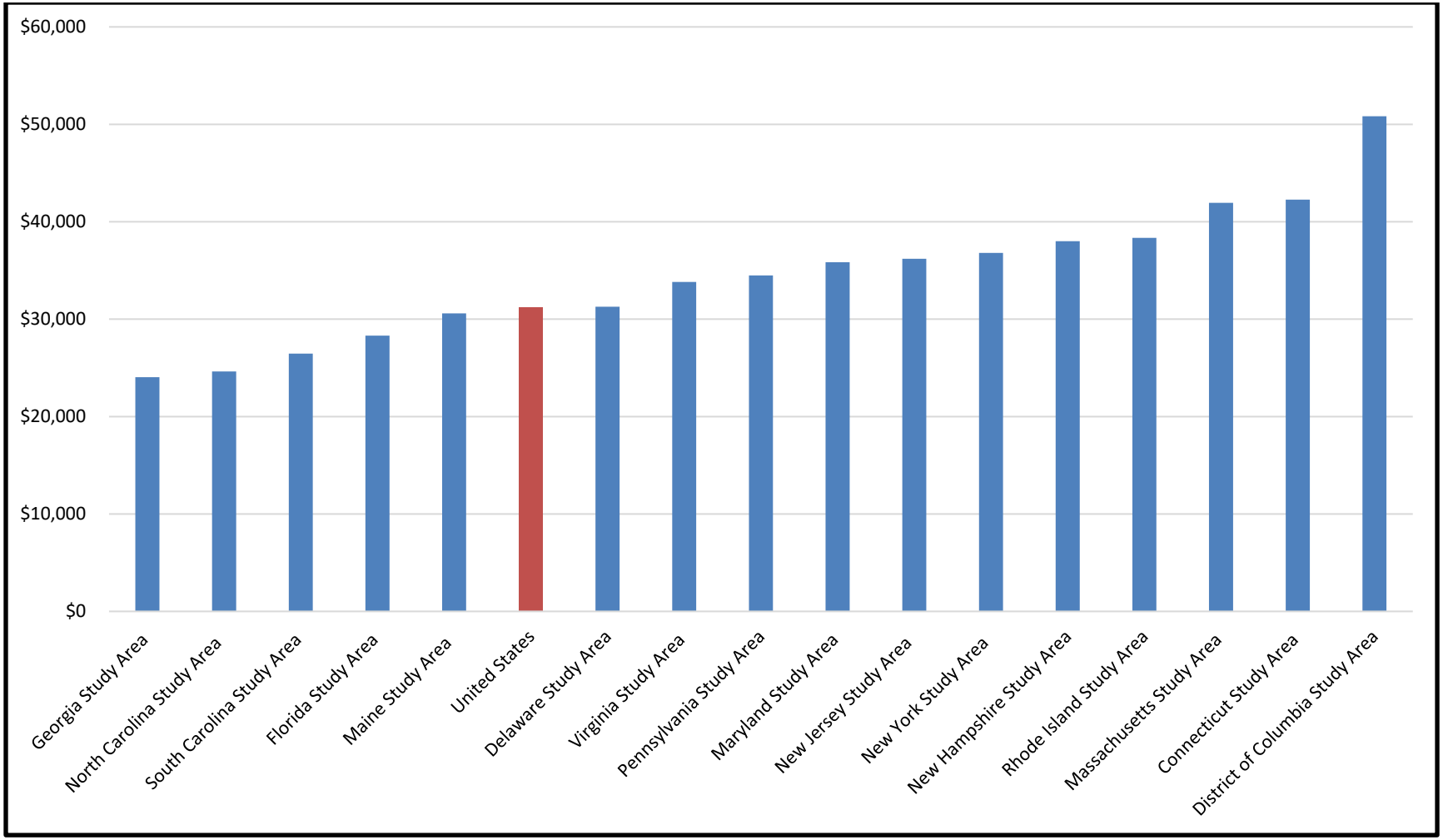
Geographic Unit	Median Household Income (2017)	Per Capita Income (2017)
Connecticut Study Area	$75,542	$42,274
District of Columbia Study Area	$77,649	$50,832
Delaware Study Area	$61,295	$31,278
Florida Study Area	$52,615	$28,316
Georgia Study Area	$49,798	$24,045
Massachusetts Study Area	$73,533	$41,943
Maryland Study Area	$71,163	$35,848
Maine Study Area	$54,220	$30,586
North Carolina Study Area	$45,211	$24,637
New Hampshire Study Area	$76,712	$38,007
New Jersey Study Area	$65,771	$36,205
New York Study Area	$69,156	$36,807
Pennsylvania Study Area	$69,839	$34,494
Rhode Island Study Area	$74,630	$38,343
South Carolina Study Area	$46,967	$26,470
Virginia Study Area	$65,164	$33,825
United States	$57,652	$31,177

Sources: USCB 2017k, USCB 2017n



Sources: USCB 2017k, USCB 2017n

Figure 1-21. Median Household Income in the State Study Areas and the United States



Sources: USCB 2017k, USCB 2017n

Figure 1-22. Per Capita Income in the State Study Areas and the United States

1.6.4.3 Unemployment Rates

While household earnings, quality and availability of appropriate housing, and employment opportunities are closely related factors within every county and region, the unemployment rate provides an excellent indication of the overall economic condition of a region. Figure 1-23 and Table 1-10 (in Chapter 1.6.4) present unemployment rates in the State Study Areas based on 2017 census data. The New Hampshire Study Area had the lowest unemployment rate (4.4%); the Pennsylvania Study Area had the highest (8.9%) (USCB 2017h). As described previously, the COVID-19 pandemic has had a significant impact on short-term unemployment as of August 2020 (Kochhar 2020). It is unknown at present what the long-term effects, if any, will be. As some businesses will close permanently, there may be a net reduction in available jobs in some areas or industries, which could also contribute to some longer-term unemployment issues.

1.6.4.4 Educational Attainment

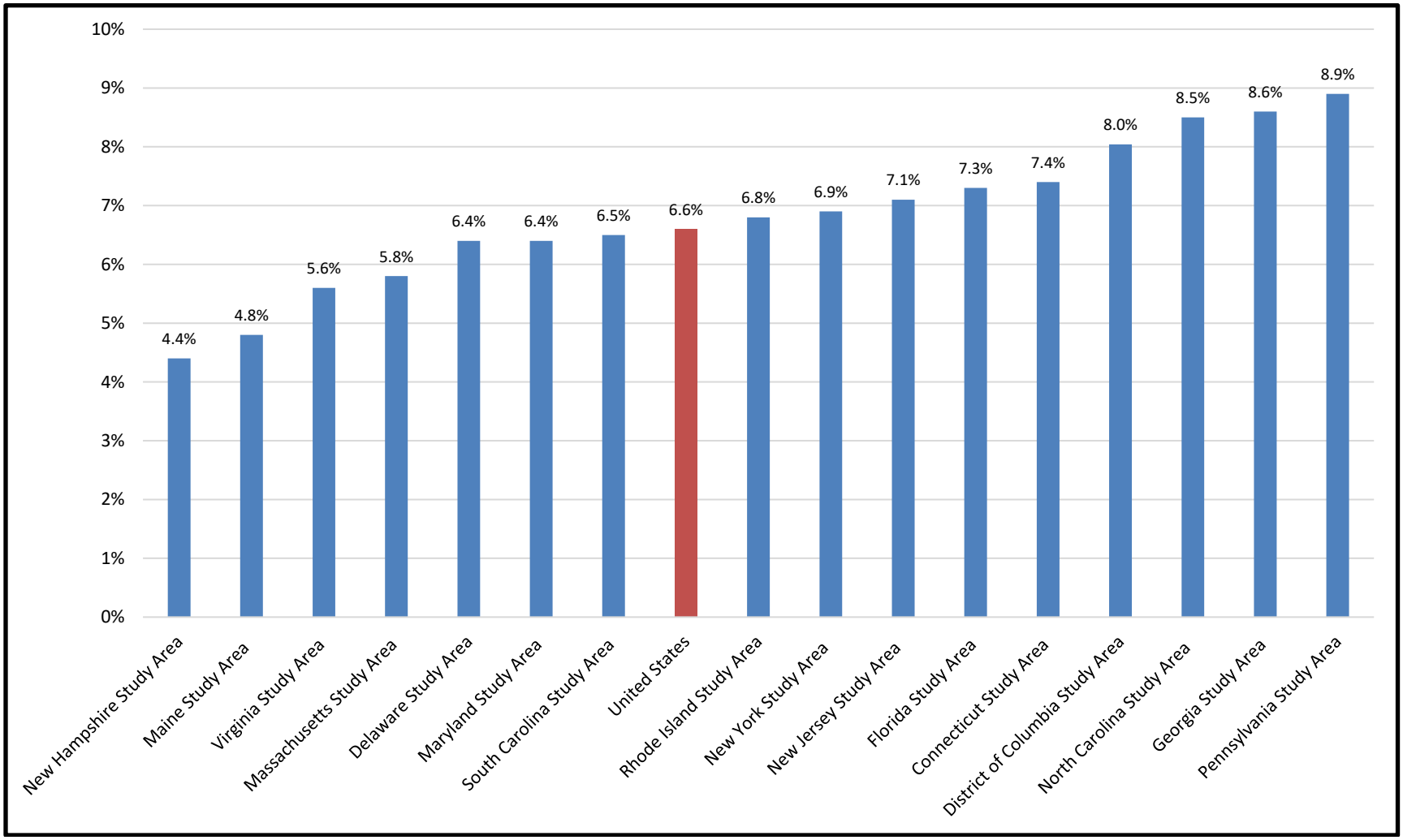
Educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region, and the state, offering increased job opportunities, higher earnings, a decreased likelihood of unemployment over a lifetime, and enhanced skills.

Generally, as education rates goes up, poverty rates go down. Educated workers have a decreased likelihood of unemployment and need for public assistance. An educated population and qualified workforce support economic competitiveness and development. An educated talent pool serves existing industry and attracts new employers to the area. Educational certifications, certificates, licenses, and current attendance in school are not included in the data provided by the USCB (USCB 2017t).

According to the U.S. Department of Health and Human Services, educational attainment is a social determinant of health. Education is associated with longer life expectancy, improved health and quality of life, and health-promoting behaviors like getting regular physical activity, not smoking, and going for routine checkups and recommended screenings (Healthy People 2020a).

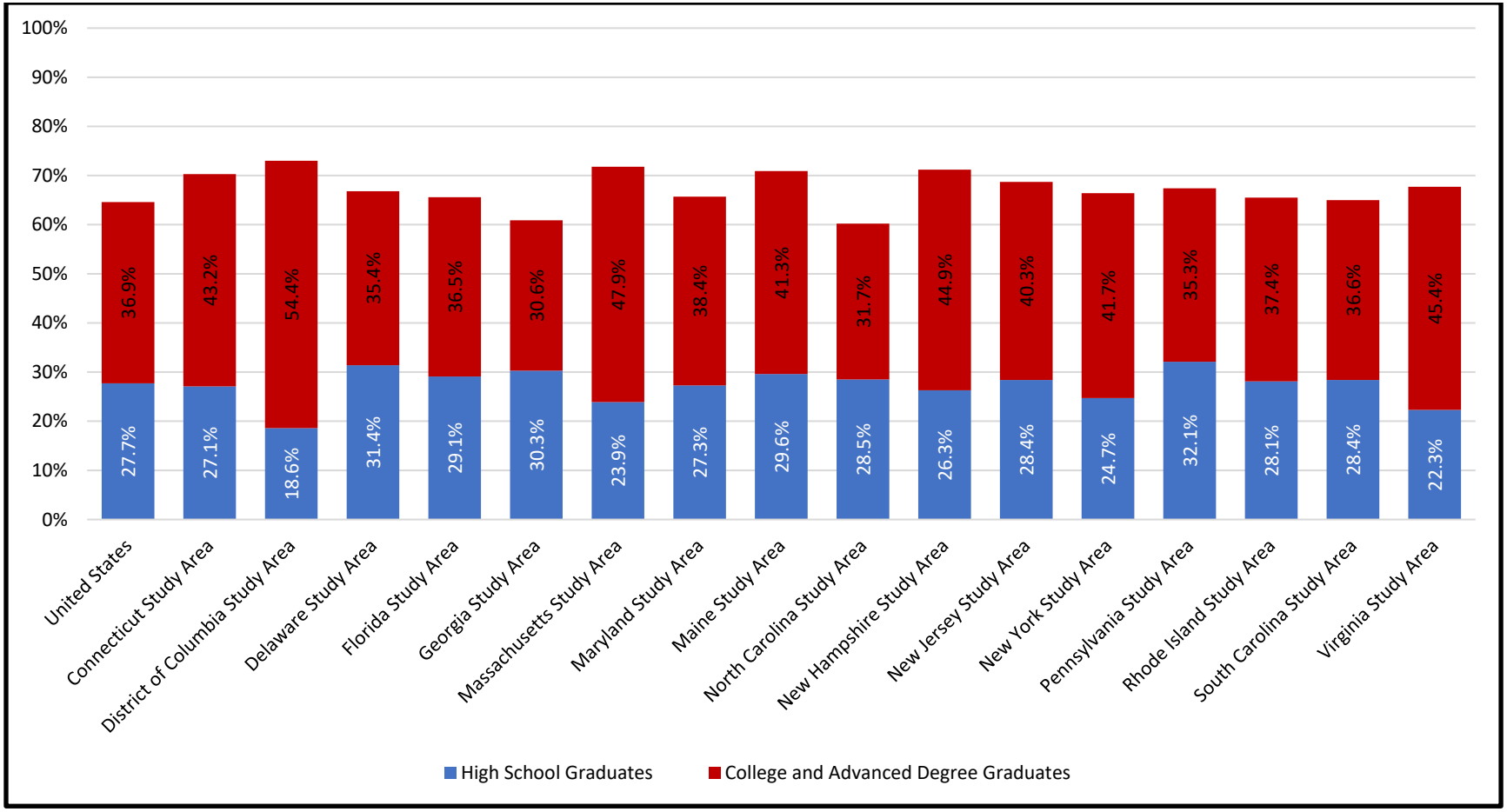
In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree. Figure 1-24 shows the percentage of the working-age population who earned only a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation and each State Study Area. Within each chapter are details of the total State Study Area educational attainment classified by number and percentage of the working-age population classified into seven groups of educational attainment (USCB 2017q).

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.



Source: USCB 2017h

Figure 1-23. Unemployment Rates in the State Study Areas



Source: USCB 2017q

Figure 1-24. High School, College, and Advanced Degree Graduate Rates in State Study Areas and the United States

The COVID-19 pandemic led most colleges and universities to move to online learning only during the second half of the Spring 2020 semester. This resulted in significant financial impacts to these institutions. Ongoing uncertainty about the duration of the pandemic has led to uncertainty about how colleges and universities will proceed for the 2020-2021 school year. Online learning is a very different experience from the on-campus experience. It is possible that if colleges and universities continue online only learning in the 2020-2021 school year, this may contribute to a decline in enrollments. Additional declines in enrollments may occur because of the economic impacts associated with the job losses and business closures caused by the pandemic. A decline in enrollments could lead these institutes to have to cut programs or even close permanently. All of this could contribute to a decline in the numbers of students achieving college or advanced degrees in the near future.

1.6.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS development.

The World Health Organization (WHO) defines vulnerability as "the degree to which a population, individual or organization is unable to anticipate, cope with, resist and recover from the impacts of disasters." Under this definition, WHO considers the following groups to be vulnerable: children, pregnant women, elderly people, malnourished people, and people who are ill or immunocompromised (WHO 2019).

The Centers for Disease Control and Prevention (CDC) states that vulnerable populations may include anyone who has difficulty communicating, has difficulty accessing medical care, may need help maintaining independence, requires constant supervision, or may need help accessing transportation (CDC 2018a).

The American Journal of Managed Care defines vulnerable populations as economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless, those with human immunodeficiency virus, and those with other chronic health conditions, including severe mental illness; and may also include rural residents, who often encounter barriers to accessing healthcare services. The vulnerability of these individuals may be enhanced by race, ethnicity, age, sex, and factors such as income, insurance coverage (or lack thereof), and absence of a usual source of care. Their health and healthcare problems intersect with social factors, including housing, poverty, and inadequate education. Vulnerable populations may include those living in abusive families, the homeless, immigrants, and refugees (AJMC 2006).

In 2010, the U.S. Department of Health and Human Services and stakeholder groups launched Healthy People 2020, a 10-year agenda for the Nation's health and disease prevention. Healthy People 2020 highlights the social determinants of individual and population health. Social determinants are the conditions in which people are born, grow, live, work and age. Social determinants include a range of personal, social, economic, and environmental factors. For example, people with a quality education, stable employment, safe homes and neighborhoods, and access to preventive services tend to be healthier throughout their lives. Conversely, poor health outcomes are often made worse by the interaction between individuals and their social and physical environment. According to the Department of Health and Human Services and its partners (including the WHO), social determinants are in part responsible for the unequal and avoidable differences in health status within and between communities (Healthy People 2020a).

Median household income, an economic measure that is also a powerful social determinant, reflects a household's ability to support a healthy lifestyle with quality food, housing, education, preventive medicine, and curative care. Individuals with a low household income status tend to suffer more diseases

and die earlier compared with people with higher household incomes, even after taking into account the effect of overall health on their income. There is an increase in stress associated with being in the lower end of the income spectrum, which is associated with unhealthy behaviors and outcomes: Individuals who have a higher burden of stress in adulthood tend to have higher body mass indexes, higher rates of smoking, higher alcohol consumption, and lower physical activity after adjusting for age (AJMC 2006).

Race and ethnicity, gender, sexual identity, age, disability, socioeconomic status, and geographic location all contribute to an individual's ability to achieve good health. It is important to recognize the impact that social determinants have on health outcomes of specific populations. Social determinants are often a strong predictor of health disparities. For example:

- In 2007 to 2008, the Asian or Pacific Islander population had the highest rate of high school graduation among racial and ethnic groups, with 91.4% of students attending public schools graduating with a diploma 4 years after starting 9th grade compared to rates among non-Hispanic white (81.0%), American Indian or Alaska Native (64.2%), Hispanic (63.5%), and non-Hispanic black (61.5%) populations (Healthy People 2020b).
- According to the National Assessment of Adult Literacy, African American, Hispanic, and American Indian or Alaska Native adults were significantly more likely to have below basic health literacy compared to their white and Asian or Pacific Islander counterparts. Hispanic adults had the lowest average health literacy score compared to adults in other racial and ethnic groups (Kutner et al. 2006).
- In 2007, African Americans and Hispanics were more likely to be unemployed compared to their white counterparts. Further, adults with less than a high school education were three times more likely to be unemployed than those with a bachelor's degree (Brennan et al. 2008).
- Low socioeconomic status is associated with an increased risk for many diseases, including cardiovascular disease, arthritis, diabetes, chronic respiratory diseases, and cervical cancer as well as for frequent mental distress (Brennan et al. 2008).
- Low-income minorities spend more time traveling to work and other daily destinations than do low-income whites because they have fewer private vehicles and use public transit and carpools more frequently (Brennan et al. 2008).

Healthy People 2020 organizes the social determinants of health around five key domains: (1) economic stability, (2) education, (3) health and health care, (4) neighborhood and built environment, and (5) social and community context (Healthy People 2020b).

In describing characteristics of vulnerable or sensitive populations, terms such as community, resiliency, adaptive capacity, sustainability, and at-risk and subsistence are often used in research literature. These terms have emerged from various but related disciples, but also lack objective meaning, except as may be provided by an author or an organization defining the term for its own purpose and specific use.

No matter the ambiguities surrounding terminology, identifying vulnerable populations is an integral part of completing environmental impact assessments. NEPA and its promulgating regulations 40 CFR §§ 1500-1508 require Federal agencies to carefully consider the impacts of their proposed actions on the environment and incorporate these considerations into their decision-making processes (Code of Federal Regulations 1977). Non-government entities seeking the use of Federal funds or Federal lands or requiring Federal permits or licenses can trigger NEPA and be required to prepare and submit proposed project plans to Federal agencies and to the public for review and comment. This is to ensure that the public has a role in the decision-making process and in implementing the decision.

NEPA is probably best known for documents that are prepared to comply with its provisions, such as the environmental impact statement, a decision-making tool. As part of the impact analysis, NEPA requires Federal agencies consider the impact of proposed projects on sensitive and/or vulnerable populations.

This section describes the sensitive and vulnerable populations present in the Atlantic Coast Project Area. The populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the CEQ and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's Social Vulnerability Index (SoVI) in the general population as applied to the respective State Study Areas.
- Resource-dependent populations are specifically those groups that may depend more heavily on natural resources for their livelihoods and/or supplementing or proving the main source of their sustenance than other populations in the region. Such groups may include fishing communities, subsistence populations, and religious populations in each State Study Area. These populations/communities
- American Indian tribes.
- Limited-English speaking populations based on USCB data.
- Each State Study Area has populations deemed vulnerable to varying degrees. These populations are described in more detail in the respective chapters.

1.6.5.1 Environmental Justice Communities of Concern

Environmental justice analyses strive to ensure negative socioeconomic impacts do not disproportionately impact sensitive populations, such as minorities and low-income communities. This section describes the regulatory guidance for environmental justice analyses and minority and low-income population characteristics related to environmental justice for the Atlantic Coast Project Area.

Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA 2014a).

EO 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations) serves to avoid the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and low-income populations (*Federal Register* 1994). Federal agencies identified in that EO are to address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. EO 12898 does not define the terms "minority" or "low-income." However, guidance provided by the CEQ describes these terms in the context of an environmental justice analysis.

Minorities include individuals who identify themselves as members of the following population groups: American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Black, Hispanic, or two or more races. For the purposes of environmental justice analyses, the minority population for a community consists of all non-white individuals as well as all Hispanic or Latino individuals (i.e., of both white and non-white racial origin). CEQ guidance states "minority populations should be identified where either (a) the minority population of the affected area exceeds 50%, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis" (USEPA 1997).

Low-income populations are identified where individuals have incomes below the U.S. Department of Health and Human Services poverty guidelines (HHS 2019). A low-income population is either a group of low-income individuals living in proximity to one another or a set of individuals who share common conditions of environmental exposure or effect (USEPA 1997).

EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks) states that Federal agencies will identify and address environmental health and safety risks from their activities, policies, or programs that may disproportionately affect children (*Federal Register* 1997). Children are discussed in this report in the Demographics section.

1.6.5.1.1 Minority Populations

The U.S. had a minority population of 38.5% in 2017. Each State Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 1-12 and Figure 1-25 show the percentage of minority populations within each State Study Area, which are discussed in detail in the following chapters (USCB 2017f).

1.6.5.1.2 Low-Income Populations

In the U.S., 23.7% of individuals have incomes less than 150% of the poverty level. Each State Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Figure 1-26 and Table 1-12 show the percentage of low-income populations within each State Study Area, which are discussed in detail in the following chapters (USCB 2017o).

1.6.5.2 Socially Vulnerable Populations

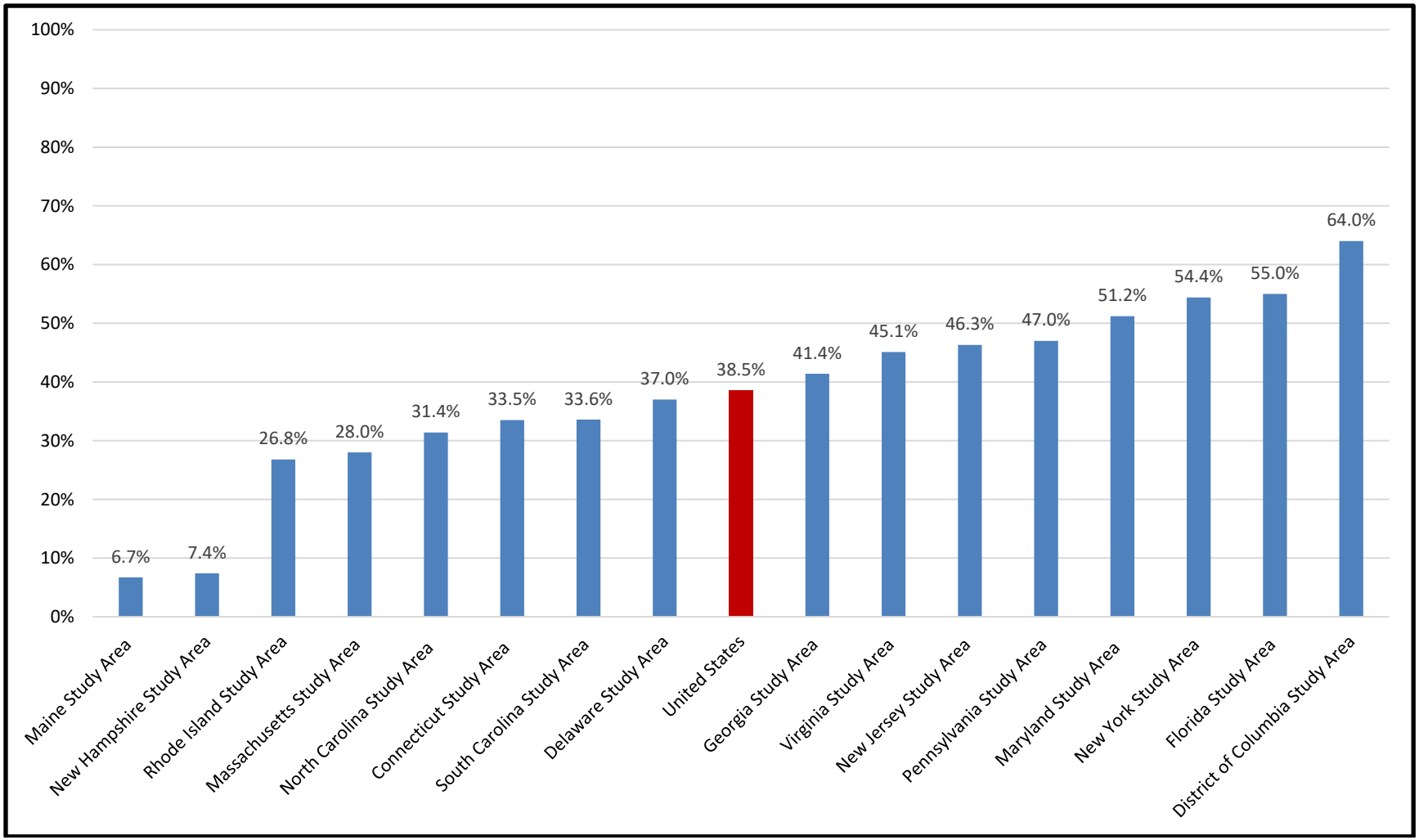
As described previously, the term “vulnerable populations” can mean different things to different people. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations such as cultural, historical, and behavioral attributes.

Various organizations, such as the CDC and NOAA have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. In this report we utilize two different tools developed by the CDC and NOAA. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the State Study Areas. The CDC SoVI is used to identify vulnerable populations in general (CDC 2016). NOAA’s Social Vulnerability Indicators (NOAA SVI) is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019b). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and discussed in detail in “Fishing Communities” (Chapter 1.6.5.3.1).

Table 1-12. Minority and Low-Income Populations in the State Study Areas and the United States

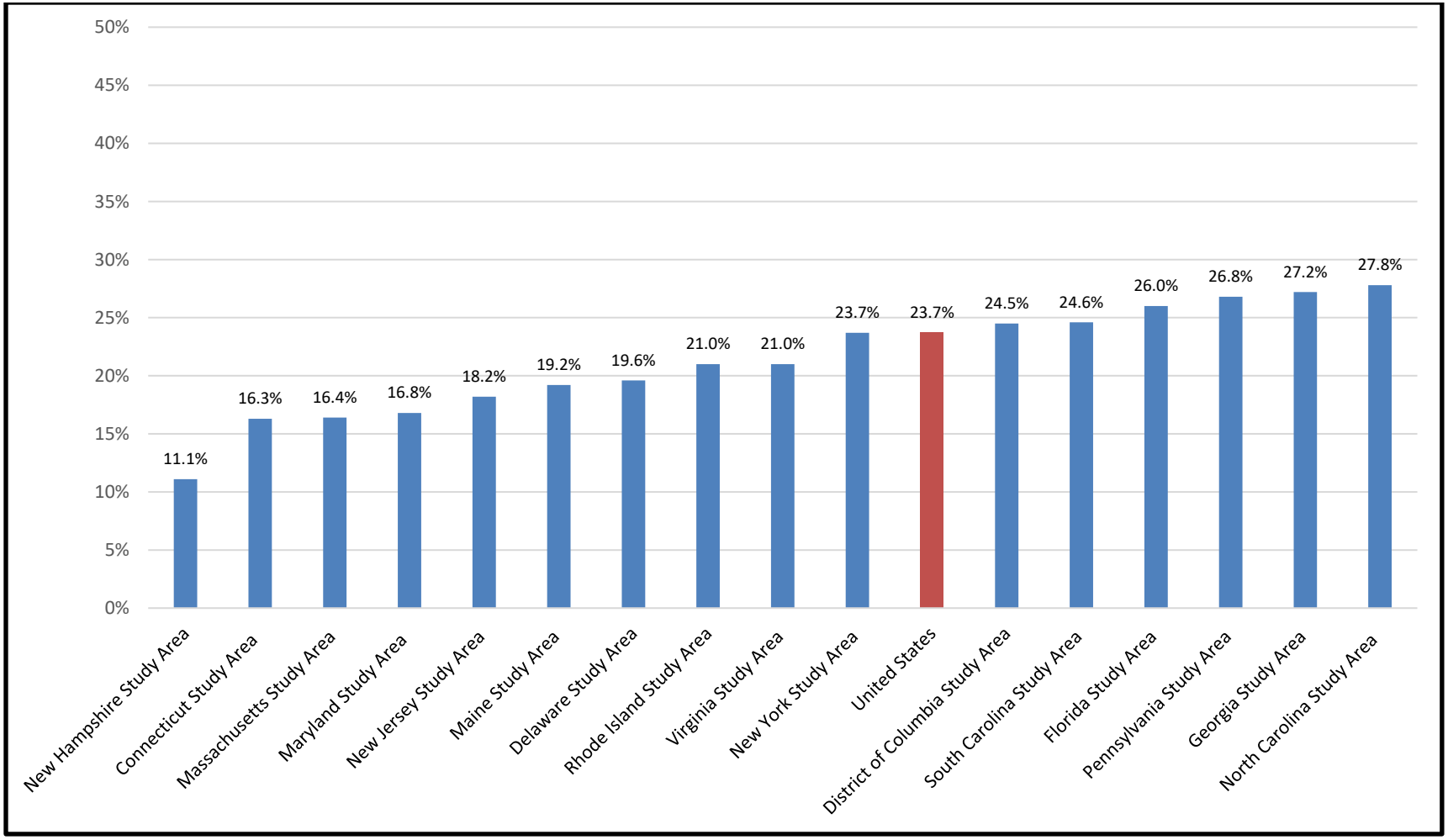
Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less Than 150% of the Poverty Level	Percent Population with Incomes Less Than 150% of the Poverty Level (%)
Connecticut Study Area	2,244,337	1,493,107	751,230	33.5	1,586	206	13.0	438	27.6	2,182,505	356,276	16.3
District of Columbia Study Area	672,391	241,901	430,490	64.0	450	67	14.9	277	61.6	638,362	156,706	24.5
Delaware Study Area	943,732	594,911	348,821	37.0	573	81	14.1	157	27.4	918,100	179,571	19.6
Florida Study Area	11,439,302	5,116,340	6,322,962	55.0	5,875	899	15.0	2,996	51.0	11,264,620	2,968,140	26.0
Georgia Study Area	668,440	391,619	276,821	41.4	406	77	19.0	172	42.4	645,376	175,754	27.2
Massachusetts Study Area	5,142,008	3,700,512	1,441,496	28.0	3,775	800	21.2	420	11.1	4,977,126	815,279	16.4
Maryland Study Area	4,291,804	2,094,925	2,196,879	51.2	2,835	296	10.4	1,401	49.4	4,185,301	703,244	16.8
Maine Study Area	846,356	790,059	56,297	6.7	676	53	7.8	12	1.8	826,172	158,446	19.2
North Carolina Study Area	1,283,929	880,655	403,274	31.4	834	133	15.9	191	22.9	1,227,852	340,938	27.8
New Hampshire Study Area	429,031	397,430	31,601	7.4	258	11	4.3	3	1.2	417,462	46,400	11.1
New Jersey Study Area	8,084,939	4,342,003	3,742,936	46.3	5,754	678	11.8	2,363	41.1	7,923,868	1,444,728	18.2
New York Study Area	14,327,971	6,537,692	7,790,279	54.4	10,776	1,482	13.8	5,138	47.7	14,048,307	3,336,352	23.7
Pennsylvania Study Area	2,759,527	1,462,577	1,296,950	47.0	2,154	479	22.2	1,046	48.6	2,687,318	720,949	26.8
Rhode Island Study Area	1,056,138	773,388	282,750	26.8	814	111	13.6	171	21.0	1,015,923	213,673	21.0
South Carolina Study Area	1,379,874	916,207	463,667	33.6	772	119	15.4	211	27.3	1,348,641	331,422	24.6
Virginia Study Area	5,374,947	2,950,574	2,424,373	45.1	3,324	454	13.7	1,288	38.7	5,246,305	1,104,224	21.0
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,56**	**74,202,606**	**23.7**

Sources: USCB 2017a, USCB 2017f, USCB 2017o



Source: USCB 2017f

Figure 1-25. Percent Minority Population in the State Study Areas and the United States



Source: USCB 2017o

Figure 1-26. Population with Incomes Less Than 150 Percent of the Poverty Level in the State Study Areas and the United States

The CDC SoVI is geared towards evaluating the resilience of communities from an emergency management standpoint. Such emergencies may be the result of natural or human-caused disasters, or disease outbreaks. The index created by the tool is useful to emergency response planners and public health officials to identify and map communities that will most likely need support before, during, and after a hazardous event (CDC 2016). The current CDC SoVI tool uses 2016 data from the USCB, ranking each census tract on 15 social factors in the following four areas:

- Socioeconomic Status – including poverty status, unemployment, income, education (no high school diploma)
- Household Composition and Disability – including age 65 or older, age 17 or younger, civilian with a disability, single-parent households
- Minority Status and Language – including minority classification and speaks English "less than well"
- Housing and Transportation – including multi-unit structures, mobile homes, crowding, no vehicle available, group quarters

The output of the CDC SoVI tool results in a ranking of a community's overall social vulnerability. Each State Study Area has populations deemed vulnerable to varying degrees (CDC 2016). Please refer to the following chapters for detailed information about each State Study Area.

Because the CDC SoVI is based on 2016 data from the USCB, it will not reflect changes in communities that result from the COVID-19 pandemic. Future OCS analysts should determine whether the CDC SoVI has been updated and, if so, incorporate the results of that update into future vulnerability analysis in conjunction with environmental assessments of potential OCS projects.

1.6.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing and self-sufficiency than the average community. Subsets of resource-dependent populations are discussed in the following sections. For the Atlantic Coast Project Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.

1.6.5.3.1 Fishing Communities

There are 212 fishing communities in the Atlantic Coast Project Area. Table 1-13 includes a list by State Study Area.

Table 1-13. Fishing Communities within the State Study Areas

Geographic Unit	Number of Fishing Communities
Connecticut Study Area	4
District of Columbia Study Area	6
Delaware Study Area	0
Florida Study Area	27
Georgia Study Area	3
Maine Study Area	48
Maryland Study Area	7
Massachusetts Study Area	30
New Hampshire Study Area	5
New York Study Area	11
New Jersey Study Area	15
North Carolina Study Area	21
Pennsylvania Study Area	0
Rhode Island Study Area	9
South Carolina Study Area	10
Virginia Study Area	16
Total	**212**

Source: NOAA Fisheries 2019d

The NOAA SVI is used in Chapter 1.6.5.2 to discuss vulnerability as it relates to fishing communities. Fishing communities are generally identified by NOAA as places associated with the fishing industry, or in the context of a legal definition of "fishing community" granting special status under the Magnuson-Stevens Fishery Conservation and Management Act (U.S. Department of Commerce et al. 2007). As populations of many fish species worldwide have declined, the price of fuel has increased, coastal development has mushroomed, and fishing communities nationwide have suffered economic and social vulnerability. Since its 1996 re-authorization, the Magnuson-Stevens Fishery Conservation and Management Act, which governs U.S. marine fisheries, has included a definition of "fishing community" as "substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs"(Clay and Olson 2008). The definition includes fishing vessel owners, operators, and crew and U.S. fish processors that are based in such communities. Some fishing communities may have or will be granted a special status under the Magnuson-Stevens Fishery Conservation and Management Act, which mandates specific actions such as conservation and management of fishery resources, and minimization of adverse economic impacts on such communities. These initiatives are being implemented in conjunction with a worldwide move towards ecosystem-based management. Legal and policy requirements under the Magnuson-Stevens Fishery Conservation and Management Act add a new layer to theoretical discussions of "community" and "vulnerability" (NOAA Fisheries 2008).

The National Marine Fisheries Service (a division of NOAA and the Department of Commerce and informally known as NOAA Fisheries) is the U.S. Federal agency responsible for the stewardship of the U.S. living marine resources and their habitat. NOAA Fisheries is responsible for the management,

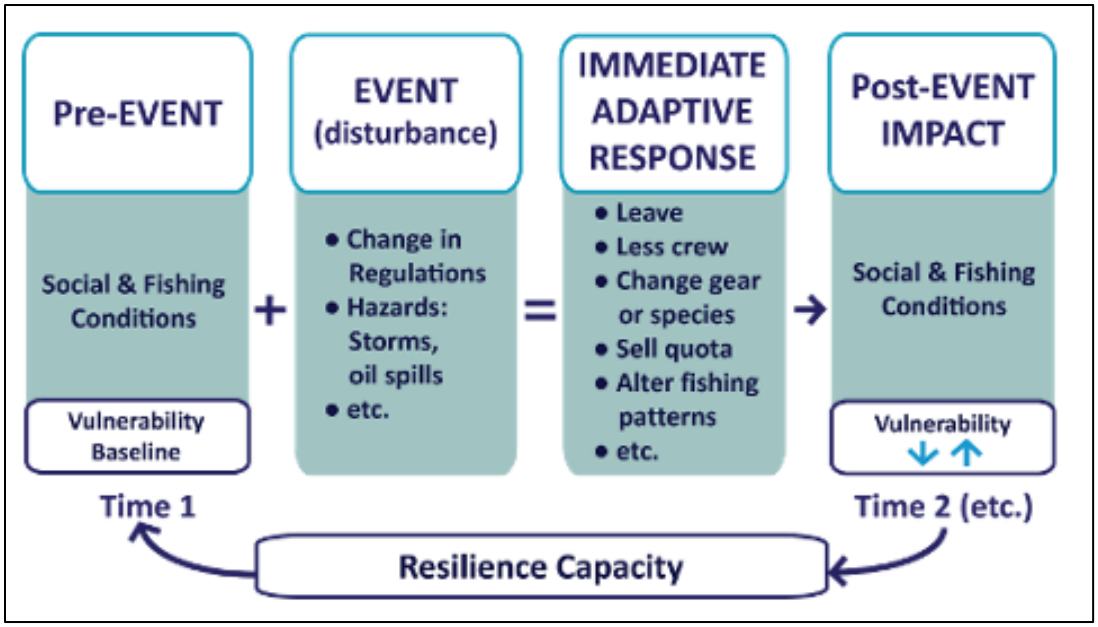
conservation, and protection of living marine resources within the U.S. Exclusive Economic Zone, which includes waters up to 200 miles off the U.S. coast (NOAA Fisheries 2019c).

In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including sections of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website (NOAA Fisheries 2019d). It is recommended such profiles be examined with respect to analyzing potential impacts associated with future OCS projects once site-specific information is known.

Communities that are dependent on commercial fishing can be more socially vulnerable than other communities (NOAA Fisheries 2019e). Many of the fishing communities identified within the Atlantic Coast Project Area are located in areas vulnerable to sea level rise and the associated storm surge impacts. The household of a commercial fisherman may include people who are limited-English speakers. These communities are relying on jobs directly dependent on the resources of the ocean, which are subject to climate change impacts, sea level rise, ocean acidification, environmental pollutants (spills), and extreme weather hazards (hurricanes and storms). Any of these threats may impact fishing conditions or fishing regulations. Changes in the marine environment affect the relationship between fishing communities and the marine resources on which they depend. Changes in regulations (such as reduction in an “annual catch limit” for a certain species of fish that a community may be dependent upon) may cause reduction in employment for the crew on a fishing vessel or a processing plant to reduce staff or close. Laid off workers may need to seek employment in other areas and move out of the community. Since commercial fishermen also bring home or trade bycatch, loss of a job may impact the family’s food supply. The impact of a change event is described in Figure 1-27 (NOAA Fisheries 2019f). Though the impacts are yet to be fully realized, the COVID-19 pandemic may constitute such a change event and may have a corresponding effect on fishing communities throughout the Atlantic Coast Project Area.

Fishing is a culturally significant activity for the Gullah Geechee communities which are found along the Atlantic coast in North Carolina, South Carolina, Georgia, and Florida. Therefore, it can be assumed these communities engage in some level of subsistence fishing and that many of the same considerations with regard to the fishing communities discussed above would apply to these communities as well.

To describe the relationship between people and the environment, and to evaluate the ability of social groups to respond to change, NOAA developed the SVI quantitative social vulnerability and resilience indicators. The SVI describe and evaluate fishing communities’ well-being in terms of social, economic, and psychological welfare, including fishing dependence.



Source: NOAA Fisheries 2019f

Figure 1-27. Vulnerability and Resilience of Fishing Communities

The terms vulnerability and resilience have multiple meaning and interpretations to different people. NOAA defines the terms vulnerability and resiliency for their own purposes, that is, in the context of a community's response to fishery management actions, as follows (NOAA Fisheries 2019g):

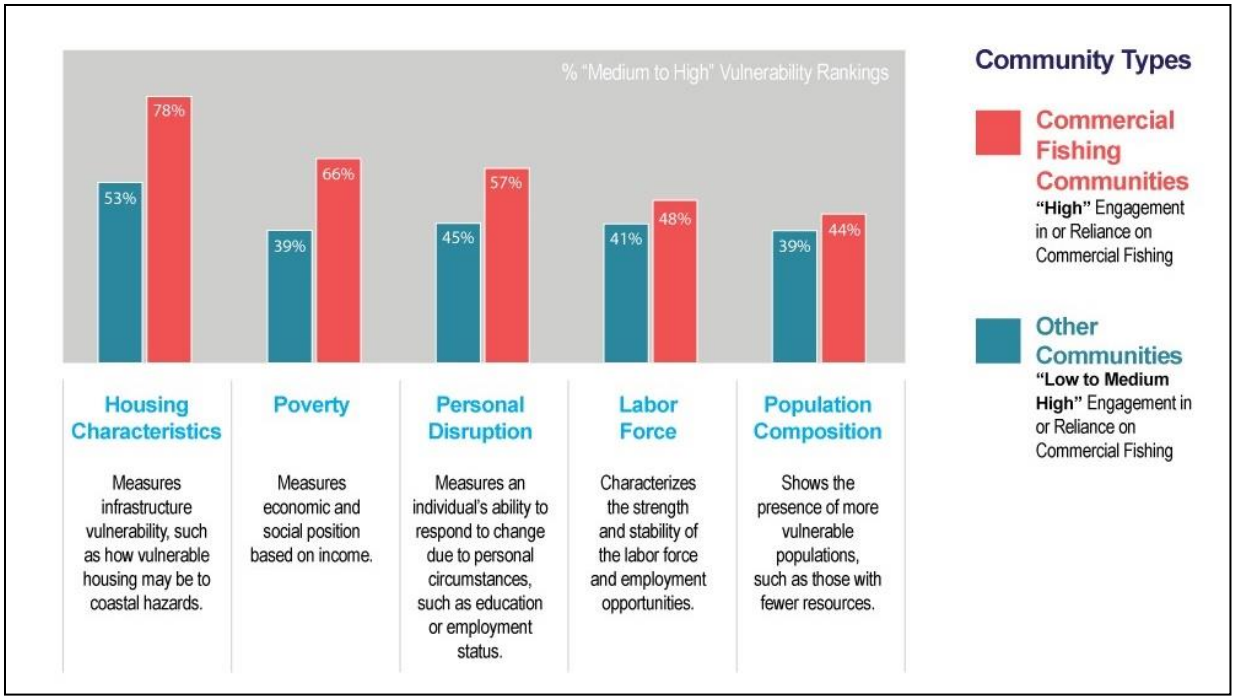
- Vulnerability, as defined by NOAA, is an inherent characteristic of the social system that create the potential for harm. The term is used to describe states of susceptibility to harm, powerlessness, and marginality of both physical and social systems and patterns of differential access to resources or differential susceptibility to loss (NOAA Fisheries 2011).
- Resiliency, as defined by NOAA, is the ability of a social system to respond and recover from disasters. The term includes the ability of the system to absorb impacts and includes coping with the event as well as post-event adaptive response. Resiliency is an attribute that facilitates the system's ability to reorganize, change, and learn (NOAA Fisheries 2011).

Table 1-14 describes NOAA's SVI (NOAA Fisheries 2019b). Figure 1-28 illustrates the use of the indicators, by comparing commercial fishing communities with high engagement in or reliance on commercial fishing to other communities with low engagement or reliance on commercial fishing. As illustrated in the figure, commercial fishing communities have higher percentages of "medium to high" vulnerability rankings (NOAA Fisheries 2019e).

Table 1-14. Components of NOAA's Social Vulnerability Mapping Tool

Social Vulnerability Indices	
Personal Disruption	Represents factors that disrupt a community member's ability to respond to change because of personal circumstances affecting family life or educational levels or propensity to be affected by poverty. A high rank indicates more personal disruption and a more vulnerable population.
Population Composition	Shows the presence of populations who are traditionally considered more vulnerable due to circumstances often associated with low incomes and fewer resources. A high rank indicates a more vulnerable population.
Poverty	A commonly used indicator of vulnerable populations. A high rank indicates a high rate of poverty and a more vulnerable population.
Labor Force	Characterizes the strength and stability of the labor force and employment opportunities that may exist. A high rank means likely fewer employment opportunities and a more vulnerable population.
Housing Characteristics	A measure of infrastructure vulnerability and includes factors that indicate housing that may be vulnerable to coastal hazards. A high rank means a more vulnerable infrastructure and a more vulnerable population. On the other hand, the opposite interpretation might be that more affordable housing could be less vulnerability for some populations.
Gentrification Pressure Indices	
Housing Disruption	Represents factors that indicate a fluctuating housing market where some displacement may occur due to rising home values and rents. A high rank means more vulnerability for those in need of affordable housing and a population more vulnerable to gentrification.
Retiree Migration	Characterizes areas with a higher concentration of retirees and elderly people in the population. A high rank indicates a population more vulnerable to gentrification as retirees seek out the amenities of coastal living.
Urban Sprawl	Describes areas experiencing gentrification through increasing population and higher costs of living. A high rank indicates a population more vulnerable to gentrification.
Sea Level Rise Risk Index	
Inundation Risk	Signifies the overall risk of inundation from sea level rise from 1-foot level to 6-foot level projections over the next 90 years. The indicator represents the possibility of inundation based upon the combined projections at each stage of sea level rise and could vary depending upon future circumstances. A high rank indicates a community more vulnerable to sea-level rise.
Fishing Engagement and Reliance Indices	
Commercial Fishing Engagement	Measures the presence of commercial fishing through fishing activity as shown through permits and vessel landings. A high rank indicates more engagement.
Commercial Fishing	Reliance measures the presence of commercial fishing in relation to the population of a community through fishing activity. A high rank indicates more reliance.
Recreational Fishing Engagement	Measures the presence of recreational fishing through fishing activity estimates. A high rank indicates more engagement.
Recreational Fishing Reliance	Measures the presence of recreational fishing in relation to the population of a community. A high rank indicates increased reliance.

Source: NOAA Fisheries 2019b



Source: NOAA Fisheries 2019e

Figure 1-28. NOAA Social Vulnerability Indicators in Commercial Fishing Communities

NOAA integrated new climate change vulnerability indices into the SVIs to assess the impact of sea level rise on critical commercial fishing infrastructure and the dependence of communities on species identified as vulnerable to the effects of climate change. The integrated tool enhances the analytical capabilities within NOAA Fisheries for conducting fisheries social impact assessments and informing ecosystem-based fishery management (NOAA Fisheries 2016). NOAA's SVI is comprised of four major areas (NOAA Fisheries 2019b):

- Social Vulnerability – including labor force, housing characteristics, poverty, population composition, and personal disruption
- Gentrification Pressure – including housing disruption, retiree migration, and urban sprawl
- Sea Level Rise Vulnerability – including inundation risk
- Fishing Engagement and Reliance – including commercial and recreational aspects

Social vulnerability by location can be mapped on NOAA's website. By entering a community location in the map or zooming in on the map and choosing a location, results of NOAA's analysis of the community will be displayed as low, medium, or high by each indicator included in the four indices (NOAA Fisheries 2019h).

Future OCS project analysts should consider the potential impacts on fishing communities directly (with regard to environmental changes, impacts to marine life, and access to fishing areas) as well as in terms of how projects may influence the vulnerability and resilience of the community in both the short- and long-term.

1.6.5.3.2 Subsistence Populations

Subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" to maintain their lifestyle/survive (*Federal Register* 1994). EO 12898 identifies the need to

consider these populations during an environmental justice analysis *(Federal Register* 1994). Subsistence populations may overlap with identified minority and low-income or other vulnerable populations.

According to the *Council on Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, American Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

One common type of subsistence community is associated with fishing communities. Marine fisheries research has long focused primarily on aspects of commercial and recreational fishing activities. Consumption-oriented fishing in the U.S. has been consistently and thoroughly addressed only in Alaska, and there primarily in the context of the Alaskan Native populations. The semantic challenges of adequately defining subsistence fishing as distinct from recreational (or commercial) fishing notwithstanding, fishing for the purpose (or with the end result) of consumption or sharing has been largely ignored by social scientists. Indeed, it is widely acknowledged that the consumptive component of both recreational and commercial fishing trips is an important motive for involvement; though few directly relevant studies have been conducted outside of Alaska (NOAA Fisheries 2013).

In describing subsistence fishing in Alaska, NOAA defines subsistence as food for direct personal or family consumption, sharing for personal or family consumption as food, or customary trade. In this area, subsistence fishermen must obtain a registration certificate and comply with reporting processes (NOAA Fisheries 2019i).

NOAA's research about fishing communities, especially in the more rural areas, confirms the widespread importance of fishing for food in coastal areas of the U.S. Although observation and discussions with informants in these places made clear that many participants use at least some component of seafood landed during their commercial and recreational trips for consumptive purposes, NOAA was unable to identify published studies or data that would assist in describing the scope or importance of subsistence or consumptive activities to residents in the communities of interest (NOAA Fisheries 2013).

Little is known about subsistence-oriented fishing in the Atlantic Coast Project Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and within each State Study Area. These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be classified as subsistence if a substantial portion of the food they consume comes from fishing. Each State Study Area chapter includes a summary of what information is available about subsistence communities in that area.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS development should be considered during future analysis once site-specific information is known. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups, and who also depend on subsistence resources may have distinct cultural or economic relationships with

coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations. To identify if subsistence populations are present in a specific area, future OCS project analysts may need to conduct interviews with local community organizations such as community planners, aid organizations, religious leaders, and shelters.

1.6.5.3.3 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. Amish and Mennonite settlements are located within four State Study Areas: Delaware, Virginia, Maine, and Maryland. Amish and Mennonites have been separate groups within the Anabaptist family since 1693. They migrated separately to North America but often settled in the same areas. Both migrated in several waves, first in the 1700s and 1800s, settling in Pennsylvania, Ohio, and Indiana, and eventually migrating to other states (Young Center 2013). The 2019 estimated population of the Amish in North America is 341,900. North American Amish communities are located in 31 states and four Canadian provinces with approximately 63% of the population living in the States of Ohio, Pennsylvania, and Indiana. However, none are located specifically within the Pennsylvania Study Area. The Amish population is fast growing and doubles about every 20 years. Since 2018, approximately 22 new settlements were established (Young Center 2019a). According to the Young Center for Anabaptist and Pietist Studies, there are numerous Mennonite groups in North America. In general, Mennonites are more assimilated into mainstream culture and are more likely to live in urban and suburban settings (Young Center 2013).

The Amish are known for their separatist values and 300-year-old traditions, which include a plain lifestyle, simple and period traditional clothing, and horse-and-buggy mode of transportation. Many Amish live in rural areas and often use manual labor to grow and produce their own food to feed their typically large families. They avoid using technology in any way that may damage their community or threaten their way of life (Scottsdale 2019) These characteristics may be perceived by the general population as indicative of a subsistence way of life that seem incompatible with the modern world (Barta 2017).

Traditional practices include farming, hunting, fishing, and gardening. The Amish maintain a large garden for their own use, which may constitute a significant part of their fresh food supply. They also buy many other items from traditional stores. Thus, gardening is a supplement to their food source. The Amish hunt with guns as well as bow and arrow and may travel out of state to find the best hunting grounds. However, because gardening is a supplement to their food source and because traveling is considered a recreational approach to hunting, these groups are better classified as having a “self-sufficiency” philosophy instead of “subsistence” behavior (Barta 2017). Therefore, Amish are not considered vulnerable due to subsistence behaviors but may still have other characteristics of vulnerable populations, such as difficulties accessing health care, social pressures against accessing social services due to a self-reliance ethic within their community and congregation, aversion to current technologies that may interfere with traditional communications in an emergency, low-income, and limited-English speakers. Mennonite populations are more assimilated into mainstream culture, and therefore may not share in these potential vulnerabilities.

1.6.5.4 Tribes

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property’s location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). To be

included in consultation under Section 106, tribal groups must be federally recognized within the respective State, though they do not have to be resident within the State. State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

Table 1-15 summarizes the total number of federally and State recognized tribes for each respective state. The table further breaks down the number federally and State recognized tribes into numbers of tribes that currently reside in the Study Area and those that do not reside in the Study Area. Please note that some tribes are recognized both federally and by the State and, thus, those tribes are accounted for in both columns for that State. For example, in Table 1-15, Virginia has 13 federally recognized tribes and 10 State-recognized tribes, making it look like there are a total of 23 tribes listed for Virginia; however, six tribes are recognized both federally and by the State, bringing the total number of tribes recognized by Virginia down to 17. Tribes that are dually recognized federally and by the State are identified in each Chapter. Also note that although Table 1-15 includes federally and State-recognized tribes that live outside the Study Area, some of these tribes have historical ties to, and an interest in activities occurring in, the Study Area and may need to be consulted. For example, the Delaware Tribe of Indians primarily reside in Oklahoma, but they maintain historical ties to several states in the Atlantic Coast Project Area. Tribes that reside outside the Study Area but maintain historical ties to the Study Area are identified in each Chapter. Figure 1-29 and Figure 1-30 show the locations of federally recognized tribal lands throughout the Atlantic Coast Project Area.

Table 1-15. Total of Federal and State-Recognized Tribes by State

State	Federally Recognized Tribes		State-Recognized Tribes	
	Resident Tribes in the Study Area	Reside Outside the Study Area	Resident Tribes in the Study Area	Reside Outside the Study Area
Connecticut*	2	4	4	1
Delaware	0	2	2	0
District of Columbia	0	1	0	0
Florida*	2	7	2	4
Georgia	0	10	1	2
Maine	2	3	0	0
Maryland	0	5	3	0
Massachusetts	2	4	3	2
New Hampshire	0	0	0	0
New Jersey	0	5	3	0
New York*	1	12	2	7
North Carolina*	0	6	2	6
Pennsylvania	0	12	0	0
Rhode Island	1	5	0	0

Table 1-15. Total of Federal and State-Recognized Tribes by State

State	Federally Recognized Tribes		State-Recognized Tribes	
	Resident Tribes in the Study Area	Reside Outside the Study Area	Resident Tribes in the Study Area	Reside Outside the Study Area
South Carolina*	0	6	3	7
Virginia*	6	7	7	3

***** States with one or more tribes dually recognized federally and by the State

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

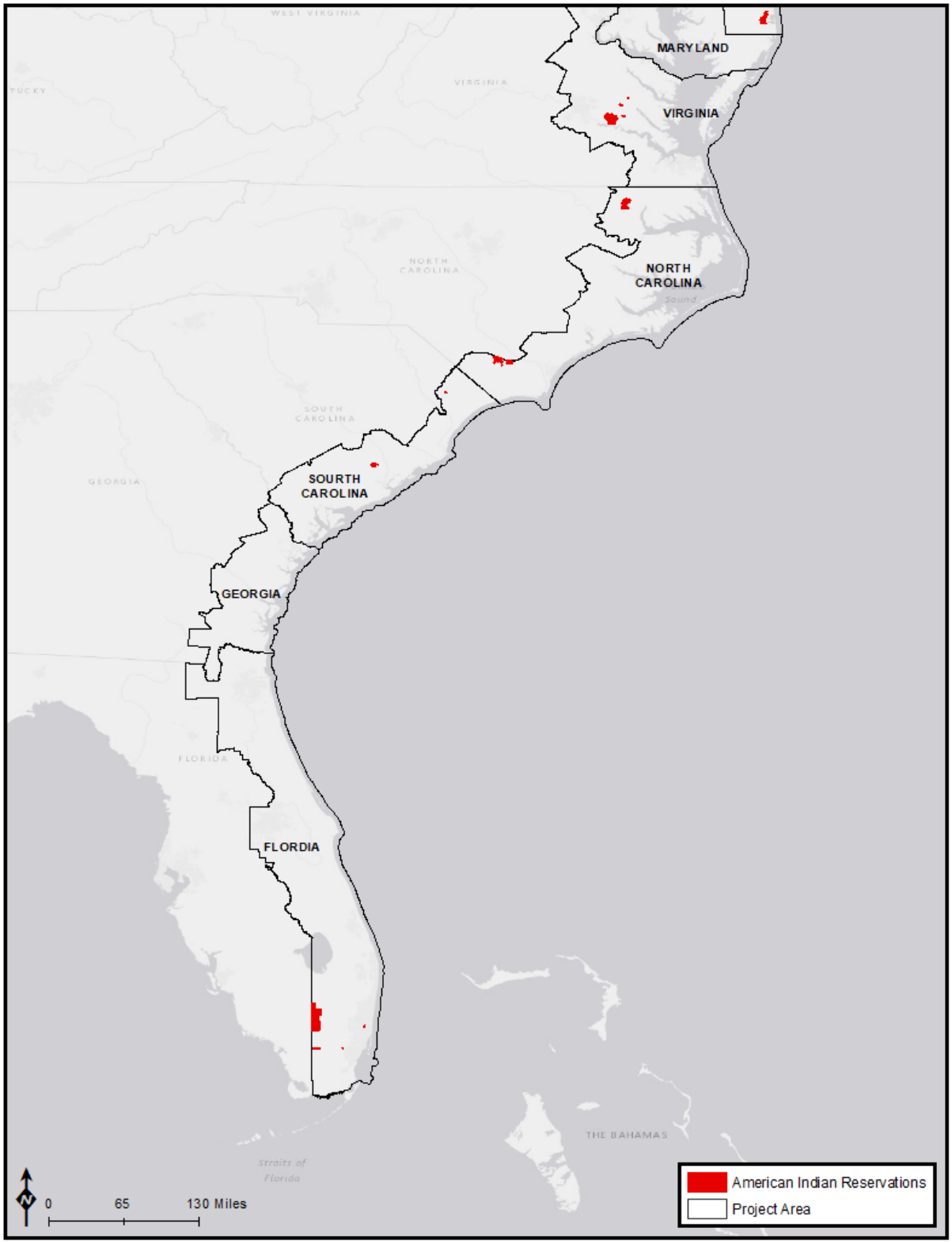
1.6.5.5 English Language Ability

The USCB measures language use and English language ability, which can help contribute to an identification of communities that require assistance with language or cultural barriers. Results of English language ability (the percentage of people who speak a language other than English at home) are based on a self-assessment of those responding to Census questions, not on a test of language ability (USCB 2015).

Populations that speak a primary language other than English are present within the State Study Areas, as discussed in detail in the following chapters. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable (USCB 2015).

Source: HIFLD 2017

Figure 1-29. Federally Recognized Tribes within Each Northern State



Source: HIFLD 2017

Figure 1-30. Federally Recognized Tribes within Each Southern State

Research shows that characteristics of limited-English populations include high rates of poverty and lower rates of educational attainment as compared to the national norm and include more recent immigrants. The language barrier may prevent limited-English speaking people from navigating and interacting with the general population and seeking and receiving medical and social services. Limited-English speaking people and households may not understand or receive instructions during emergency or disaster situations and/or be able to communicate with emergency responders or mitigation personnel following such an event. Most emergency response organizations have interpreters, and many prepare materials in a variety of languages. It is important that community planners, emergency managers, and emergency response personnel know which languages are spoken within their community to be best prepared to interact with these communities under normal and emergency circumstances (USCB 2015).

Future OCS project analysts should further examine the location of limited-English speaking populations once site-specific information is known as these populations may require different outreach, particularly in consideration of communications and emergency planning.

1.7 Conclusion

The resources introduced in the sections above are analyzed in more specific detail for each State Study Area in the respective chapters. The sections below present some overall observations regarding the Atlantic Coast Project Area as a whole, particularly with regard to coastal populations and climate change. Finally, this chapter concludes with general recommendations for additional areas of research when analysts begin environmental assessments related to potential future OCS projects.

1.7.1 Coastal Populations

This analysis of physical characteristics, land cover and land use, and demographic and socioeconomic factors of the coastal counties and independent cities of the Atlantic Coast Project Area demonstrates that overall, many of these coastal populations are vulnerable populations. The threats to coastal communities as discussed in Chapter 1.4.2 include extreme natural events such as hurricanes, coastal storms, and nuisance flooding, as well as longer-term risks of coastal erosion and sea level rise. As discussed in the Fourth National Climate Assessment, climate change is already resulting in impacts to communities nationwide. Climate change is driving both more frequent and more intense weather events (hurricanes, severe storms, blizzards, ice storms, drought, etc.) as well as driving changes in average climate conditions. These changes in both severe weather and average conditions cause various impacts such as damage to infrastructure, ecosystems, and to the built environment and supporting social systems and networks (USGCRP 2018). Collectively, these damages can significantly impact individual communities as well as entire regions. Populations living in the floodplain of coastal counties have a high physical vulnerability due to their geographic locations. These communities are also growing and expanding.

Extreme weather and climate events affect all regions of the U.S. However, the U.S. south/central and southeast regions experience a higher frequency of billion-dollar disaster events than any other region (NOAA NCEI 2019b). Recent decades have seen costly and damaging hurricanes in the Atlantic and Gulf Coast regions. However, these areas have also continued to experience both economic and population growth. Many of the urban areas within these coastal communities continue to grow in aerial extent with development along the shorelines in high demand bringing in high profits.

As is shown throughout the State Study Area chapters, these coastal communities also have a high population and economies that contribute significantly to both individual state economies and the national economy in many ways, including significant contributions in tourism and recreation areas. The coastal communities also have subsets of the population that have social vulnerabilities such as minority and

low-income communities, populations with aging populations or high percentages of children, resource-dependent communities that rely in various ways on the Nation's waters, limited-English communities, or unique populations such as religious communities and subsistence populations. Some of these socially vulnerable communities are also physically vulnerable.

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% of the Nation's land mass (excluding Alaska) (NOAA 2013). This population trend is also evident in most of the State Study Areas. This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards (USCB 2017d).

1.7.2 Climate Change

As discussed in the Fourth National Climate Assessment, climate change is already resulting in impacts to communities nationwide. Climate change is driving both more frequent and more intense weather events (hurricanes, severe storms, blizzards, ice storms, drought, etc.) as well as driving changes in average climate conditions. These changes in both severe weather and average conditions cause various impacts such as damage to infrastructure, ecosystems, and to the built environment and supporting social systems and networks (USGCRP 2018). Collectively, these damages can significantly impact individual communities as well as entire regions.

Communities that are already physically and/or socially vulnerable are less prepared to deal with the potentially significant cascading effects that can occur as a result of severe climate impacts. Programs such as the Opportunity Zones that encourage development in these vulnerable communities can help these communities become more resilient by bringing in additional resources and services and boost the local economy.

Climate change also influences the ecosystem. Changes in both severe weather and local climate conditions can affect natural resources that some resource-dependent communities rely on for their daily sustenance or way of life (USGCRP 2018). Rising sea level will lead to inundation of certain coastal areas potentially permanently damaging certain natural resources that provide both valuable ecosystem functions and may also have cultural and historic importance to communities. Changes in the ecosystem may also affect trade if certain natural resources that are typically traded are affected. Water supplies/water availability may also be affected by climate change. As discussed in the Fourth National Climate Assessment, changes in the relative amounts and timing of snow and rainfall are contributing to issues for some areas to access enough water to meet their needs (USGCRP 2018). Additionally, climate change can drive migration of species, changes in biodiversity, and spread of invasive plants (USGCRP 2018).

Agricultural systems may also be affected by climate change. Crop productivity may decrease; certain crops may no longer be suitable for growth in certain areas as temperatures increase or as the sea encroaches into certain areas. Growing seasons may shift. Warmer temperatures and severe weather events may increase strain on livestock. Climate change, consequently, may drive changes in the availability or price of certain agricultural products, thus affecting the economy (USGCRP 2018).

The ocean and marine life also experience effects from climate change. Fisheries may be impacted by changes in ocean acidification, ocean temperature, and changes in sea level. Changes in fisheries would affect fishing communities throughout the Atlantic Coast Project Area that are already socially vulnerable (USGCRP 2018).

Changing climate and rising temperatures may also lead to reduced energy efficiency and greater energy consumption, which could lead to higher energy costs which again would hit socially vulnerable communities harder than other more affluent communities. As climate change continues, coastal communities will expend more and more funds adapting to the changes and/or mitigating damages caused by factors such as sea level rise, storm surge, and coastal erosion (USGCRP 2018). Many of the cities located along the Atlantic Coast were some of the earliest locations inhabited by European settlers in North America. Many of these communities have been continually occupied since the earliest days of European settlement. While these cities have grown and adapted over time, many have aging and deteriorating infrastructure (buildings, roads, bridges, underground utilities, etc.) within at least certain areas of the community. Extreme weather events and even increasing temperatures can put increasing strain on the infrastructure contributing to increased risk of failure. Damage to or failure of interconnected systems could place greater strain on communities that are already socially vulnerable (USGCRP 2018).

Human health may also experience impacts associated with climate change. Extreme weather events and rising temperatures can increase exposure to both foodborne and waterborne disease which can jeopardize food and water supplies. Illness and death associated with temperature extremes may increase. Certain diseases such as asthma and allergies may increase. Changing climate will likely lead to geographic changes in the range and distribution of some disease-carrying insets and pests, potentially resulting in more widespread distribution of certain diseases in the human population. Climate change can also cause mental health effects. Climate-related impacts to human health would be felt more significantly by socially vulnerable populations who may not have much access to health care or insurance (USGCRP 2018).

Communities along the coastline throughout the Atlantic Coast Project Area could also experience impacts to tourism as a result of climate change, particularly those communities with heavy ocean-based or outdoor tourism components.

Many communities are already taking measures to adapt to changing climate conditions. These plans, where identified, are discussed in further detail in the State Study Area chapters. Communities that incorporate this kind of planning into their master/comprehensive plans for future land use will have an advantage. Future OCS project analysts would benefit from further site-specific research into the planning and decision-making that communities are engaging in to deal with the potential impacts of climate change once potential project locations are known. Preparedness and mitigation efforts offer economic opportunities for both developers and the affected communities.

1.7.3 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Atlantic Coast Project Area, the following recommendations are presented for consideration in conjunction with proposed future OCS or OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- **GENERAL:** The data presented in this analysis is presented at the level of the individual State Study Areas. Future project analyses need a more detailed examination of State, county, and local datasets and information once site-specific information is known for potential future OCS projects. The need for site-specific information applies to all resource topics below.
- **PHYSICAL VULNERABILITY:** The potential for sea-level rise and corresponding contributions to nuisance flooding and storm surge impacts should be examined in greater detail. Recovery periods from major flooding events can be long. Therefore, environmental reviews of potential future projects should consider the project's potential to affect flooding, whether from sea level rise, nuisance flooding, storm surge, or combined effects. Future project analysts would benefit from further site-specific research into the planning and decision-making that

communities are engaging in to deal with the potential impacts of climate change once potential project locations are known. Preparedness and mitigation efforts offer economic opportunities for both developers and the affected communities.

- **EXISTING AND FUTURE LAND USE AND ZONING:** Analysts of future projects should review and consider the compatibility of proposed projects with regard to local land use and planning documents, zoning ordinances, and Opportunity Zones.
- **PROTECTED AREAS:** Proximity of future projects to protected areas needs to be considered during evaluation. Because many of the protections are in place around these designated areas, proximity to protected areas needs to be considered during potential future OCS project analysis to determine the potential for impacts.
- **CULTURAL AND HISTORIC RESOURCES:** Site-specific detailed cultural resource surveys of proposed project sites and the immediate vicinity and viewsheds will be required to determine potential effects to these resources.
- **RECREATION:** Future project analysis will need to conduct a site-specific evaluation of local recreational resources. Seasonality of the recreational opportunities, activities, and events may also be an important consideration. Such information will be needed to fully consider impacts to recreational resources in future environmental analyses.
- **TRANSPORTATION:** Future project analysts will need to consider local transportation networks and resources. Congestion of transportation networks is common throughout the Atlantic Coast Project Area given the prevalence of urban centers throughout the region as well as overall population density. Aging infrastructure and recurrent flooding is also an issue in many municipalities throughout the Project Area. Therefore, potential impacts to the transportation network or individual transportation resources will be an essential consideration for future environmental impact analyses.
- **POPULATION:** Population projections often assume the continuation of historical average rates of migration. However, migration rates are often more volatile than natural population increase rates as they are sensitive to changes in domestic economic conditions and changes to immigration policy. Rising sea level may also contribute to new migration patterns over time. Future project analysts should update projections with the latest datasets and be aware of any changes in U.S. immigration policy that may affect the numbers of immigrants in their area of interest. For example, skilled international workers generally migrate to large cities for the best jobs; if immigration is reduced, the flow of skilled workers could be dampened in smaller cities.
- **COVID-19 DATA UPDATES:** All USCB data utilized in this report were associated with 2017 or earlier data collection and estimates. In 2020, the U.S. is conducting the new decennial census. Additionally, the COVID-19 pandemic is having widespread impacts on population and the economy as well as on decennial census data collection efforts. The full effects of the pandemic may not be known for some time and may have impacts in ways not yet understood or recognized. Consequently, future project analysts need to identify and consider the most up-to-date information for all demographic and socioeconomic factors when conducting environmental reviews of potential projects.
- **SOCIAL VULNERABILITY:** Because the CDC SoVI is based on 2016 data from the USCB, it will not reflect changes in communities that result from the COVID-19 pandemic. Future project analysts should determine whether the CDC SoVI has been updated and, if so, incorporate the results of that update into future vulnerability analysis in conjunction with environmental assessments of potential projects.
- **FISHING COMMUNITIES:** Fishing community profiles, available by region through the NOAA Fisheries website, should be considered with respect to analyzing potential impacts

associated with future projects. Future project analysts should also consider the potential impacts on these fishing communities directly (with regard to environmental changes, impacts to marine life, and access to fishing areas) as well as in terms of how projects may influence the vulnerability and resilience of the community in both the short and long term.

- **SUBSISTENCE POPULATIONS:** Proximity of potentially vulnerable subsistence communities to prospective sites for development should be considered during future analysis. To identify if subsistence populations are present in a specific area, interviews with local community organizations such as community planners, aid organizations, religious leaders, and shelters may be necessary.
- **ENGLISH LANGUAGE ABILITY:** Future project analysts should further examine the location of limited-English speaking populations as these populations may require different outreach, particularly in consideration of communications and emergency planning.

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CHAPTER 2

MAINE

2 Maine

2.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Maine to support development of future BOEM environmental impact assessments related to prospective development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Maine is located near the North Atlantic Planning Area (Figure 1-1 in Chapter 1.1). A total of nine counties are located within the Maine Study Area (Study Area) along the Maine coastline. The counties range in population size from around 32,000 in Washington County to over almost 290,000 in Cumberland County. There is only one city within the Study Area with a population greater than 50,000; it is Portland with almost 69,000 (ESRI 2019a). As a result, there are disparities regarding demographics (age, income, race/ethnicity, and subsistence populations) between the greater Portland area and the rest of Maine. Property in the Study Area exhibits a range of land ownership (Federal, State, local, and private) and includes commercial/industrial ports, resort and vacation destinations, natural areas, and private property. The northern position of Maine and distance from major metropolitan areas decreases the diversity of demographics and visitors to the area. Additionally, Maine's location and geology form a rocky coastline unique from other Atlantic States, although sandy beaches are common at the southern coast of Maine. The Maine coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

`The Study Area includes the overall Project Area counties that are located within the State of Maine. The Study Area is shown in Figure 2-1 and Figure 2-2 and includes the following counties:

- Cumberland
- Hancock
- Kennebec
- Knox
- Lincoln
- Sagadahoc
- Waldo
- Washington
- York

2.1.1 Methodology

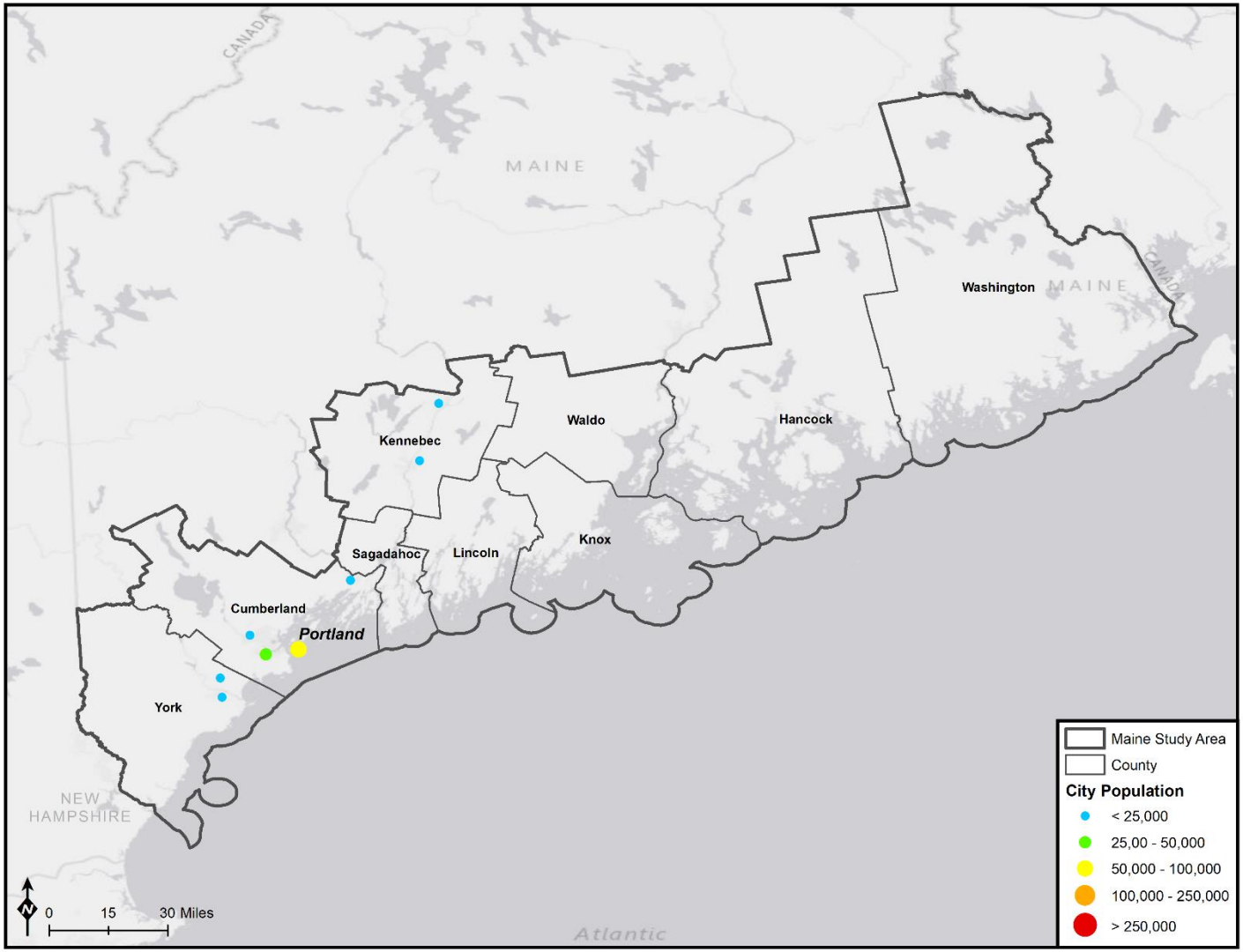
National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Maine are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area, including State data sources such as:

- Maine Geolibrary
- Maine Department of Transportation (MaineDOT)
- Maine State Economist
- Maine Bureau of Parks and Lands
- Maine Department of Inland Fisheries and Wildlife

Source: ESRI 2019a

Figure 2-1. State of Maine Study Area



Source: ESRI 2019a

Figure 2-2. Cities in the Maine Study Area

The metadata database for Maine-specific State, county, and local data sources is included in Appendix A.

2.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

2.2.1 Water Resources

Maine's water resources include the Gulf of Maine and submerged lands, bays, rivers, lakes, floodplains, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

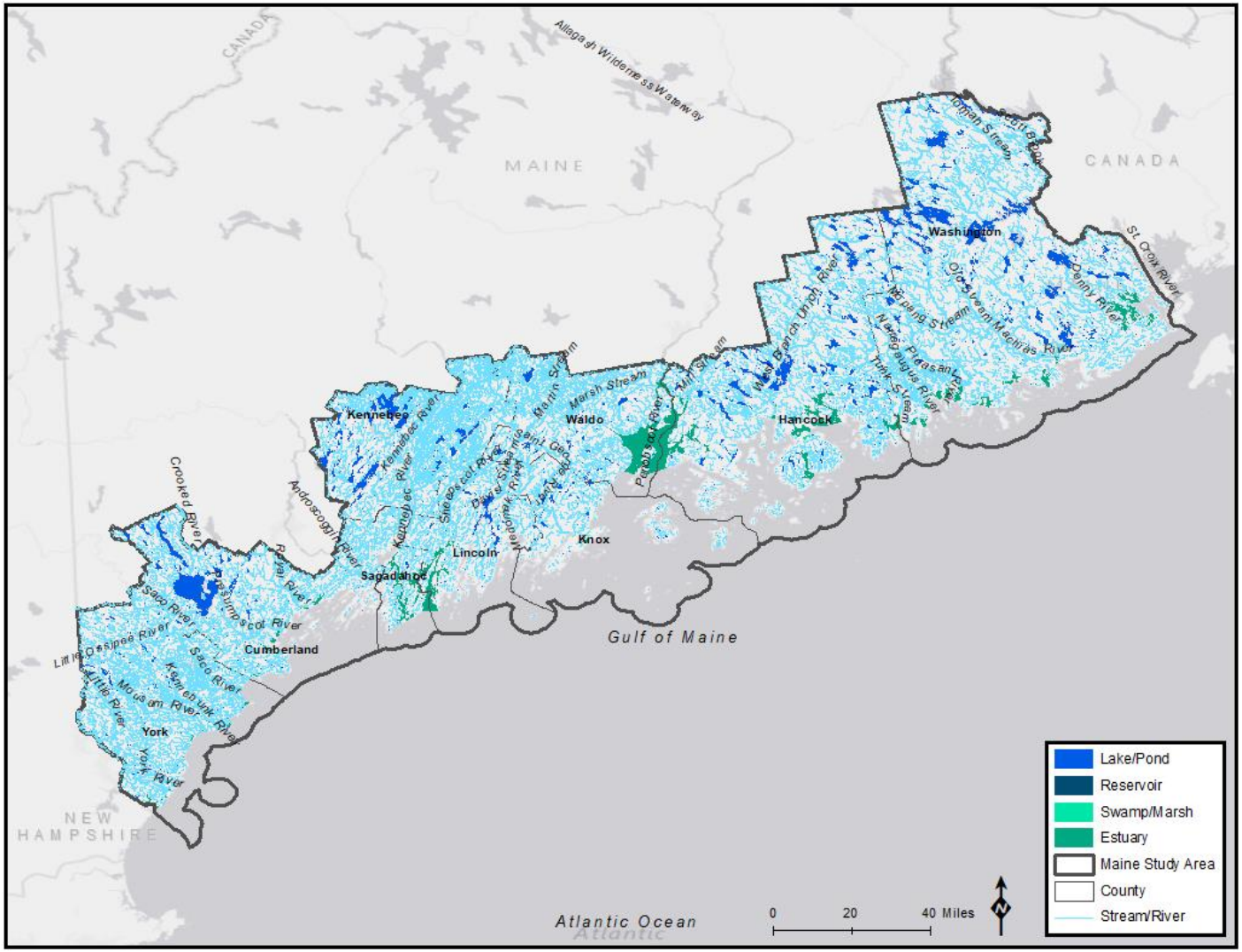
2.2.1.1 Gulf of Maine and Submerged Lands

Defined by shallow waters at Georges Bank on the south and Browns Bank on the east, the Gulf of Maine, shown in Figure 2-3, is bounded by Massachusetts, New Hampshire, and Maine in the U.S. and by New Brunswick and Nova Scotia in Canada. The Gulf of Maine is a semi-enclosed sea spanning 36,000 square miles with dynamic tides mixing freshwater from 60 rivers in a productive marine ecosystem supporting over 3,000 marine species, including habitat for the endangered Atlantic right whale. With geology similar to coastal New England, igneous and metamorphic rocks are scoured bare in some high points while in other, less energetic locations, end moraines stretch into the till-covered Gulf of Maine underlain with igneous and metamorphic rocks. Twice-daily tides average 9 feet in southern Maine to over 20 feet in northern Maine (DACF 2009, Kelley et al. 1998, Slovinsky 2005, GOM 2019).

Submerged lands, defined as lands covered by water, are recognized as a finite resource that must accommodate a variety of uses; as such, Maine considers submerged lands a public resource that everyone has the right to use for fishing, hunting, and navigation. However, of Maine's 5,400 miles of mainland and island shoreline, only 12% is publicly owned. For publicly owned submerged lands, the public resource is described as including coastal waters and islands from the mean low-water mark out to the 3-mile limit, land below the mean low-tidal mark upstream to the furthest tidal reach of tidal rivers, land between the banks of rivers bordering Canada, and land below the low-water mark for great ponds (ponds naturally in excess of 10 acres). Public submerged lands do not include beaches only covered at high tide, land flooded by dams, and land beneath ponds less than 10 acres. While the submerged land and water may be public, structures, including piers, on these submerged lands may be private. Permanent structures, structures occupying submerged lands for more than seven consecutive months a year, require a lease or easement from the Bureau of Parks and Recreation. Leases may be granted if the structure has water-dependent use and if it does not interfere with public access to the water resource (DACF 2013b, DACF 2016, DACF 2019a).

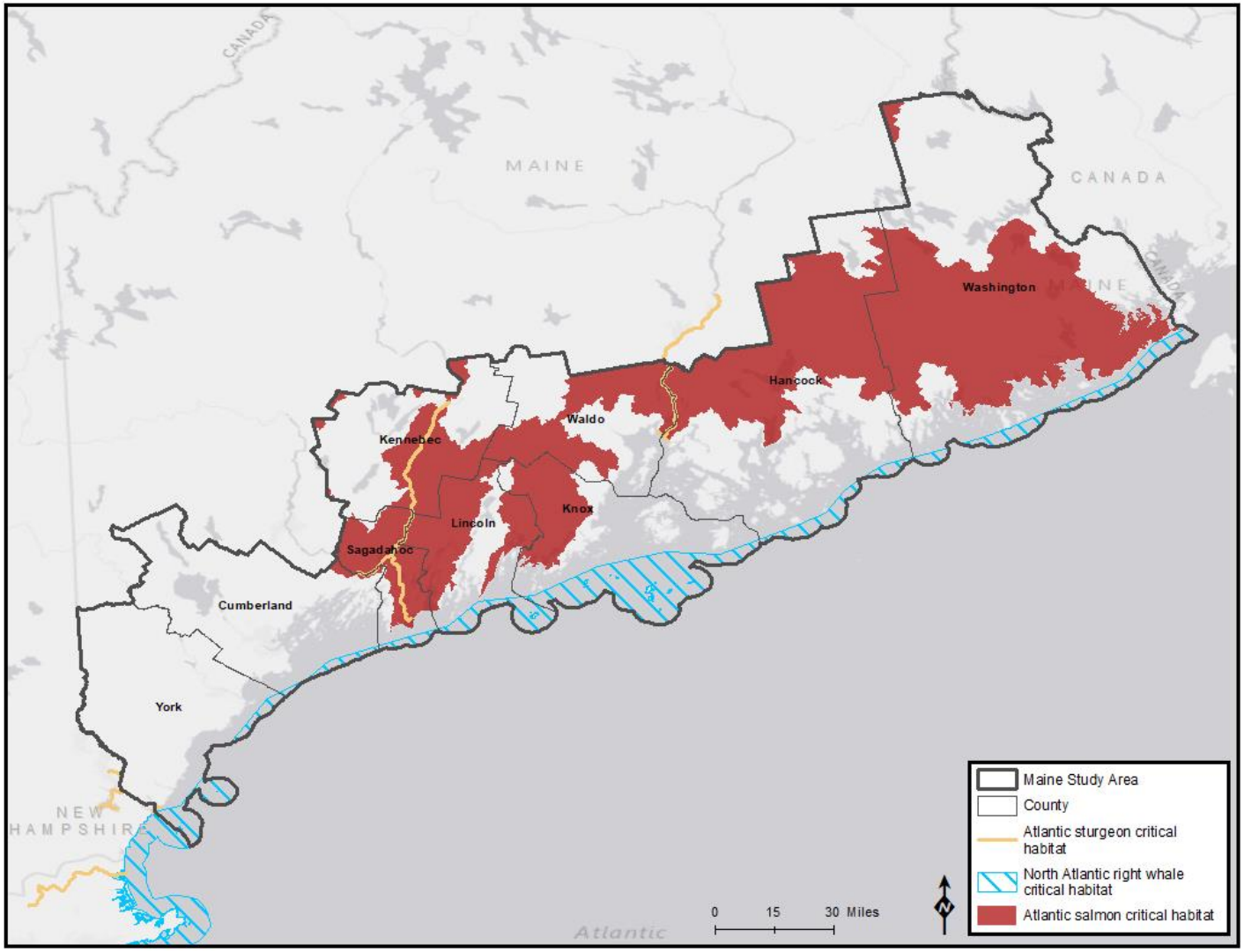
As shown in Figure 2-4, the coastal area of Maine within the Study Area includes designated critical habitat for the Atlantic salmon, Atlantic sturgeon, and North Atlantic right whale. Critical habitat provides essential features for the conservation of the species.

Atlantic salmon are anadromous (live primarily in the sea and return to swim up their natal, freshwater river to spawn). The salmon tend to return to spawn in late autumn and the eggs typically do not hatch until spring. After a short period of maturation, the fish migrate to the ocean. The Atlantic salmon can spawn several times over their typical lifetime of 4 to 6 years. Most populations of Atlantic salmon in New England have been eradicated (NOAA Fisheries 2020h).



Source: USGS 2019e

Figure 2-3. Hydrography in the Maine Study Area



Source: USFWS 2019i, USFWS 2019j

Figure 2-4. Critical Habitat within the Maine Study Area

The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Maine, the designated critical habitat of the Atlantic sturgeon is in the Penobscot, Kennebec, Androscoggin, and Piscataqua Rivers (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

One of the most endangered species, the North Atlantic right whale occurs primarily close to the continental shelf, though may also be found in deeper waters. The North Atlantic right whale is typically found in New England or Canadian waters in the spring, summer, and fall. The right whale typically winters in the shallow waters off from around Cape Fear, North Carolina to southern Florida; calves are generally born in the winter in these waters (NOAA Fisheries 2020e).

2.2.1.2 Bays, Rivers, and Lakes

Within the Study Area, the major drainage basins include the Saco, Androscoggin, Kennebec, Penobscot, and St. Croix Rivers; these basins all flow into the Gulf of Maine and the Atlantic Ocean. Figure 2-3 shows the major surface water bodies within the Study Area. Many of Maine's ocean-connected rivers provide critical habitat for the Atlantic salmon. Critical habitat for the Atlantic sturgeon in the Study Area also includes portions of the Kennebec, Penobscot, Androscoggin, and Piscataqua Rivers.

At the southern end of the Study Area, the Saco River flows from the White Mountains of New Hampshire to Maine's Ferry Beach a flat, semicircular sandy beach south of Portland. Average daily flow for the Saco River is 3,550 cubic feet per second or 2,200 million gallons per day. Drinking water withdrawals average 6 million gallons per day and total demand averages 40 million gallons per day (MSWC 2019).

East of Ferry Beach, the rocky shore of Casco Bay stretches from two lights in Cape Elizabeth to Cape Small in Phippsburg, covering 229 square miles and encompassing Portland and South Portland, Maine. Casco Bay includes 785 islands, historic forts, and lighthouses along with secluded anchorages and working ports for cruise ships, container ships, and oil tankers. Providing protection from the Atlantic Ocean, Casco Bay estuary provides habitat for "850 species of marine life and 150 kinds of water birds." While Casco Bay estuary historically boasted more than 8,000 acres of eelgrass beds, recent losses are under investigation along with studies and mitigating plans on climate change, ocean acidification, human population growth, and habitat fragmentation (CBEP 2017, CBEP 2018, CBEP 2019, Casco Bay 2019).

North of the Saco River, the Androscoggin River flows from Errol, New Hampshire through western Maine merging with Kennebec River in Merrymeeting Bay, an estuary, before flowing 17 miles into the Gulf of Maine east of Casco Bay. Starting at an elevation of 1,200 feet above mean sea level, the Androscoggin includes numerous rapids and waterfalls with more than 20 dams over its 170-mile course, delivering an average of 4,190 million gallons per day into the bay. While the waters provide ample water power for industry, especially from Rumford Falls to Brunswick, low-lying broad areas along the Androscoggin are filled with rich, alluvial soil providing some of Maine's best farmland (Bethel Historical Society 2011).

East of Androscoggin River, the Kennebec River drops over 1,000 feet flowing from Moosehead Lake in northern Maine, merging with the Androscoggin River at Merrymeeting Bay, before flowing 17 miles to Popham Beach in the Gulf of Maine. Once dammed and dynamited to facilitate log drives from Moosehead Lake down to the mills at Waterville, this 170-footlong, roaring river provides recreation in addition to power and transportation. The Kennebec River is "navigable for about 43 miles from Phippsburg to Augusta" with 150-foot wide dredged channels around Swan Island, 27 feet deep on the west and 17 feet deep on the east, decreasing to 11 feet deep at Augusta (Begin 2012, USACE 2019j).

East of the Kennebec River, the Penobscot River flows from Penobscot Lake on the border with Quebec. Joined by the East Branch at Medway, the Penobscot River becomes navigable at Bangor before entering the Gulf of Maine at picturesque Penobscot Bay. Joined by the Mattawamkeag River from the east and then the Piscataquis River from the west, the Penobscot River provides recreation, navigation, and hydropower resources (Dickson 1999, NRCM 2019).

East of Kennebec River and Merrymeeting Bay, the jagged coastline of Penobscot Bay is a spectacular array of coves and islands with long, narrow channels on the eastern boundary of Waldo County, at Bluehill Bay, and at Eggemoggin Reach. These are deepwater channels of the drowned coast. The current Penobscot River valley flows directly into the East Passage, a wide channel east of the island of Islesboro. The West Passage, to the west of North Haven and Vinalhaven Islands, is deeper and includes a canyon over 500 feet deep (Dickson 1999).

Ascribing the border between Maine and New Brunswick, Canada, the St. Croix River is the most northerly of the major rivers in the Study Area. From headwaters in Aroostook County, the St. Croix River straddles the border with Canada for 110 miles, receiving contributions from West Grand Lake and Big Lake before being joined by its westerly branch at Grand Falls and flowing to its estuary. The tidal range in this estuary is 25 feet. About 80% of the land in this watershed is forested; much of that is managed forestry. From its estuary, the St. Croix River empties into Passamaquoddy Bay, an inlet on the western shore of the Bay of Fundy, and the Atlantic Ocean (St. Croix 1993).

Covering over 24,400 acres, the Moosehorn National Wildlife Refuge (NWR) is part of the Atlantic Flyway, a major migratory route along the east coast. Bordering on Cobscook Bay with twice daily tides up to 24 feet, the refuge provides a stop along the migratory route and a breeding area for many birds, from warblers to waterfowl to shorebirds. With rolling hills, hardwood forests, and marshes, Moosehorn supports hares, beavers, otters, deer, coyotes, bear, and moose (USFWS 2007).

Part of the Moosehorn NWR, Cobscook Bay State Park is a 422-acre park surrounded on three sides by the Passamaquoddy Bay. Till and glacial mud provide a thin covering, less than 10 feet, over highly striated bedrock indicating historical glacial movement to the southeast. With only a narrow opening to the sea and very few freshwater sources, the Cobscook estuary provides nutrient-rich salt water on 24-foot tides stimulating plankton growth and providing habitat for a vast web of species including trout, osprey, otters, seals, and bears. Cobscook Bay supports Maine's largest bald eagle population (Johnston 2000, DACF 2019b).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. § 1271 *et seq.*) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. The State of Maine has approximately 31,752 miles of river. Only the 92.5 mile Allagash Wilderness Waterway, flowing from Mt. Katahdin in northern Maine, is designated as wild and scenic (USFWS 2019s).

2.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As seen in Figure 2-5, floodplains are a large part of the land area of many counties in the Study Area. Table 2-1 details the flood zone acreage within the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 2-1. Floodplains in the Maine Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Cumberland	<1	0.0	0	0.0
Hancock	134,059	13.2	546	0.1
Kennebec	92,601	16.7	2,770	0.5
Knox	95,176	40.7	463	0.2
Lincoln	63,936	21.9	89	0.0
Sagadahoc	40,048	24.6	391	0.2
Waldo	54,318	11.6	417	0.1
Washington	228,354	13.9	630	0.0
York	3,231	0.5	220	0.0
Study Area Total	**711,724**	12.9	**5,525**	0.1

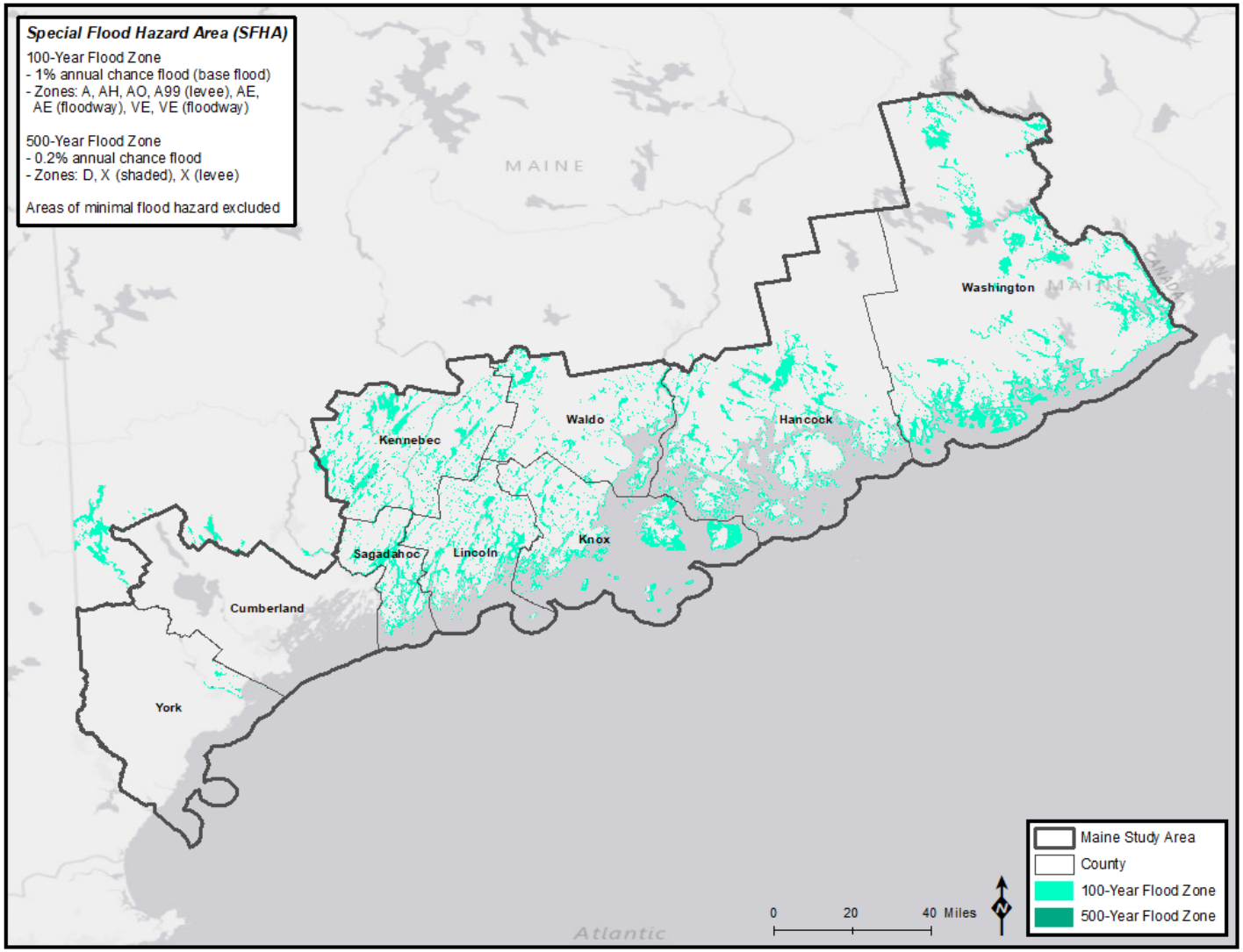
Source: FEMA 2019b
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

2.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 2-6, wetlands are a large part of the land area in many of the Study Area counties; Cumberland County and York County have few floodplain acres.

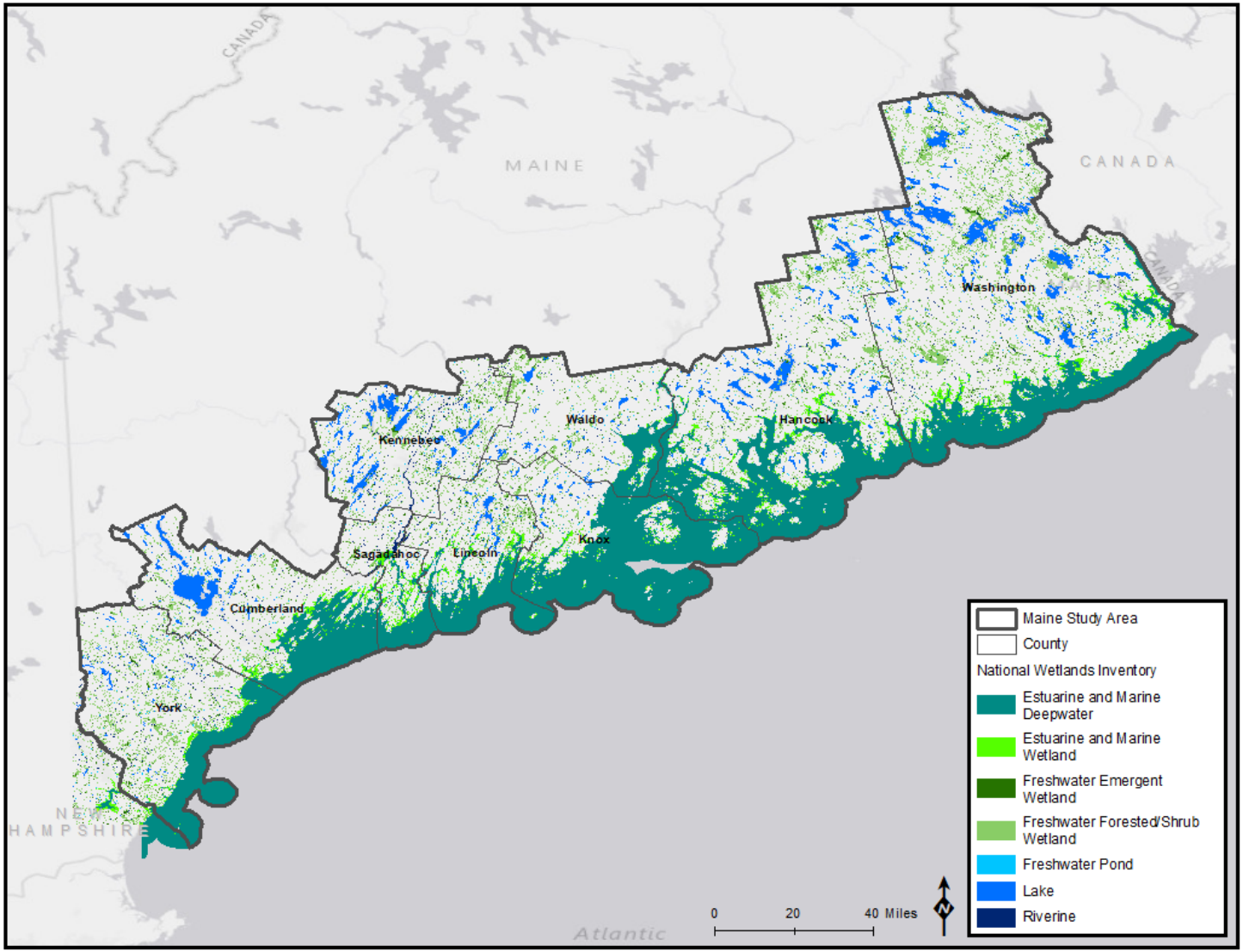
As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands).

Table 2-2 details the wetland acreage in the Study Area along with other water resources. Estuarine and marine wetlands are tidal habitats, open to the ocean, with a mix of fresh and salt waters. Freshwater emergent wetlands, sometimes called marshes or wet meadows, are characterized by perennial, upright plants during most of the growing season. Freshwater forest and shrub wetlands are described as forested swamps or shrubby bogs. Wetlands are part of estuarine systems. Estuarine and marine deepwater systems have deep tidal habitats with partly obstructed or occasional access to the ocean and occasional influence from freshwater. Lakes are deepwater bodies, whereas freshwater ponds are shallow water bodies, possibly with marshy bottoms. Riverine systems are river or stream beds and channels (FGDC 2013).



Source: FEMA 2019b

Figure 2-5. Floodplains of the Maine Study Area



Source: USFWS 2018a

Figure 2-6. Wetlands in the Maine Study Area

Table 2-2. Wetlands in Maine Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine	Other
Cumberland	299,771	18,227	6,355	38,116	177,454	51,202	2,108	6,309	18,227
Hancock	602,191	36,126	14,396	91,746	384,586	66,141	3,396	5,800	36,126
Kennebec	129,001	0	11,619	54,793	0	49,086	2,126	11,377	0
Knox	505,858	17,004	2,797	16,786	460,364	6,605	902	1,400	17,004
Lincoln	201,291	12,899	7,907	31,020	132,479	11,178	1,597	4,211	12,899
Sagadahoc	94,394	13,396	2,875	10,808	59,981	1,102	832	5,400	13,396
Waldo	128,574	4,022	5,943	38,252	62,193	13,019	1,446	3,699	4,022
Washington	677,645	38,281	28,040	191,805	287,657	117,003	5,358	9,502	38,281
York	279,660	10,889	9,721	77,045	158,795	11,479	3,122	8,608	10,889
Study Area Total	**2,918,385**	**150,845**	**89,654**	**550,371**	**1,723,508**	**326,814**	**20,887**	**56,306**	**150,845**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

2.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods, because higher seas raise the launch pad for storm surge (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in Maine's coastal areas reflects the national trend for increasing population growth in coastal areas. The coast of Maine is home to the majority of the State's population, attracts millions of visitors each year, supports working waterfronts and marine businesses, and sustains Maine's tourism industry (University of Maine 2009). The socioeconomic impacts of this relationship are discussed in Chapter 2.4.

Although commonly referred to as a "rockbound coast," Maine has a dynamic coastline composed of diverse landforms, each of which respond to coastal pressures differently (Kelley et al. 1996, MSPO 1983, University of Maine 2009). Coastal landforms can be classified as soft, with bluffs, marshes, and sandy beaches; hard, with glacially smoothed rocks; or something in between, with boulders or a mix of materials (MSPO 1983, Kelley et al. 1996). Above the tidal zone, about 46% of the coast is comprised of bluffs formed from soft, loose sediment (University of Maine 2009). Table 2-3 provides estimates of aerial coverage for common coastal landforms exposed to regular tidal influences (University of Maine 2009, MSPO 1983).

Table 2-3. Coastal Landscapes of Maine

Landform	Examples	Percent Cover
Flats	Washovers, mud flats, sand flats, vegetated flats	50
Hardscape	Exposed bedrock	12
Beaches	Sand, mixed-grain, gravel, boulder	10
Marshes	Freshwater, brackish, saltmarsh, fluvial	10
Dunes	Sand dunes, ridges	2
Other	Channels, waterways, sand bars, deltas, fans, lobes, transitional slopes, ridges, man-made armor	16

Sources: University of Maine 2009, MSPO 1983

The geology of Maine's coastline can be categorized into four distinct sub-regions approximately corresponding to Saco Bay, Casco Bay, Penobscot Bay, and the northeast region around Cobscook Bay, each of which will response to sea level rise differently (CBEP 2014). The area around Saco Bay is characterized by curved bays with sandy beaches backed by marshes; the Casco Bay area is composed of indented embayments; the Penobscot Bay area is a complex of islands, peninsulas, and bays; and the Cobscook Bay area is described as eastern cliffs (CBEP 2014, MSPO 1983).

2.2.2.1 Sea Level Rise

Current rates and future predictions of sea level rise at the coast of Maine vary along the coast. Based on the tide gauge at Portland, Maine, sea level has been rising at a rate of approximately 1.8 + 0.1 millimeter/year (0.075 inch/year) since 1912 (CBEP 2014). Rates of sea level rise in Maine are projected to increase in the future. Climate Central has analyzed data at multiple water level stations in Maine and made projections of local sea level rise of 0.7 inches every 10 years (0.07 inch/year) and 10 inches of sea level rise by 2050 (~0.26 inch/year). As a result, the likelihood of a 100-year flood or worse by 2030 is

36% (Climate Central 2012). According to different calculations, sea level is rising one inch every 6 years (0.17 inch/year) (SeaLevelRise.org 2019). According to NOAA measurements of relative sea level trends using tide gauges throughout the US, the average linear relative mean sea level rate for the Study Area is 0.08 inches/year (NOAA 2019b).

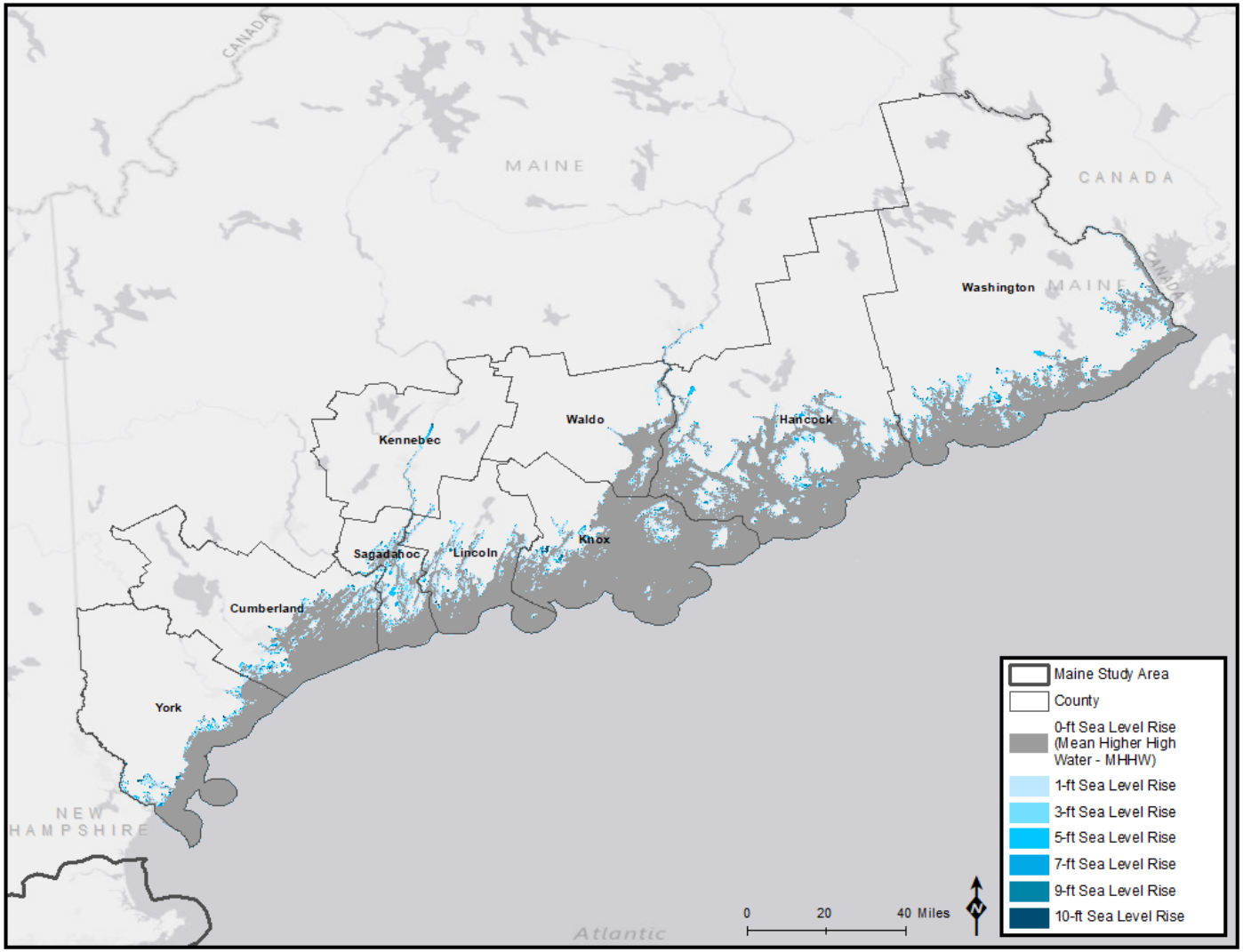
Figure 2-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in Maine primarily along the immediate coastline. Sea level rise of about 1 foot is also projected up the Piscataqua River, up the Penobscot River to Bangor, and up the Kennebec Rover to Gardiner and Augusta. Only small isolated areas are projected to experience sea level rise over 1 foot (NOAA 2018a). The sea level rise data depict the potential inundation of the coastal areas as a result of 0-10 foot rise in sea level above current mean higher high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. This projected rise does not take into account other potential factors that can influence sea level such as subsidence and hydrography changes.

Rising sea levels in Maine would most likely result in the inland migration of beaches, dunes, and tidal wetlands, coastline erosion, and saltwater intrusion (Kelley et al. 1996, Climate Central 2012). Even small amounts of sea level rise will make rare floods more common by adding to tides and storm surge (Climate Central 2012). Changes to coastal habitats will negatively impact commercial fishing, shellfishing, and outdoor recreation, which contribute millions of dollars to Maine's economy (CBEP 2014).

Beaches, including their sand dunes, naturally undergo dynamic processes in response to coastal hazards that involve landward movement and subsequent accretion; thereby, protecting inland areas. However, because beaches also experience some of the most intense development pressure, they are commonly altered to the point of being unable to provide this protection. The response of beaches to sea level rise depends on the relationship of the sedimentation rate to the rate of sea level rise; and also whether or not the beach or dune has the ability to migrate inland (University of Maine 2009). The State of Maine is addressing the threat of sea level rise through the Natural Resources Protection Act's Sand Dune Rules and shoreland zoning program. These rules anticipate future shoreline changes from a 2-foot rise in sea level by 2100, regulating new construction and replacement of damaged structures in coastal settings (University of Maine 2009, Kelley et al. 1996).

Even small changes in sea level can change the pattern and frequency of tidal flooding, resulting in major changes in the type and extent of tidal flats and salt marshes (University of Maine 2009). As a described previously, flats and marshes make up more than 50% of coastal Maine (MSPO 1983). Tidal wetlands serve as flood storage, flood and storm surge protection, erosion control, and wildlife habitat (CBEP 2014). Changes to these important habitats from sea level rise would impact food sources for shorebirds that visit on their annual migration and drown commercially important shellfish habitat. Eventually, salt marshes can expand into previously freshwater marshes, killing salt-intolerant plants and thereby hastening land loss (University of Maine 2009).

Although sea level rise is not the primary cause of saltwater intrusion, it will increase the occurrence and exacerbate the impacts of saltwater intrusion. Saltwater intrusion contaminates residential drinking water wells drilled into fractured bedrock aquifers, can eventually ruin wells, and affects soils and ground water (Kelley et al. 1996, University of Maine 2009).



Source: NOAA 2018a

Figure 2-7. Projected Sea Level Rise throughout the Maine Study Area

Shoreline erosion is variable along the coast of Maine because erosion rates are highly dependent on the type of coastal landform. Hard shores generally erode slowly, while soft shorelines erode more quickly. Even among different bluff regions, erosion rates range from stable to moderately eroding to rapidly eroding, depending on exposure to storm waves and varying cycles of erosion and stability (Kelley et al. 1996). As a result, bluffs will continue to erode and move landward in response to sea level rise. Analysis of the distribution of coastal bluffs, the severity of erosion, and the extent of shoreline engineering along the coast, indicates that at least 40% of Maine's coast is vulnerable to increased erosion at higher sea levels (University of Maine 2009). Based on the vulnerability of different coastal landforms in Maine, the most vulnerable coastal areas are characterized by sand beaches, unstable bluffs, and flats (MCP 2015). Table 2-4 shows the relative vulnerability to sea level rise of different landform types in Maine as determined by the Main Coastal Program (MCP 2015).

Table 2-4. Vulnerability to Sea Level Rise of Different Landform Types

Vulnerability to Sea Level Rise	Landform Type	Miles	Percent (%)
Very Low	Rocky, Armored	1827	34
Low	Coarse Beaches	355	7
Moderate	Stable Bluffs	942	17
High	Sand Beaches and Dunes, Unstable Bluffs	617	11
Very High	Flats, Highly Unstable Bluffs	1667	31
Total Shoreline		**5408**	**100**

Source: MCP 2015

2.2.2.2 Storm Surge

Storm surges from coastal storms increase the impacts of sea level rise. The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b). Higher sea levels create a higher launching point for storm surge, increasing the frequency of what were 100-year storm surges. Just a few inches of sea level rise allows storms to push more water onto the land, even if the storm remains offshore (SeaLevelRise.org 2019).

Although hurricanes are only considered to be a moderate risk to the coast of Maine, the Study Area is at high risk to experience wintertime storms called nor'easters; these storm systems are described in greater detail in Chapter 1.4.2.2 (MCP 2015). The primary threat to the coast of Maine from nor'easters is erosion from storm waves (MSPO 1983). Coastal storms are most destructive when they persist over time and multiple high tides (Delaware DNREC 2019d, MSPO 1983). When nor'easter surges are combined with an increased gravitational pull from the moon, high tide levels can be 2 feet higher than normal high tides along the coast of Maine (MSPO 1983, SeaLevelRise.org 2019). When hurricanes do impact the coast of Maine, damage comes primarily from high winds and storm surges, which can be 2 or more feet higher than those generated by the strongest nor'easter and cause severe coastal flooding (MSPO 1983).

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Figure 2-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. Storm surge is projected to impact areas in Maine similar to those affected by sea level rise, mostly to the south in York and Cumberland Counties. Significant storm surges of up to 20 feet are predicted along the protected shoreline of the Wells National Estuarine Research Reserve, York Harbor, the Nonesuch River delta, rivers, and bays (NOAA 2020a).

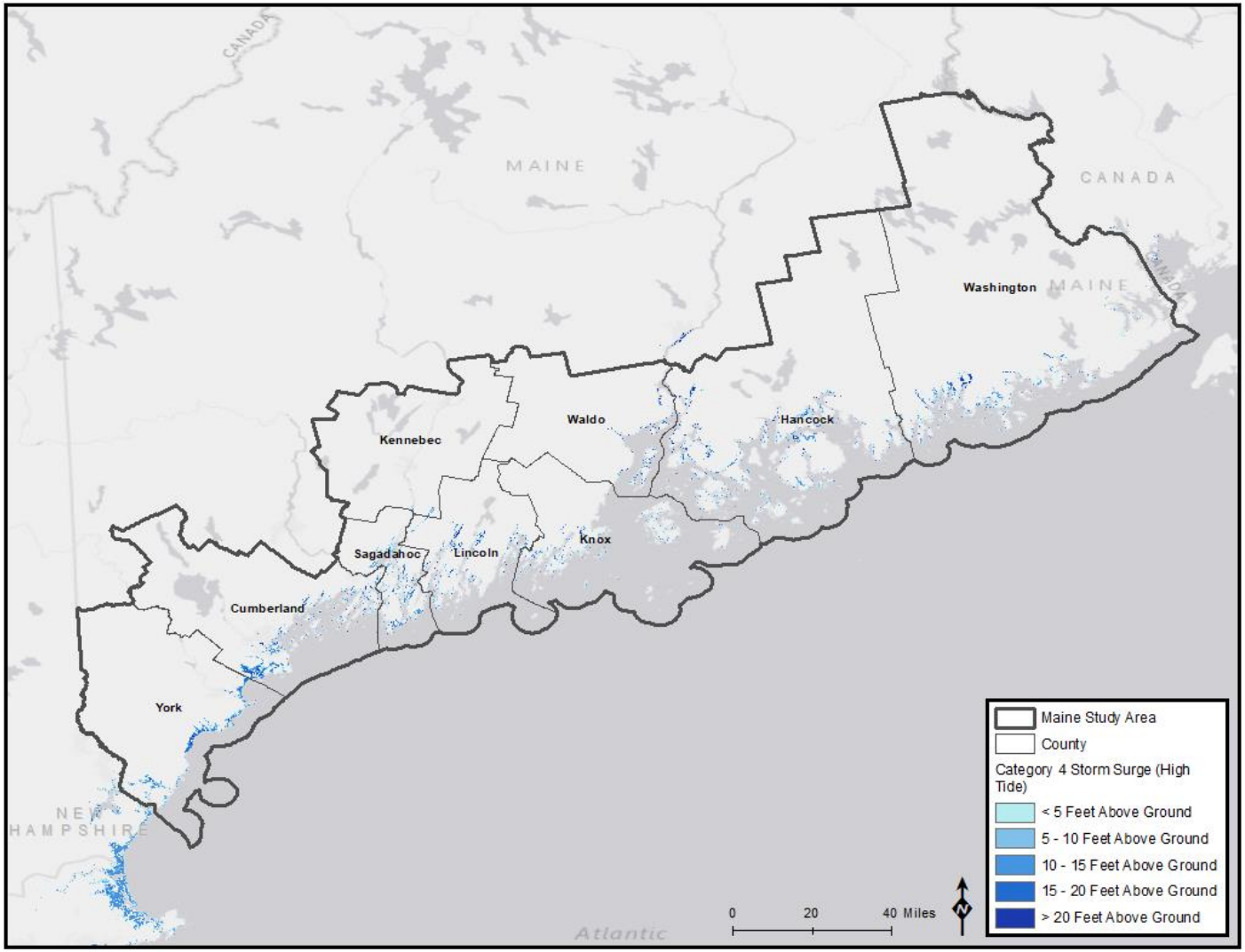
2.2.3 Summary – Physical Characteristics

The physical characteristics of Maine, in particular the location of major rivers and the shape of the shoreline, have influenced where cities and towns as well as natural areas have been established. Rivers and bays in Maine provide a vital food source and transportation route, making them prime focal areas for cities. The topography of the Gulf of Maine and its accessibility to both the U.S. and Canada heavily influences transportation and as a result also influences land use, population characteristics, and maritime employment. Future projects located within and around the Gulf of Maine will need to take into account current regulatory requirements associated with construction (in-water work, runoff, etc.) and any operational discharge. The physical characteristics of the Study Area could influence the proposed location of future Atlantic Region OCS-related projects.

Natural resources in the Study Area, which are protected by certain regulations and laws, include water resources, wetlands, floodplains, and critical habitat for the Atlantic sturgeon, Atlantic salmon, and North Atlantic right whale. These natural resources are prevalent across the Study Area and are factors that should be considered during evaluation of potential future projects in the Atlantic OCS planning area.

The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Sea level rise is projected to impact areas in Maine primarily along the immediate coastline. Sea level rise of about 1 foot is also projected up the Piscataqua River, up the Penobscot River to Bangor, and up the Kennebec Rover to Gardiner and Augusta. Combined with the effects of sea level rise, storm surge would push farther inland in the future. Storm surge is projected to impact areas in Maine similar to those affected by sea level rise, mostly to the south in York and Cumberland Counties. Significant storm surges of up to 20 feet are predicted along the protected shoreline of the Wells National Estuarine Research Reserve, York Harbor, the Nonesuch River delta, rivers, and bays (NOAA 2020a). Storm surges are particularly damaging when they occur from nor'easters during natural high lunar tide cycles in winter. Developers of potential future OCS-related activities within these areas will need to be cognizant of the projected changes in sea level and storm surge. Potential future projects could exacerbate impacts if built in areas projected to experience sea level rise and increased storm surge if these expected changes are not taken into account during the planning and design process. Early consideration of projected future changes is beneficial to the project as well to avoid potential future expenditures for costly repairs or relocations should sea level rise and/or storm surge affect project facilities and/or equipment.

In summary, physical characteristics of the Study Area influence land use and land cover, demographics, and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.



Source: NOAA 2020a

Figure 2-8. Projected Storm Surge throughout the Maine Study Area for a Category 4 Hurricane

2.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

2.3.1 Land Cover

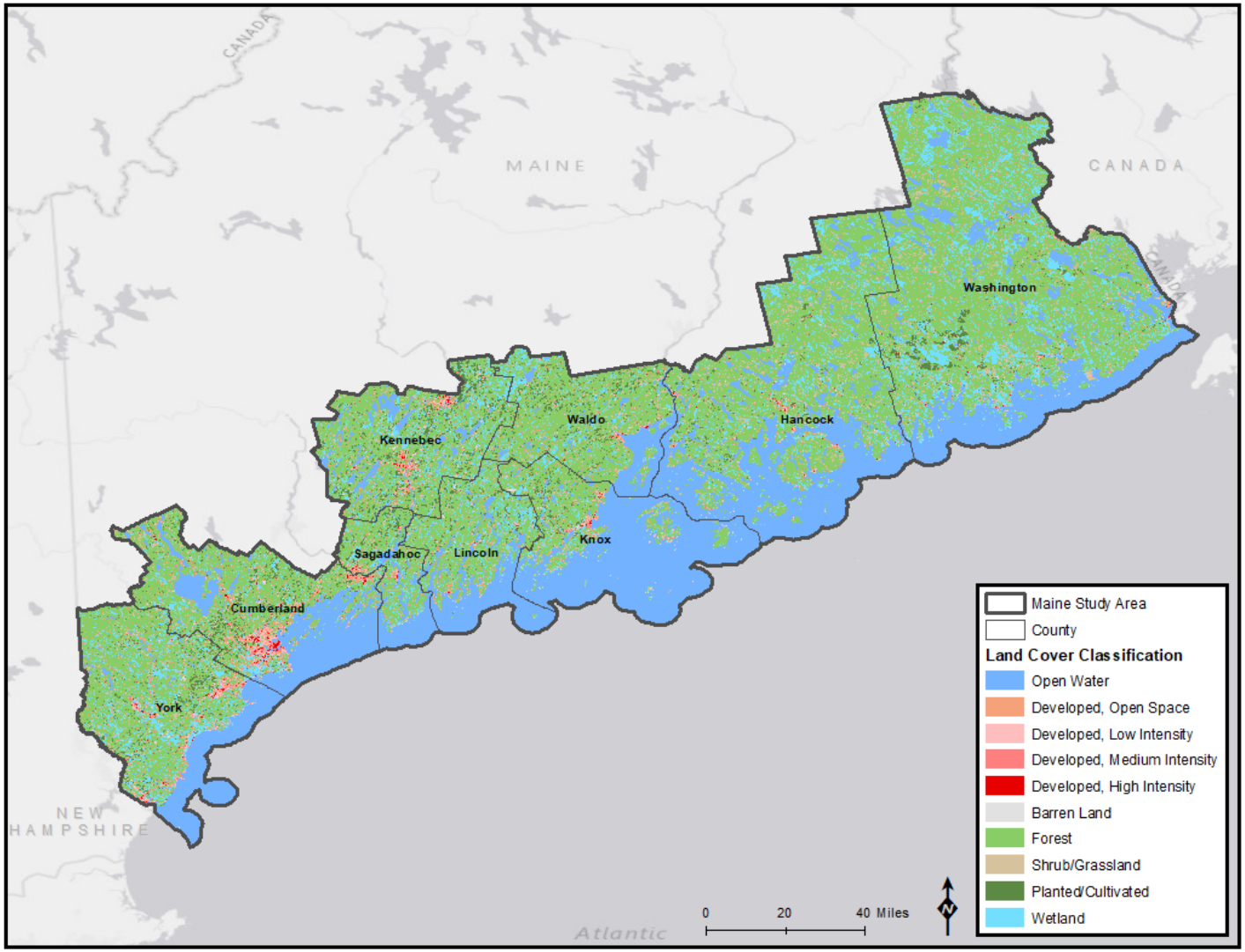
Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available.

Figure 2-9 displays the NLCD data for the Study Area. Table 2-5 presents the NLCD data for each county within the Study Area by acreage. With the exception of open water land cover (e.g., rivers, lakes, ponds, ocean), Table 2-6 presents the same NLCD data by percentage and overall land cover for each county (NLCD 2016a). Although the Study Area has hundreds of lakes and ponds (see Chapter 2.2.1), open water land cover was excluded from Table 2-6 because this land cover would not be considered for future industrial development. The following section discusses the key findings of this analysis.

As shown in Table 2-6, the primary land cover of all nine counties in the Study Area is forest. When open water is not accounted for, forest lands makes up approximately 68% of the land cover in the Study Area. The second most predominant land cover is wetlands at approximately 15% of the Study Area.

The total developed land cover in the Study Area is 7.3%. Cumberland County has the highest percent of developed area (17%). The most developed regions in Cumberland County correspond to the city of Portland and surrounding suburbs, and the city of Brunswick. Of the 17% of developed land in Cumberland County, 13.8% is comprised of open space or low intensity development, indicating there may be potential for future growth in these regions. York County has the second highest developed land cover (11.2%), concentrated around the cities of Biddeford, Saco, and Sanford, and the Rachael Carson NWR along the coast. Washington County has the least developed landcover at 3.6%.

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once. In Maine, 4.8% of the land cover in the Study Area changed at least once. Figure 2-10 and Table 2-7 show the land cover change within the Study Area from 2001 to 2016. Washington County experienced the most significant land cover change at 6.8% closely followed by Hancock County at 6.4%. Most of the change is from or to one of the three forest classes. These changes in forest cover could be related to changes in suburban areas. Knox County experienced the least land cover change at 1.8%. Most of this change was also from or to one of the forest classes.



Source: NLCD 2016a

Figure 2-9. National Land Cover in the Maine Study Area

Table 2-5. Acres of Land Cover by NLCD Classifications in Maine Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Cumberland	779,165	44,368	29,365	11,793	5,659	91,186	2,860	330,768	15,546	35,905	60,105	242,795
Hancock	1,500,742	18,974	16,607	5,465	1,226	42,273	5,428	761,895	58,719	14,961	134,586	482,880
Kennebec	608,752	27,181	17,473	6,337	2,225	53,216	2,450	345,612	15,525	58,031	78,407	55,511
Knox	732,097	11,981	7,644	2,253	729	22,607	4,240	153,992	11,308	13,997	30,429	495,525
Lincoln	447,742	15,891	4,254	993	228	21,366	2,207	197,138	8,622	14,522	49,912	153,974
Sagadahoc	236,815	10,560	4,236	1,410	394	16,600	1,001	108,633	4,921	10,493	23,447	71,720
Waldo	545,765	15,768	7,707	2,012	539	26,026	1,843	332,697	19,358	30,939	56,813	78,089
Washington	2,084,653	42,372	12,617	3,824	739	59,552	4,740	1,158,164	80,588	35,573	310,020	436,015
York	812,585	36,861	23,490	8,242	2,772	71,364	4,190	394,213	20,177	33,342	112,015	177,284
Study Area Total	**7,748,314**	**223,956**	**123,394**	**42,329**	**14,511**	**404,190**	**28,960**	**3,783,112**	**234,763**	**247,763**	**855,733**	**2,193,793**

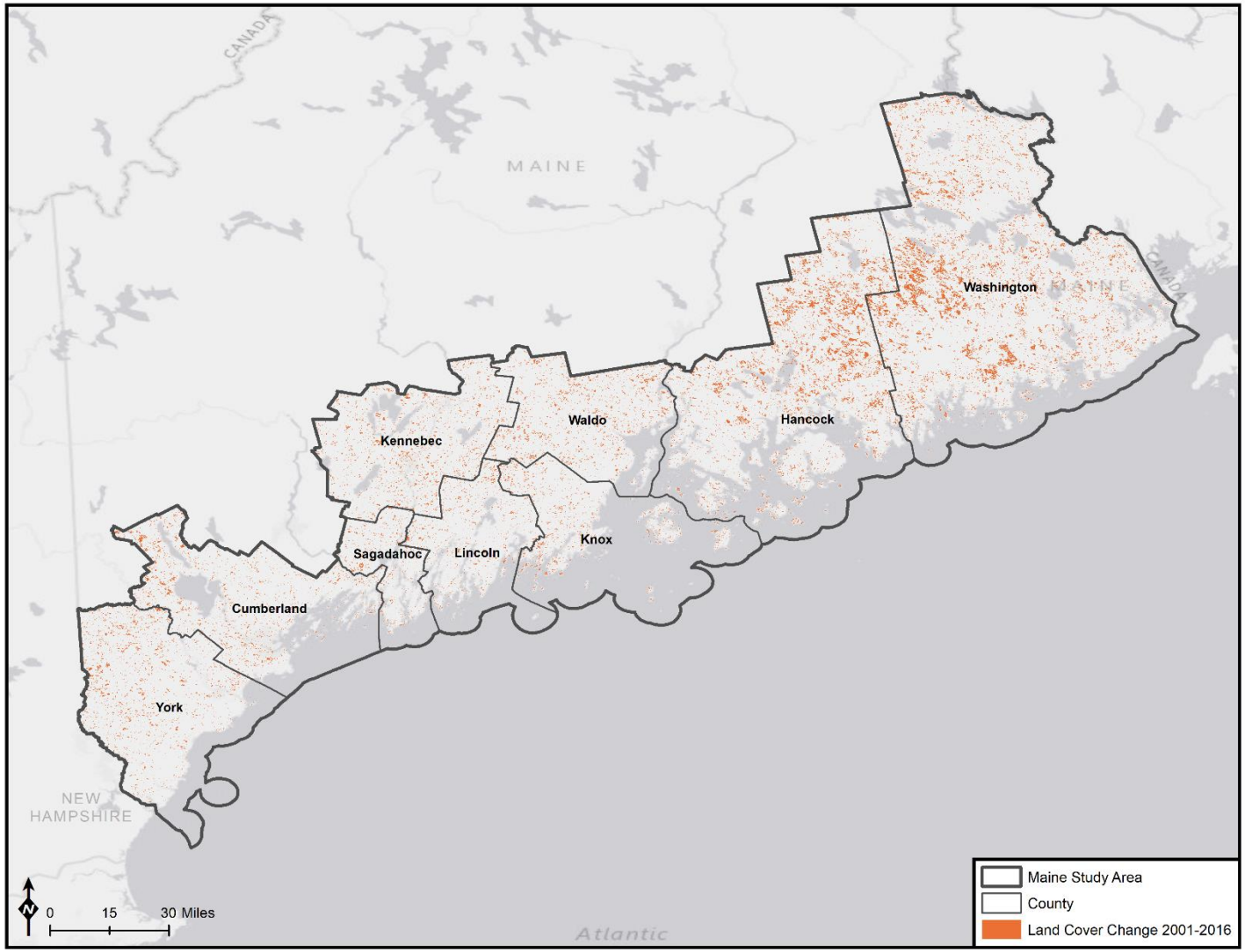
Source: NLCD 2016a

Table 2-6. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Maine Study Area (Excluding Open Waters)

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Percent Pre-dominant Land Cover Type(s)
Cumberland	8.3	5.5	2.2	1.1	17.0	0.5	61.7	2.9	6.7	11.2	Forest
Hancock	1.9	1.6	0.5	0.1	4.2	0.5	74.9	5.8	1.5	13.2	Forest
Kennebec	4.9	3.2	1.1	0.4	9.6	0.4	62.5	2.8	10.5	14.2	Forest
Knox	5.1	3.2	1.0	0.3	9.6	1.8	65.1	4.8	5.9	12.9	Forest
Lincoln	5.4	1.4	0.3	0.1	7.3	0.8	67.1	2.9	4.9	17.0	Forest
Sagadahoc	6.4	2.6	0.9	0.2	10.1	0.6	65.8	3.0	6.4	14.2	Forest
Waldo	3.4	1.6	0.4	0.1	5.6	0.4	71.1	4.1	6.6	12.1	Forest
Washington	2.6	0.8	0.2	0.0	3.6	0.3	70.2	4.9	2.2	18.8	Forest
York	5.8	3.7	1.3	0.4	11.2	0.7	62.1	3.2	5.2	17.6	Forest
Study Area Total	**4.0**	**2.2**	**0.8**	**0.3**	**7.3**	**0.5**	**68.1**	**4.2**	**4.5**	**15.4**	Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2001-2016

Figure 2-10. Land Cover Change in the Maine Study Area

Table 2-7. Land Cover Change within the Maine Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Cumberland	779,176	24,831	3.2
Hancock	1,500,755	96,183	6.4
Kennebec	608,752	25,733	4.2
Knox	732,124	13,413	1.8
Lincoln	447,752	11,492	2.6
Sagadahoc	236,819	6,802	2.9
Waldo	545,765	25,408	4.7
Washington	2,084,910	140,871	6.8
York	812,615	26,718	3.3
Study Area Total	**7,748,668**	**371,452**	**4.8**

Source: NLCD 2001-2006

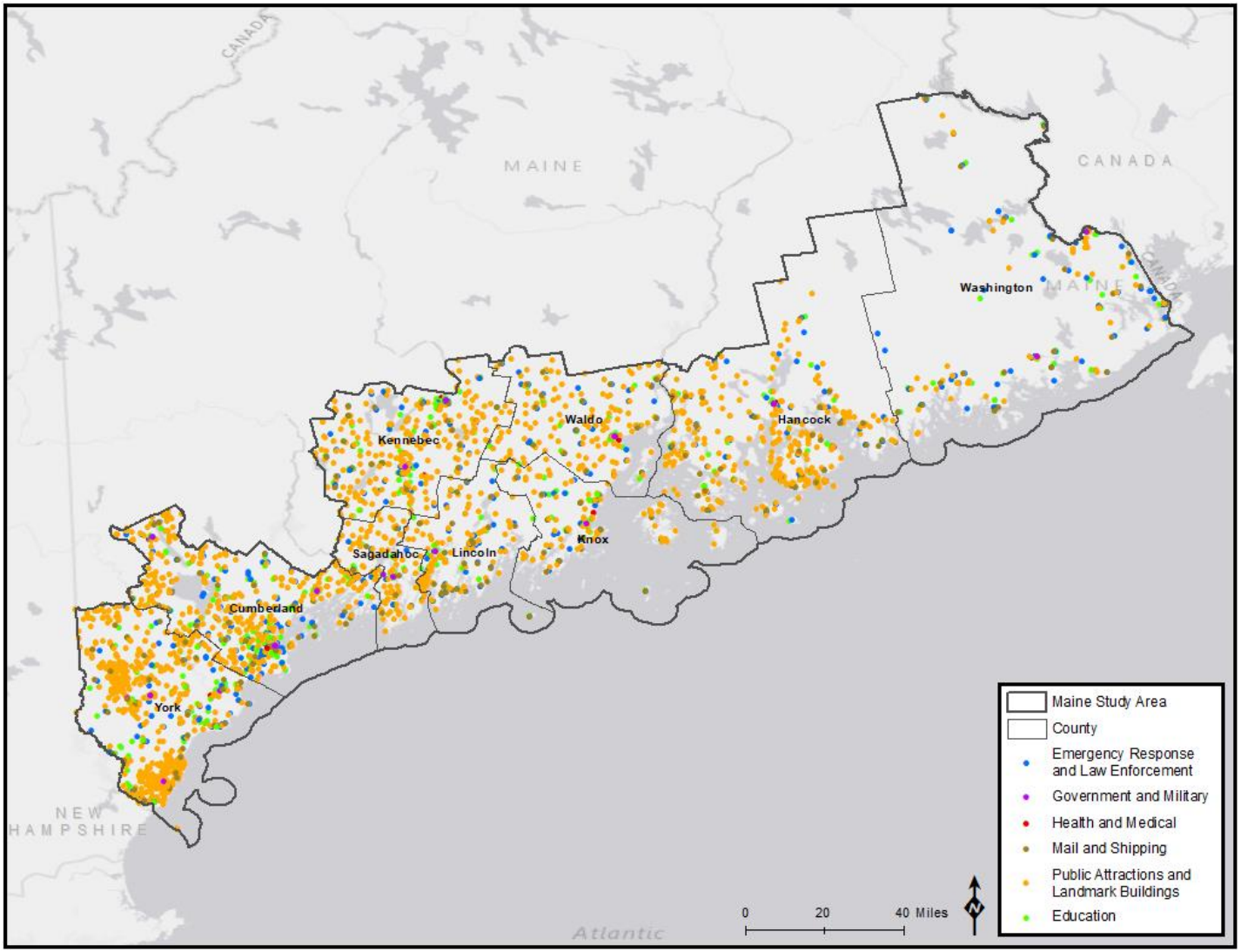
It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. These counties would be the most suitable to accommodate future industrial coastal projects while the counties in the northern region would be least suitable. It is also important to note that there are hundreds of acres of lakes, ponds, and wetlands throughout the Study Area that may concentrate and reduce uncontrolled urban development.

2.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.

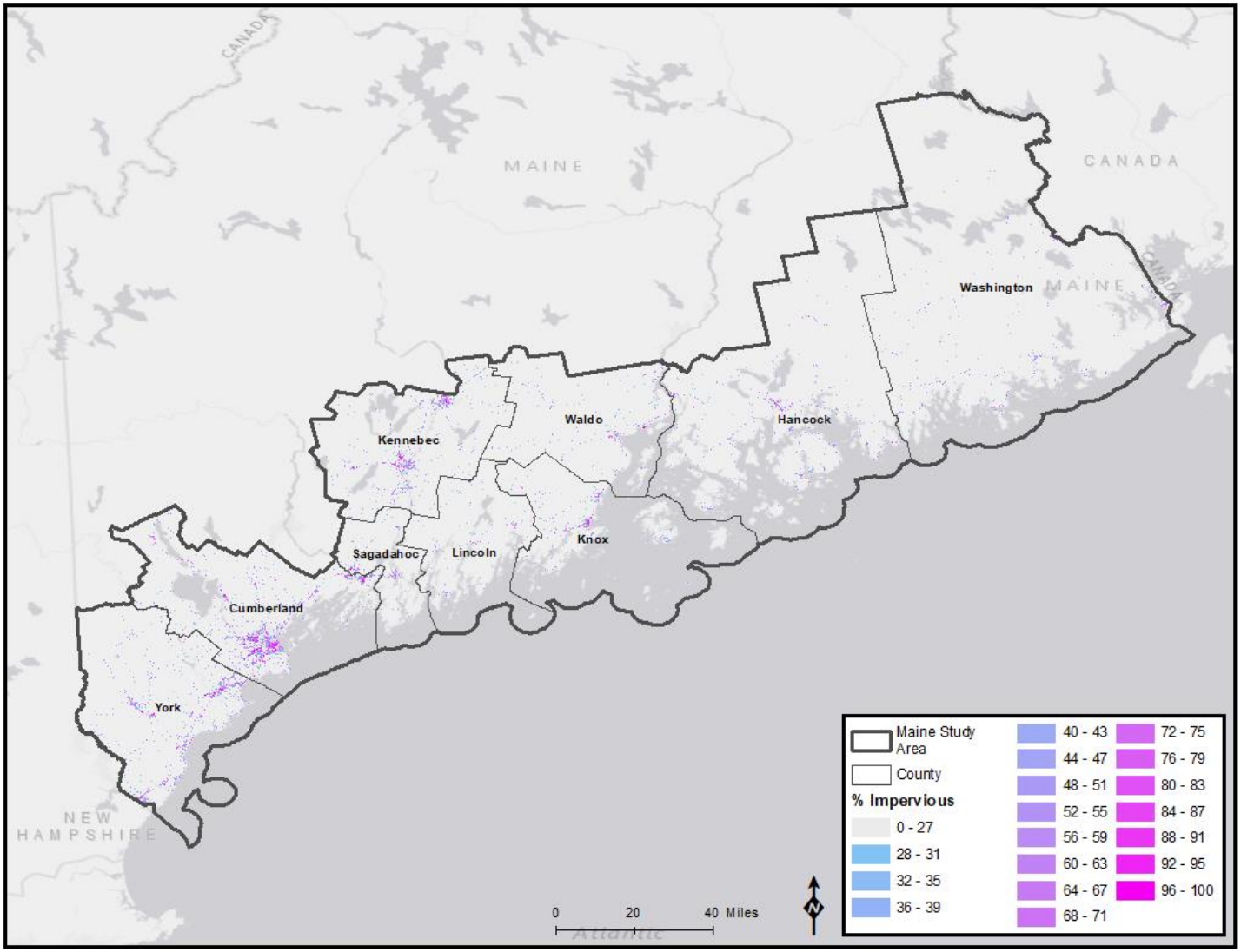
2.3.2.1 Existing and Future Land Use

The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. In this section, land cover data are enhanced by the application of more detailed ground-based information. Figure 2-11 presents existing land uses at the broad scale of the Study Area (USGS 2017). Figure 2-12 shows impervious areas across the Study Area (NLCD 2016b). These figures show the relationship between land cover analysis, which identified developed areas in Chapter 2.3.1, and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 2-11. Select Existing Land Uses within the Maine Study Area



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Source: NLCD 2016b

Figure 2-12. Impervious Surfaces within the Maine Study Area

As determined in the land cover analysis in Chapter 2.3.1, most of the land cover in the Study Area is forest (68.1%). The land use map in Figure 2-11 indicates that public attractions and landmark buildings make up a large portion of developed land use in the Study Area. Impervious surfaces shown in Figure 2-12 are highly correlated with urban development and major transportation corridors shown in Figure 2-18 in Chapter 2.3.2.8. It is important to note that the public attractions and landmark buildings do not have a strong correlation with impervious surfaces because most of the public attractions in the Study Area are the State and local park, lakes, and nature trails. These recreational attractions are discussed further in Chapter 2.3.2.7. Many of the public attractions and landmark buildings noted in Figure 2-11 are in the southern portion of the Study Area, with only a few urban land uses in Washington County. Many of the land uses identified in Hancock County are in the southern region of the county and within the vicinity of Acadia National Park on Mount Desert Island.

Overall, the existing land use maps for the Study Area indicate that (1) impervious surfaces are associated with urban land use and transportation corridors, (2) public attractions and landmark buildings are not exclusively associated with urban land use or impervious surfaces, and (3) there are higher concentrations of public attractions and landmark buildings in the southern region of the Study Area as compared to the northern region.

Municipal governments (cities and towns) in Maine control zoning and permitting rather than county governments. Each municipality within the Study Area has developed a comprehensive plan regarding future development activities within their specific boundaries. Typically, these planning documents cover a range of five to ten or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Appendix B includes links to relevant planning documents.

Outside of municipalities, it is the Maine Land Use Planning Commission that authorizes zoning and planning in unorganized territories including townships, towns, and plantations (DACF 2013c). Townships have no form of local government and, therefore, receive funded services from the State which would normally be provided by local governments. Towns and plantations under the jurisdiction of the Maine Land Use Planning Commission have chosen not to administer land use controls to the local level. Within the Study Area, there are single plantations or townships within Knox, Lincoln, Sagadahoc, and Kennebec counties; however, a large portion of Washington and Handcock Counties in the northern part of the Study Area are under the authority of the Maine Land Use Planning Commission. The Maine Land Use Planning Commission also prepares a Comprehensive Land Use Plan for areas within their jurisdiction that is periodically revised. This document describes, among other things, the purpose and goals of the Commission, their jurisdictions, land use standards, regulatory approach (e.g., policies and regulations for development), and land ownership and development data and trends (Maine Land Use Regulation Commission 2010).

Comprehensive and preservation plans are also developed for Maine's State parks, public lands, and cultural and historical resources. Maine has 15-year Management Plans for State Parks and Public Lands which are under the authority of the Bureau of Parks and Lands in Maine's Department of Agriculture, Conservation, and Forestry. The Historic Preservation Commission develops 5-year statewide Historic Preservation Plans that identifies short- and long-term goals for the preservation of Maine's cultural and historic resources.

Future Project Developers of onshore components associated with OCS-related activities should consult the comprehensive plan (or equivalent) of the particular municipality within which they are interested in developing a new project. They should also consult statewide comprehensive plans and associated State laws and regulations that may be applicable to the proposed activities. Municipalities and regulating State agencies will be more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents will assist the Project Developers in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

Maine is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. Massachusetts' Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 32 Opportunity Zones in the State, several of which are located in the Study Area. A map of opportunity zones is located at https://www.maine.gov/decd/business-development/opportunity-zones (ME DECD 2018).

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). Counties and municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

It is important to note that the preservation of natural resources is a priority for the State of Maine. Therefore, Maine has several laws that need to be considered prior to future land development. The Site Law that requires review of development projects that may have a substantial effect on the environment, including projects occupying more than 20 acres, large structures and subdivisions, and oil terminal facilities. The Natural Resources Protection Act is a law focused on the protection of natural resources when activities (e.g., dredging, bulldozing, removing or displacing soil, sand, vegetation) will be located in, on, or over any protected resource, or located adjacent to specific types of protected natural resources. The Mandatory Shoreland Zoning Act pertains to shoreline zoning regulations that are meant to prevent pollution and protect shoreline natural resources.

2.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would

be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

2.3.2.3 Industrial Incentives

Maine has several business opportunities, reimbursements, and tax credits that promote business growth while also protecting and enhancing Maine jobs. The State currently has several ways in which businesses can recoup tax money through investment in material, capital, and human resources in Maine, as well as several income tax credits. These credits apply against the State of Maine income tax and are separate from Federal income tax credits (MRS 2018a).

The State of Maine has several financial programs that allow businesses to recoup State taxes. Starting in 2017, the Major Business Headquarters Expansion Program encourages the location and expansion of major business headquarters in the State of Maine, and to promote the recruitment and training of employees for these facilities. The benefit is a credit against the tax due for the taxable year in an amount equal to 2% of the certified applicant's qualified investment for a period up to 20 years (ME DECD 2019a).

The Business Equipment Tax Exemption Program, enacted in 2008, allows businesses to eliminate personal property tax on eligible property (ME DECD 2019b).

Maine's Department of Economic and Community Development offers financial, practical, and technical assistance for corporations looking to establish new, expand existing, or relocate businesses in the State. The available programs include those listed below.

- *Employment Tax Increment Financing Program*: This program encourages Maine businesses to hire new employees. The program will refund a portion of the State withholding taxes that business pay over a period up to 10 years if the company hires five or more new employees over a period of 2 years. The amount of the reimbursement varies based on the level of local unemployment. Those companies located in the Pine Tree Development Zone are eligible for the highest reimbursement rate (ME DECD 2019c).
- *Pine Tree Development Zone Tax Credit*: This credit is available for select industry sectors including biotechnology, aquaculture and marine technology, composite materials technology, environmental technology, advanced technologies for forestry and agriculture, manufacturing and precision manufacturing, information technology, and financial services. Building on the Employment Tax Increment Financing Program, the Pine Tree Development Zone Tax Credit is another opportunity to reduce State taxes for a period of up to 10 years when the eligible business creates, or moves new, quality jobs into the State (ME DECD 2019c, ME DECD 2019d).
- *Major Business Headquarters Expansion Program*: This program encourages companies to create or expand corporate headquarters within the State and create new, permanent job and job training opportunities. Businesses that qualify for this program receive a tax credit based on a percentage of their investment for a period of up to 20 years providing certain job creation and retention measures are met (ME DECD 2019a, ME DECD 2019c).
- *Business Equipment Tax Exemption Program*: This program offers a 100% property tax exemption on eligible property such as repair and replacement parts, replacement equipment, and additions, accessions, and accessories to certain business property and inventory parts (ME DECD 2019b, ME DECD 2019c, MRS 2018b).

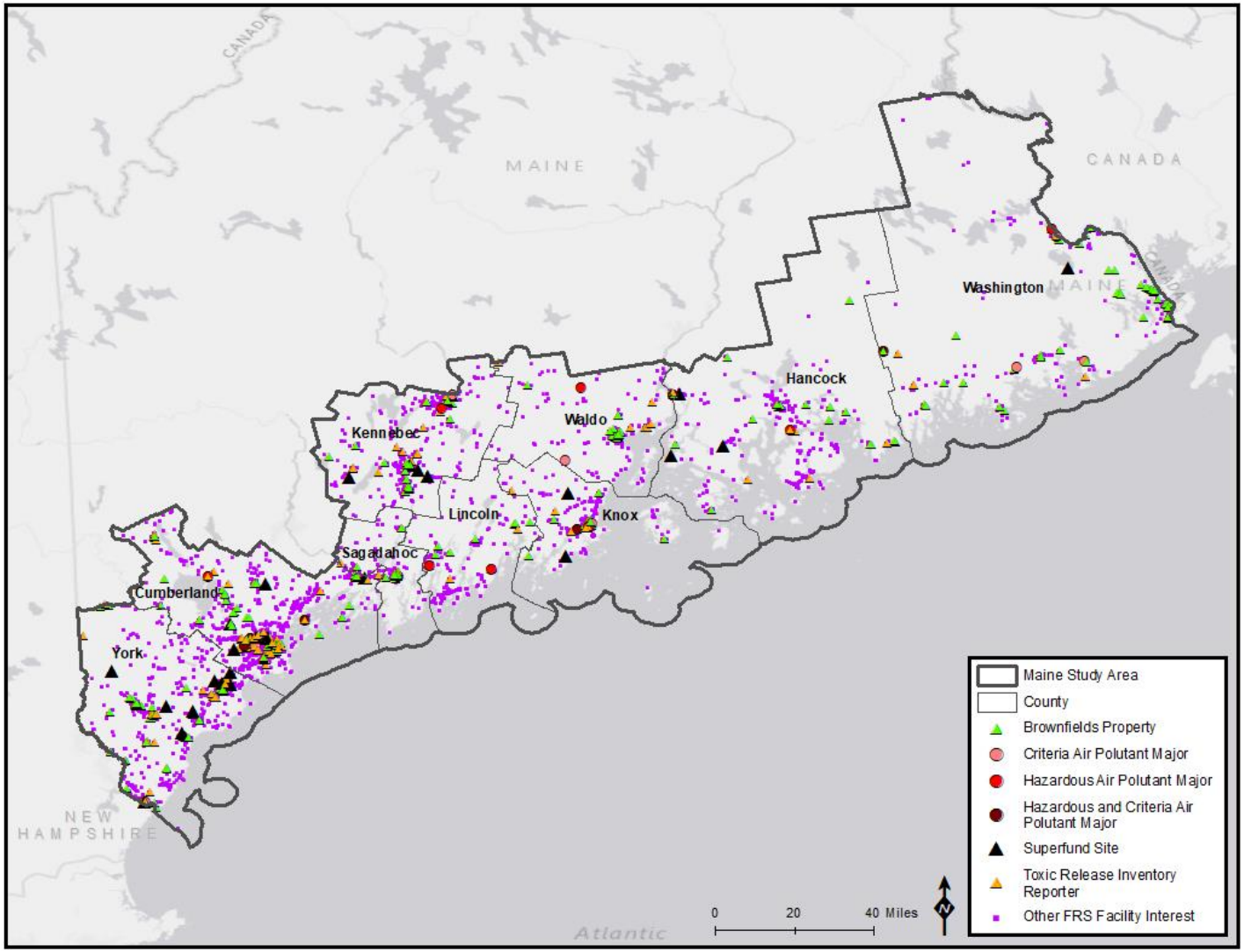
- *Finance Authority of Maine*: This is an independent organization with the goal of fostering economic development in the State. The organization offers businesses a variety of programs including loans (some of which are for job creation or the revitalization of certain commercial spaces) (FAME 2020), commercial loan insurance, commercial bonds for manufacturers, and the Maine New Markets Capital Investment Program (for investment in low-income communities) and Maine Seed Capital Tax Credit Program (for investment in small businesses) (FAME 2020).
- *Jobs and Investment Tax Credit* (36 M.R.S.A. 5215): This credit is available when employers invest $5 million in eligible properties and create a minimum of 100 new jobs. For qualified investors, the credit roughly equals 10% of the taxpayer's investment and is limited to tax liability of $500,000 (MRS 2018a).

2.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 2-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility that emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environment Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility:* Registry includes the facilities described in Chapter 1.5.2.4.

There is a variety of industry present in the Study Area. According to the USCB 2016 Business Patterns in Maine, the top four industries based on the number of jobs provided in the Study Area are 1) healthcare; 2) retail; 3) accommodation and food services; and 4) manufacturing (USCB 2016). Healthcare and Retail are the largest employment industries in Maine, employing 30.8% of Maine's workforce in 2015 according to the Maine Department of Labor's Center for Workforce Research and Information (USCB 2016). Chapter 2.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 2-13. USEPA Facility Register Service Record for the Maine Study Area

2.3.2.5 Protected Areas

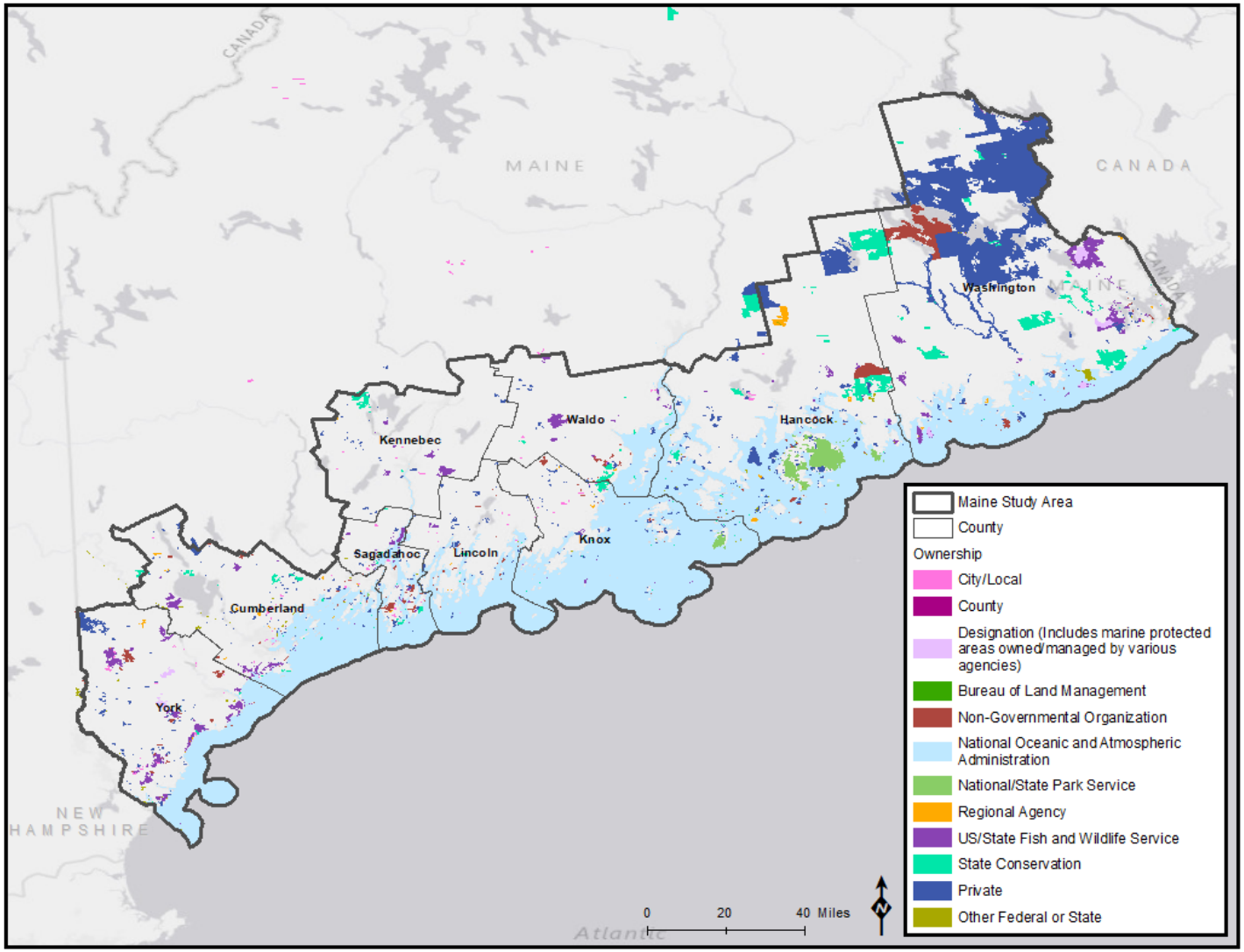
The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 2-14 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

Protected lands in the Study Area include those owned and/or managed by the Federal Government, State, non-government agencies, or private individuals. These protected lands include Acadia National Park, NWRs, wildlife management areas, wildlife preserves, sanctuaries, State parks, wetlands, ponds, lakes, beaches, conservation easements, conservation areas, and hundreds of islands.

Washington County has a significant amount of protected lands. This is primarily because of the Downeast Lakes Land Trust, which has acquired over 370,000 acres of forest and wetlands for conservation purposes, including the 55,678 acre Downeast Lakes Community Forest (DLLT 2019). Adjacent to the Downeast Lakes Land Trust, in Hancock County, are two large preservation areas. The 27,000-acre Duck Lake Public Reserved Land is managed by the State (NRCM 2016), and the 21,000 acres of land surrounding Nicatous Lake is managed by a statewide land trust (Forest Society of Maine, 2019). Acadia National Park is also located in Hancock County on Mount Desert Island.

Large parcels of protected land in Waldo County include the 5,240-acre Frye Mountain State Game Management Area (DIFW 2019) and the 1,114-acre Ducktrap River Preserve (NRCM 2017). Camden Hill State Park is a 5,710-acre public recreation area crossing Waldo and Knox Counties. There are also several other large wildlife management areas that are protected lands throughout the central region of the Study Area.

The protected area on the southern shore of Cumberland County is Scarborough Marsh, a 3,100-acre wildlife management area owned and managed by the Maine Department of Inland Fisheries and Wildlife (Maine Audubon 2019). Along the coast of York County, there are several notable protected areas. The Rachael Carson Wildlife Refuge spans approximately 50 miles of shoreline over several fragments of land in York County and is projected to occupy approximately 14,600 acres of land once land acquisition is complete (USFWS 2020c). The Wells National Estuarine Research Reserve is adjacent to the Rachel Carson Wildlife Refuge and occupies approximately 2,250 acres of coastal habitats (Wells Reserve at Laudholm 2019a). Inland, protected areas in York County include the 3,280-acre Mount Agamenticus Wildlife Management Area (Maine IFW 2019), the 6,700-acre Great Works Regional Land Trust in southern York County (Great Works Regional Land Trust 2019), and the 8,600-acre Leavitt Plantation Forest, in western York County.



Source: USGS 2019f

Figure 2-14. Protected Areas within the Maine Study Area

Overall, the most developed areas in the Study Area are the southern counties of York and Cumberland. The coast of York and Cumberland Counties has notable areas of protected lands, primarily because of the Rachael Carson Wildlife Refuge, but there is still potential for future growth if laws and regulations like the Natural Resources Protection Act and Mandatory Shoreland Zoning Act (discussed in Chapter 2.3.2) are followed. Therefore, future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

2.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 16 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Maine, resided in the area long before the era of European exploration as hunters and gatherers. The Indians in the region gathered near what is now Mount Desert Island and Bar Harbor in Hancock County. Later, these early inhabitants became more involved with agriculture, ceramics, expanding trade networks, exploring marine and coastal resources, and more permanent settlements on the coast and islands (Maine Historical Society 2010c). The Wabanaki were a confederacy of tribes including Abenaki, Maliseet, Mi'kmaq, Passamaquoddy, and Penobscot Nations. Tribal groups were at least partially nomadic moving seasonally, and based on food availability, between the coast to inland areas. South of the Penobscot River, some Maine tribes practiced agriculture. However, the short growing season and poor soil limited extensive agriculture and most tribes thrived on the abundant wild food and resources in the area (Penobscot Marine Museum 2019a).

The first recorded European explorer in Maine was Giovanni da Verrazano in 1524; however, he did not establish a settlement. It was not until 1604 that Frenchmen Pierre du Guast and Samuel de Champlain established the first settlement on St. Croix Island (Washington County) and founded a colony called Acadia (Nelson 2020i). By 1652, the land became part of the Massachusetts Bay Colony of England and remained as such until 1820. Initially the Maine tribes had friendly engagements with European settlers (Dutch, English, and French) and members of Maine tribes helped the Plymouth Pilgrims. However, by the late 1600s, as was common with most relationships between the European settlers and contact with American Indian tribes, conflicts over land and resources arose (Maine An Encyclopedia 2019a).

During the American Revolutionary War (1775-1783), the Penobscots, the Passamaquoddies, and the Malecite tribe, were involved with both the British and American troops during the Revolutionary War. At the beginning of the Revolutionary War, Maine was caught between the English forces in Nova Scotia and the American revolutionaries in Massachusetts, as Maine was still part of Massachusetts during the American Revolutionary War. The first naval battle of the American Revolutionary War was fought in the port of Machias (Washington County) on June 11-12, 1775. This was known as the Battle of Machias, or the Battle of the Margaretta (Nelson 2020i). The Burning of Falmouth (formerly Massachusetts and now the city of Portland, Maine) on October 18, 1775, was another prominent naval battle in Maine. Much of eastern Maine was occupied by, and under the control of, the British until the war ended in 1783 (Penobscot Marine Museum 2019b).

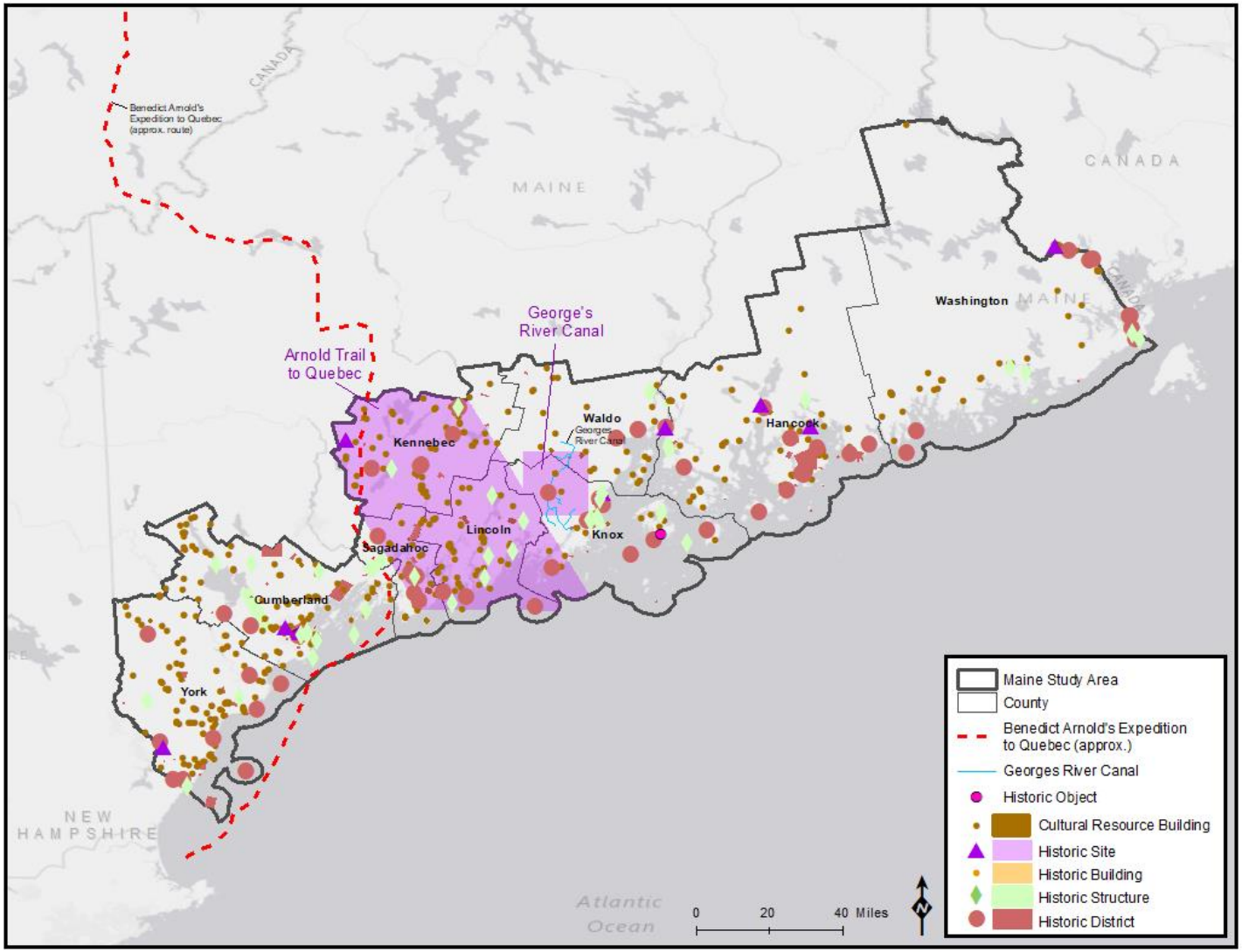
After the Revolutionary War, in the late 1700s and early 1800s, Maine's population grew and migrated inland along rivers and roads, and Portland (formerly Falmouth) became a major seaport in Maine (Maine Historical Society 2010a). However, over time, tensions rose between the farming pioneers and the town-based merchants and investors. Additional friction was caused by Maine's potential separation from Massachusetts and a failure to agree on a common vision for the State. By 1786, Maine's governing bodies had begun to argue for separation from Massachusetts as an independent State (Maine Historical

Society 2010a). While Maine was still part of Massachusetts, it was legally considered the District of Maine. Although the debate between the States continued, separation was delayed until after the War of 1812. After years of debate and two unsuccessful votes, separation was approved, and Maine wrote a new State constitution in 1819. However, Maine did not become a State until March 15, 1820, as a result of the Missouri Compromise signed on March 6, 1820, which allowed Maine (free state) and Missouri (slave state) to be admitted to the Union, while maintaining balance between the North and the South (Maine Historical Society 2010a).

After statehood, Maine's population grew again. Although the majority of residents were farmers, the State exported large quantities of its abundant natural resources including lumber, stone, ice, lime, slate, and brick (Maine Historical Society 2010b). In the mid-1800s Maine became a major shipbuilder and trade and fishing became a major economic boon. At various times, Maine was also one of the leading producers of cod, mackerel, and menhaden in the U.S. (Maine Historical Society 2010b). The only Civil War battle fought in Maine was the Battle of Portland Harbor in June 1863; however, Maine strongly supported the abolitionist movement and contributed greatly to the Union armies (Maine Historical Society 2010c).

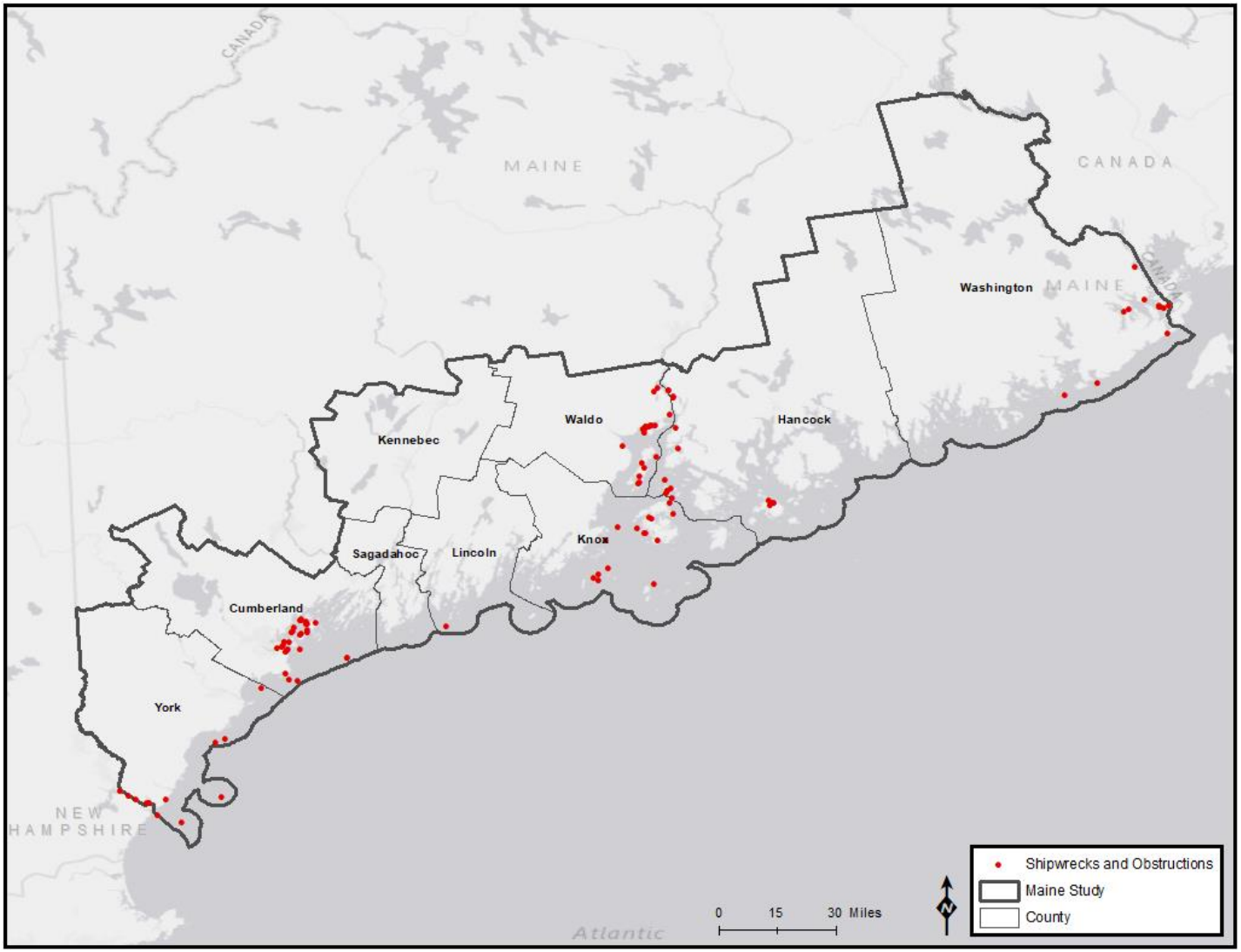
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with major turning points in American History. Figure 2-15 and Figure 2-16 present a summary of many of the historic sites and locations in the Study Area, including maritime sites and shipwrecks and obstructions in Casco Bay, West Penobscot Bay, and along the Atlantic Coast. The red dashed line and large purple polygon in the figure represents the Arnold Trail to Quebec and historic sites related to the March to Quebec in 1775. During this expedition, Benedict Arnold proposed to invade Canada and seize Quebec in an attempt to both create an uprising against the British in Canada and to deprive the British of a potential staging area for attacking the colonies. However, the expedition was fraught with failures and by the time Arnold arrived in Quebec, the British had anticipated the attack and had fortified Quebec City (Kiger 2018). The blue line and smaller square polygon on Figure 2-15 represents the Georges Canal River which was built in 1793 and used to transport forestry products downstream and food and other resources upstream. However, due to low revenues, the locks fell into disrepair and decay in 1802, and the system had ceased to operate by 1806. The 28-mile waterway was briefly reopened in 1847, but was abandoned with the rise of the railroad system (Maine An Encyclopedia 2019b).

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Maine) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.



Source: NPS 2014, USGS 2019e

Figure 2-15. Cultural and Historic Sites within the Maine Study Area



Source: NOAA 2016a

Figure 2-16. Shipwrecks and Obstructions within the Maine Study Area

In summary, many cultural sites in the Study Area are identified in Figure 2-15 and Figure 2-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources, and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near waterbodies for use as a drinking water, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are ample high-probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Maine's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and the immediate vicinity are essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

2.3.2.7 Recreation

Maine has three peak recreational seasons. Summer is the peak travel season to Maine, especially along the coast. Fall is peak season for tourists who like to look at fall foliage. Winter is the peak season for snow activities (snowmobiling, skiing, snow shoeing). Major recreational opportunities in the Study Area include camping, hiking, biking, canoeing, kayaking, hunting, fishing, viewing wildlife, and snow activities. Opportunities also include visiting Acadia National Park, State parks, beaches, and exploring cultural and historic districts, lighthouses, and museums (Visit Maine 2019a). Outdoor recreational resources are prolific in Maine. Maine is a "destination location" for many outdoor enthusiasts because of the pristine and remote natural conditions. A selection of major recreation resources in the Study Area is shown in Figure 2-17. The cultural and historic resources shown in Figure 2-15 also can be considered potential recreational resources as can many of the protected areas shown in Figure 2-14. The following discussion addresses the general recreation characteristics in the various counties of the Study Area. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 2.3.2.6), transportation (Chapter 2.3.2.8), tourism employment (included in Chapter 2.4.4), and rental housing (included in Chapter 2.4.3).

The State of Maine has over 6,000 lakes and ponds, 32,000 miles of rivers and streams, 542,629 acres of State and National Parks, 67 lighthouses, and has over 5,000 miles of coastline when accounting for island coasts (Visit Maine 2019b). Maine fisherman provide 90% of the Nation's lobster supply (Awesome America 2018). In a 2014 survey published in Maine's State Comprehensive Outdoor Recreation Plan, it was noted that Maine residents participated in several outdoor recreational activities at levels that were at least 10% greater than national levels. These activities include primitive camping, big-game hunting, snow and ice activities, boating, canoeing, cold water fishing, and viewing wildlife other than birds (DACF 2015). In this survey, respondents also rated the most desirable settings in Maine to be lakes/ponds, mountains, forests, and rivers. Thus, the number of boat launches identified in Figure 2-17 is not surprising. It is also likely that campgrounds are located within the vicinity of the boat launches, but GIS campground data were not available for Maine.

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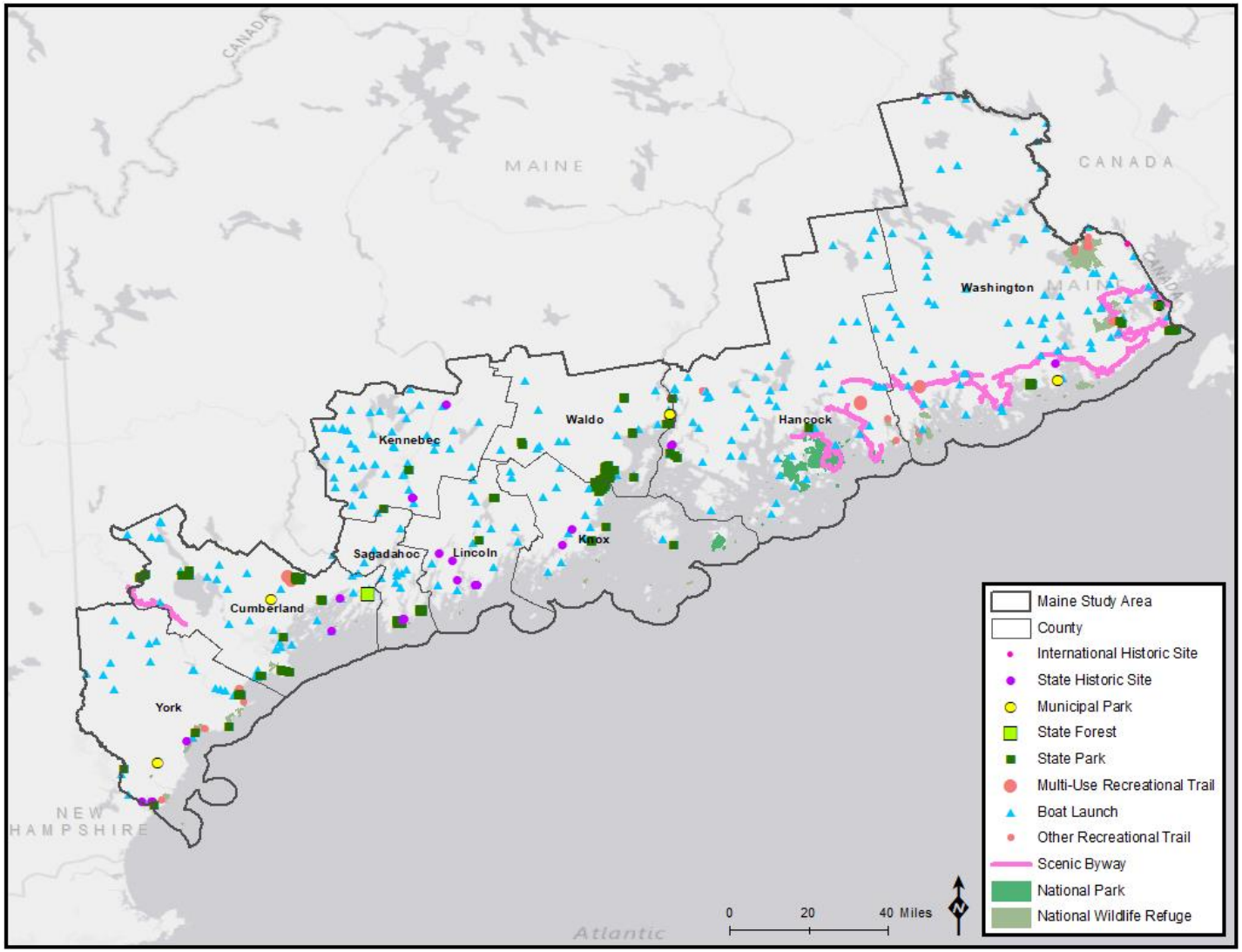


Sources: Maine Geolibrary 2019a, Maine Geolibrary 2019b, Maine Geolibrary 2018a, NPS 2014, USFS 2019b

Figure 2-17. Select Recreational Resources within the Maine Study Area

There are several annual festivals throughout the year in the Study Area (Visit Maine 2019a) as well as lobster and scenic boat tours, bass fishing tournaments between May and November (Maine.gov 2019b), and open water and ice fishing derbies December through March (Maine.gov 2019c). For example, in Cumberland County, annual festivals include Old Port Festival (June), Yarmouth Clam Festival (July), and Casco Bay Island Swim Run (August). In Knox County, annual festivals include the US National Toboggan Championships (February), Maine Windjammer Parade in Rockland and Tall Ships in Camden Harbor (July), North Atlantic Blues Festival (July), Maine Lobster Festival (August), and the Camden Windjammer Festival and Parade (September). In York County, annual festivals include Kennebunk May Day Parade and Festival (May), Kennebunkport Festival (June), LAUNCH, A Maine Maritime Festival (June), George HW Bush Celebrity Golf Classic (June), Berwick's Strawberry Festival (June), and Paddle Battle at Nonantum Resort (August). Other festivals in the Study Area include the Lobster Boat Races (July) in Hancock County, the Belfast Harbor Fest (August) in Waldo County, and the Windjammer Days Festival (June) and Boothbay Harborfest (September) in York County (Visit Maine 2019a). The following sections describe some of the major recreational opportunities within the Study Area

Washington County

Moosehorn NWR, established in 1937 and managed by USFWS, is located in northern Washington County. This refuge has no entrance fees and consists of almost 30,000 acres of federally protected lands, with one-third of it being designated as Federal wilderness. Two wilderness areas within the refuge are part of the National Wilderness Preservation system, which means that habitat management is kept to a minimum to allow the area to develop into old-growth climax forests and that mechanical vehicles, including bicycles, are prohibited. The refuge provides important feeding and nesting habitat for many bird species and is in the Atlantic Flyway, a migration route along the eastern coast of North America. There are over 50 miles of trails and roads throughout the refuge and recreational activities include hiking, hunting, fishing, skiing and snowshoeing, wildlife viewing, environmental education, and photography. Camping, campfires, and motorized vehicles are not permitted (USFWS 2019t).

Hancock and Knox Counties

In Hancock and Knox Counties is Acadia National Park. Acadia National Park was created in 1916 and covers more than 47,000 acres with a majority of the park being on Mount Desert Island in Hancock County (Just Fun Facts 2016). The park includes mountains, woodlands, 26 lakes and ponds, and ocean shoreline. There are more than 158 miles of hiking trails, 27 miles of historic motor roads, and 45 miles of carriage roads that were created prior to 1940. Recreational activities include, birdwatching, hiking, climbing, biking, horseback riding, swimming, fishing, canoeing and kayaking, skiing, snowmobiling, and snowshoeing (NPS 2019j).

Acadia National Park is open year-round with entrance fees ranging from $15 per individual over the age of 15 (bicyclist, hiker, pedestrian) to $30 per vehicle. In 2018, Acadia National Park hosted more than 3.5 million visitors and supported more than 5,000 jobs, making it the seventh most visited National Park (National Geographic 2019). The National Parks Service estimated that visitors spent about $388 million in nearby communities on hotels, food, and recreational activities (Feinberg 2019).

Bar Harbor is also located in Hancock County and is considered the gateway to Acadia National Park because it is also located on Mount Desert Island (Visit Maine 2019b). Bar Harbor is a popular summer vacation destination as well as a scheduled stop for several cruise ships. In Bar Harbor, visitors can go biking, kayaking, whale-watching, shopping, dining, and visit museums (Bar Harbor Chamber of Commerce 2019).

Waldo and Knox Counties

Spanning Waldo and Knox Counties is Camden Hill State Park, a 5,710-acre public recreation area with 30 miles of hiking trials. This is one of Maine's popular attractions for hiking, boating, and camping with admission fee ranging from $2 to $6 per person (DACF 2018). In 2017, it was estimated that there were 158,000 day users and 27,000 campers to Camden Hill State Park (Parrish 2017).

York and Cumberland Counties

Along the coast of York and Cumberland Counties is the Rachael Carson NWR, which is managed by USFWS (USFWS 2015). The refuge has no entrance fees and is open to hundreds of thousands of visitors year-round (Dietsch et al. 2013). Hunting permits for big games, migratory birds, upland game birds, and fishing are allowed on the preserve beginning the last week in August.

Adjacent to the Rachel Carson NWR in York County is the 2,250-acre Wells National Estuarine Research Reserve. This reserve managed by Federal and State government agencies and the town of Wells. The Wells National Estuarine Research Reserve attracts visitors who want to be educated on coasts, estuaries, and environmental conservation. The reserve is only open from April to November, but it attracts more than 25,000 visitors each year with admission fees $5 or less (Wells Reserve at Laudholm 2019b).

In Cumberland County, Portland and the surrounding cities of South Portland, Scarborough, Westbrook, Windham, Gorham, Falmouth, and Brunswick are some of the largest municipalities in Maine (Maine Demographics 2019). It was estimated that, in 2018, 5.4 million people visited the Greater Portland Area with spending reaching $682 million (Visit Portland 2019). There are some traditional tourist attractions such as amusement parks or theme parks in the Portland area, but visitors also have access to the nearby beaches, hiking trails, parks and gardens, campgrounds, lighthouses, and hundreds of restaurants (U.S. News 2019b). Cruise ships also leave out of Portland for destinations in Canada and the East Coast of the U.S., primarily between May and October (Portland Maine 2019).

Another city that tourists visit in the Study Area is Kennebunkport in York County, which offers beaches, art, architecture, antiques, boating, shopping and dining, and local events throughout the year. (Visit Kennebunkport 2019a). There are several ocean-related recreational activities in Kennebunkport, such as whale watching, lobster boat cruises, fishing charters, and deep sea fishing (Visit Kennebunkport 2019b).

Summary

Overall, there are a variety of year-round outdoor recreational activities within the Study Area. Many of the largest cities in Maine are located within the Study Area and provide additional tourist attractions such as amusement parks, museums, zoos, shops, and restaurants. These cities include Portland, Bar Harbor, and Kennebunkport. However, it is the numerous State parks, nature preserves, lakes, campgrounds, and Acadia National Park that are the major recreational resources for residents and tourists. Because many of the recreational attractions are also protected lands (Figure 2-14 in Chapter 2.3.2.5), there will likely be limitations for development near these areas. Although summer is the primary tourist season in Maine (especially along the coast), summer, fall, and winter are considered separate peak seasons for tourism based on the activities. Therefore, travel costs (e.g., hotel prices) may be higher during these peak seasons. Also, there are several annual festivals and events that occur through the Study Area. Future potential projects would need to consider the potential impacts on these events and attractions during the planning phase and site selection process.

2.3.2.8 Transportation Resources

The MaineDOT is a cabinet-level State agency responsible for all statewide transportation(MaineDOT 2019b). Maine DOT was created in 1972 and assumed responsibility of all highways and bridges, as well as air, rail, public transportation, ports, and marine transportation (MaineDOT 2019a). As shown in Figure 2-18, Maine DOT is responsible for (MaineDOT 2019a, ME DEP 2019, Explore Maine 2019, ARBTA 2015, MaineDOT 2017):

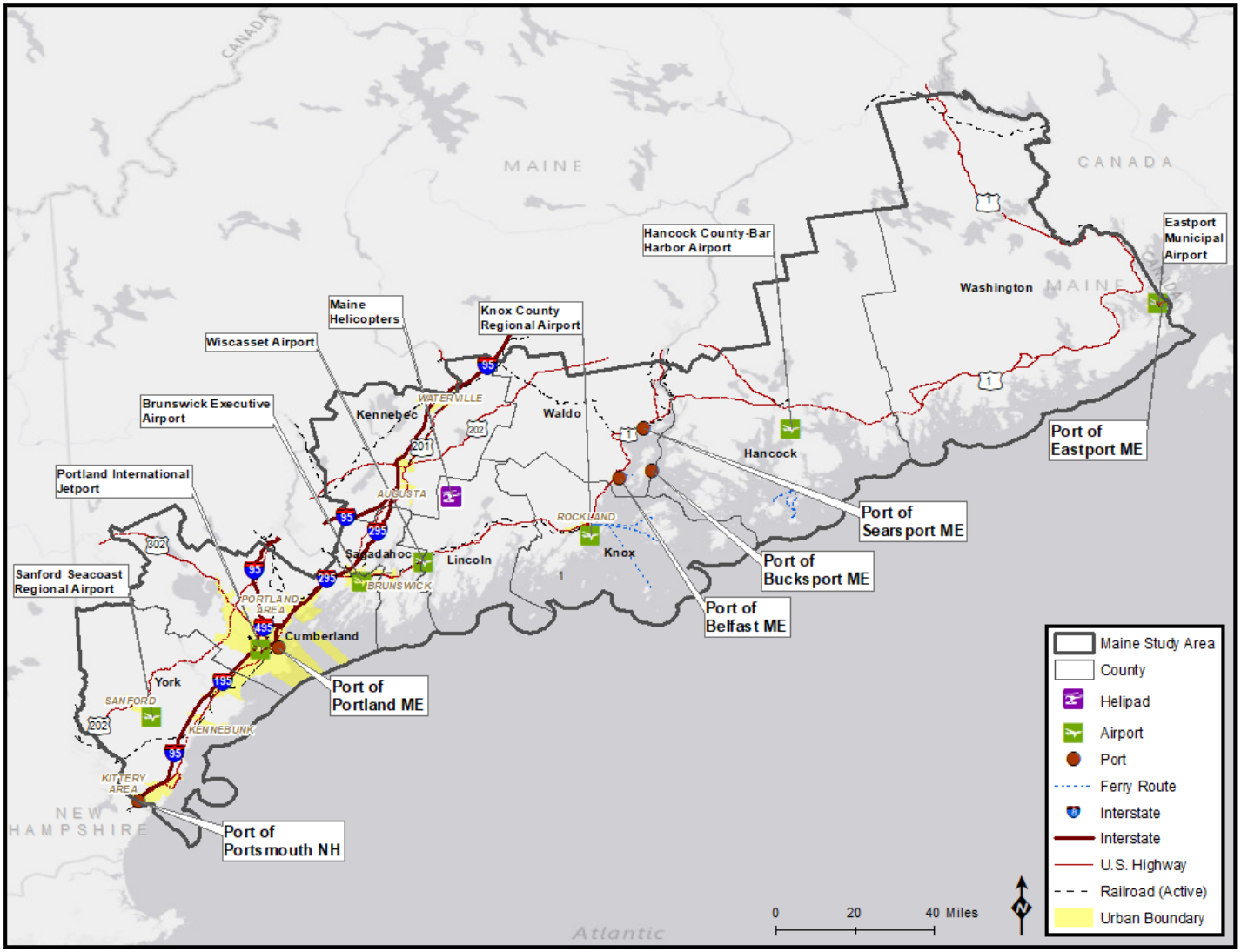
- 7 ferries
- 16 fixed bus routes
- 133 discharge points for Combined Sewer Overflows
- 9,182 miles of highways and interstates
- 14,362 miles of local roads and streets
- 2,419 rural and urban bridges
- 1,091 railroad route miles
- 7 airports
- 6 ports

Maine's location promotes and encourages international trade. Maine's location allows for trade through the International Marine Terminal in Portland, which was instrumental for expanding container service between Europe and Maine for the first time since the 1980s (MaineDOT 2019a).

Railroads in the Study Area also connect the North and South ends of the State. According to the MaineDOT 2016 Rail System, there are several State-owned railways within the Study Area, which benefit coastal industries and the movement of goods to and from coastal towns.

2.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area is primarily forest and wetland. Total developed land cover in the Study Area is only 7.3%. Most developed land use is concentrated on the southern coast, especially in the Portland area. Given the amount of low-intensity development in Cumberland County, the area has potential for future growth. Land cover equates closely with actual land use. Although, populated areas have more developed land uses (developed open space, developed low intensity, developed medium intensity, or developed high intensity) than other areas, the overall Study Area is relatively undeveloped compared to other States. Regardless, land use trends are like other States. The developed high-intensity areas are the urban downtown centers where there are higher concentrations of impervious surfaces, more buildings, more development, and more transportation resources (road, rail, air, and port). Overall, the existing land use maps for the Study Area indicate that (1) impervious surfaces are associated with urban land use and transportation corridors, (2) public attractions and landmark buildings are not exclusively associated with urban land use or impervious surfaces, and (3) there are higher concentrations of public attractions and landmark buildings in the southern region of the Study Area as compared to the northern region.



Sources: Maine Geolibrary 2019c, Maine Geolibrary 2018b, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 2-18. Transportation Resources within the Maine Study Area

Protected areas, coastal zones, cultural resources, and recreational areas abound throughout the Study Area. Numerous State parks, nature preserves, lakes, campgrounds, and Acadia National Park are the major recreational resources for residents and tourists. The preservation of natural resources is a priority for the State of Maine, as shown by the Natural Resources Protection Act and the Mandatory Shoreland Zoning Act. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

In addition to local municipalities, various other entities within the Study Area have developed comprehensive plans regarding future development activities within their specific boundaries. There are the Maine Land Use Planning Commission's Comprehensive Land Use Plan, Bureau of Parks and Lands 15-year Management Plans, Maine Historic Preservation Commission plans, and Maine's Statewide Historic Preservation Plan. These future land use plans and ordinances often consider preservation of existing protected areas, cultural and historic areas, and recreation resources and may plan for expansion of such land uses in the future. Future development will need to be consistent with existing future land use plans and existing zoning ordinances.

Maine has several business opportunities, reimbursements, and tax credits that promote business growth while also protecting and enhancing Maine jobs. The State currently has several ways in which businesses can recoup tax money through investment in material, capital, and human resources in Maine, as well as several income tax credits.

2.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

2.4.1 Population

Maine's population is growing, but much more slowly than the national population. Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. According to the USCB, Maine's estimated population was over 1.3 million residents in 2017. As shown in Table 2-8, which presents the demographic regions comprising the Study Area, Maine grew just 0.1% since the 2010 Census, having added approximately 9,200 people. During the same time period, the population of the U.S. grew 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Table 2-8. 2010 and 2017 Total Population and Population Projections Through 2036 in the Maine Study Area

Regions	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2021)[3]	Population Projection (2031)[3]	Population Projection (2036)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2036) (%)
Downeast & Acadia	Hancock	54,418	54,468	54,588	54,522	54,152	0.1	-0.6
	Washington	32,856	31,822	31,172	30,155	29,522	-3.1	-7.2
	Total Downeast & Acadia	***87,274***	***86,290***	***85,761***	***84,677***	***83,674***	***-1.1***	***-3.0***
Greater Portland & Casco Bay	Cumberland	***281,674***	***289,173***	***294,711***	***301,376***	***302,944***	***2.7***	***4.8***
Kennebec & Moose River Valley	Kennebec	***122,151***	***121,289***	***120,469***	***119,468***	***118,667***	***-0.7***	***-2.2***
Maine Beaches	York	***197,131***	***201,454***	***208,062***	***217,689***	***220,651***	***2.2***	***9.5***
Mid Coast	Knox	39,736	39,700	39,430	38,627	38,080	-0.1	-4.1
	Lincoln	34,457	34,021	32,801	30,651	29,605	-1.3	-13.0
	Sagadahoc	35,293	35,149	35,233	35,197	34,994	-0.4	-0.4
	Waldo	38,786	39,280	39,797	40,002	39,879	1.3	1.5
	Total Mid Coast	***148,272***	***148,150***	***147,261***	***144,477***	***142,558***	***-0.1***	***-3.8***
	Study Area Total	**836,502**	**846,356**	**856,265**	**867,687**	**868,493**	**1.2**	**2.6**
	Maine	**1,328,361**	**1,330,158**	**1,335,260**	**1,341,046**	**1,337,568**	**0.1**	**0.6**
	United States	**308,745,538**	**321,004,407**	**334,998,000[4]**	**357,147,000[4]**	**366,676,000[4]**	**4.0**	**14.2**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Population growth in the U.S. has slowed over the last decade, and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). Maine is affected by the nationwide trend of aging population, and as a result posted seven annual periods of natural population decrease between 2010 and 2018, according to USCB 2018 estimates. However, loss due to natural decrease was offset by six annual periods with positive net migration, resulting in overall slight growth, the highest of which was an increase of 3,693 people in 2017 (USCB 2019b). According to the Maine State Economist, the recent trend of in-migration originating from young age groups (Age 25 to 29 and Age 30 to 34) could help Maine's overall demographic picture (Maine State Economist 2018). Census Bureau 2018 estimates indicate that the biggest domestic in-migration came from Massachusetts, New Hampshire, New York, Texas, Florida and Connecticut (USCB 2019c). These values are Census Bureau estimates. As estimates, they contain "residuals" that necessitate margins of error in the Census Bureau calculations. Therefore, these values may not match the overall population sums exactly.

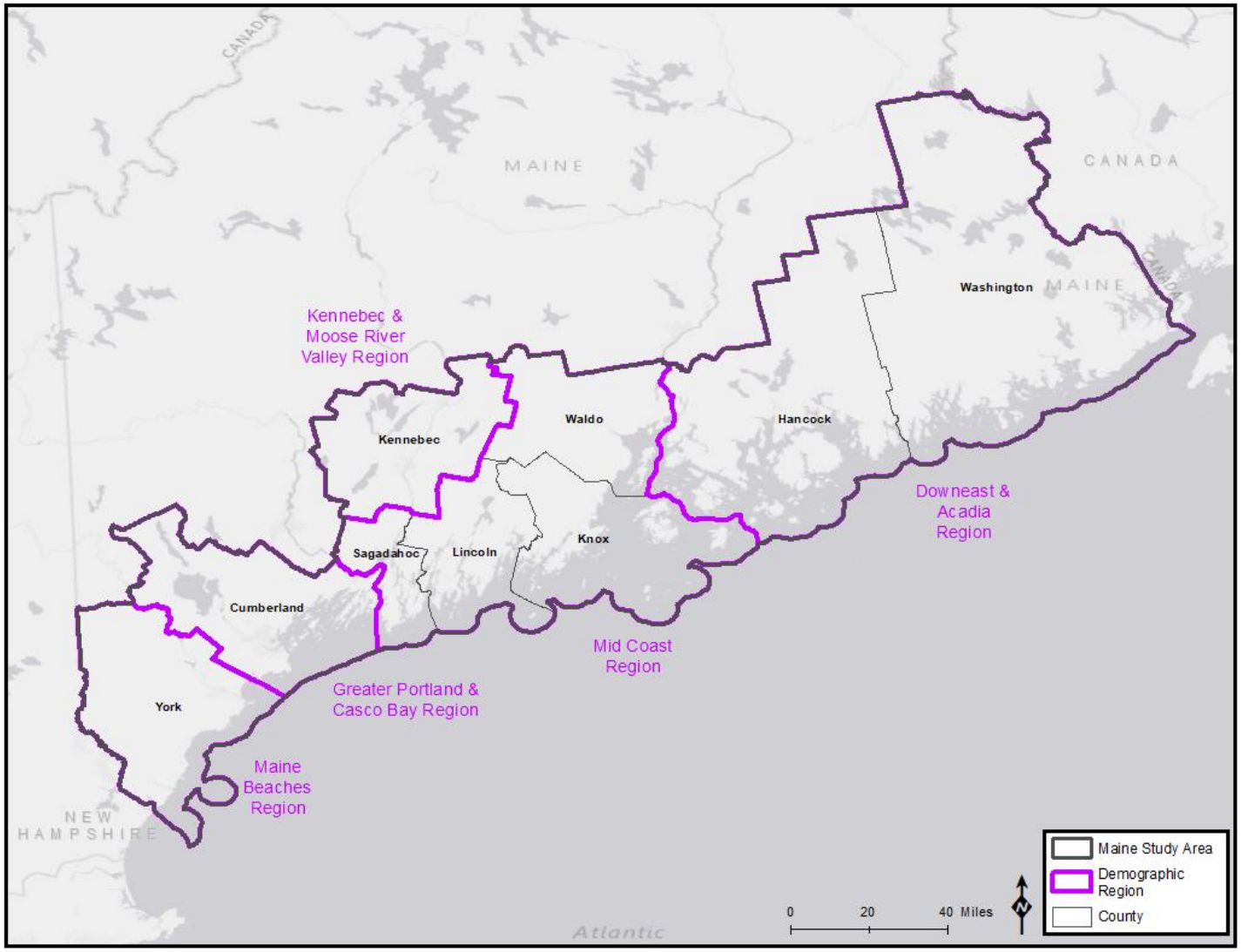
2.4.1.1 Study Area Trends

Figure 2-19 shows the demographic regions comprising the Study Area. These regions are different from the physiographic regions described in Chapter 2.2 because they are derived from official demographic regions used by the Governor's office. The counties within the Study Area are located within five demographic regions defined as Downeast and Acadia, Greater Portland and Casco Bay, Kennebec and Moose River Valley, Mid Coast and Maine Beaches (Maine.gov 2019a).

According to 2017 population estimates, the Study Area represented 63.6% (846,356 residents) of the overall State population of 1,330,158. Table 2-8 shows population growth and decline in the Study Area counties, as well as their location within the demographic regions. Between 2010 and 2017, five (Washington, Kennebec, Knox, Lincoln, and Sagadahoc) of the nine Study Area counties experienced population loss. During the same period, the population of the Study Area grew 1.2%, faster than the State (0.1%), but slower than the Nation (4.0%) (USCB 2017a, USCB 2017d).

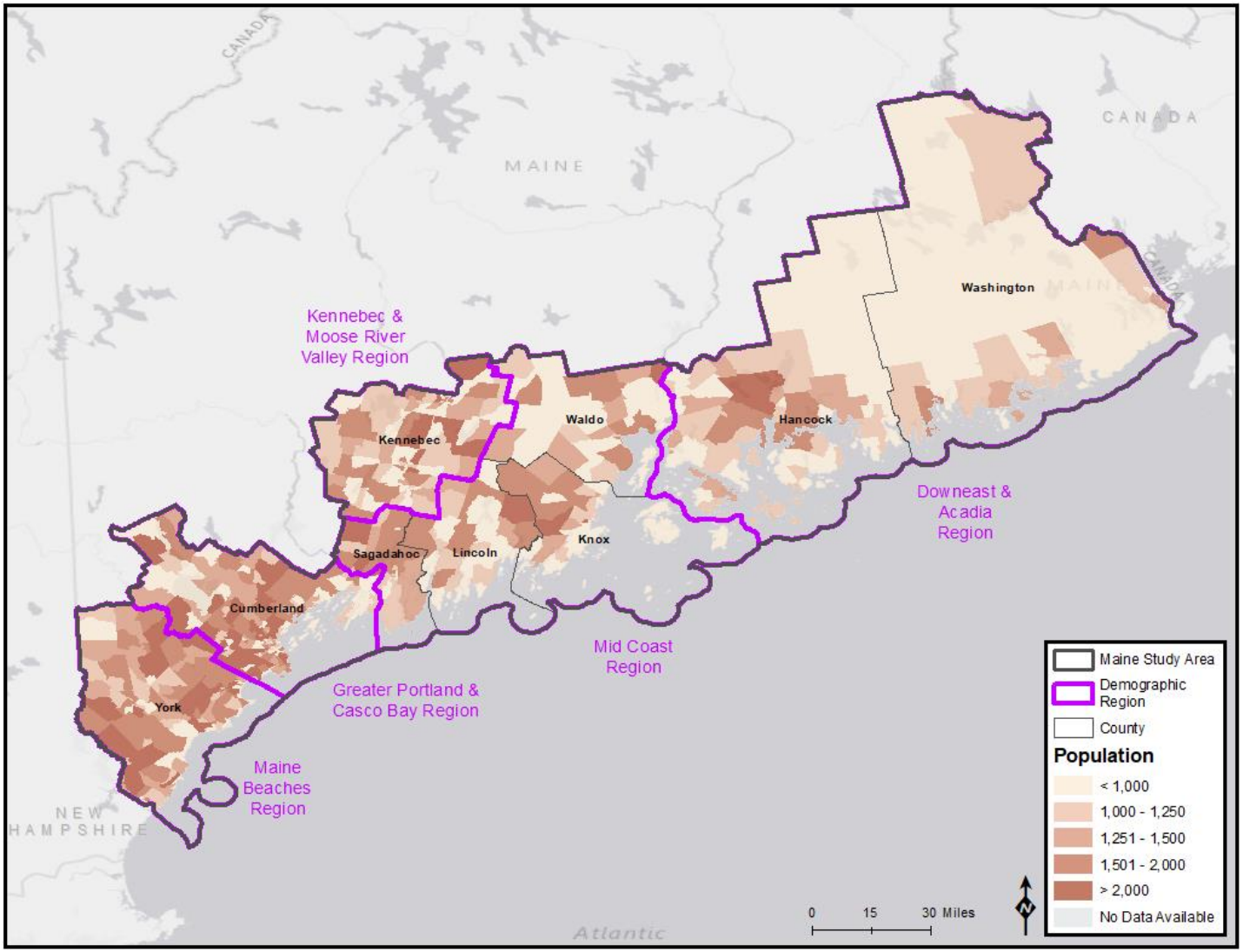
Between 2010 and 2017, three Study Area regions lost population while two gained population. The regions with population loss were Downeast and Acadia (-1.1%), Kennebec and Moose River Valley (-0.7%) and Mid Coast (-0.1%). Regions with population gains were located in the southern part of the State in the regions of Greater Portland and Casco Bay (2.7%) and Maine Beaches (2.2%). The fastest growing county was Cumberland, located near the city of Portland, which grew 2.7% between 2010 and 2017. Washington County lost 3.1% of its population during the same period (USCB 2017a, USCB 2017d).

Figure 2-20 shows population counts in block groups within the nine counties located in the Study Area. The figure illustrates that the most populated areas are located near Portland in the Greater Portland and Casco Bay and Maine Beaches regions. Higher population concentrations in these areas correspond to proximity to a MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 2-21, there is one MSA (Portland-South Portland, ME) present in the Study Area, which encompasses York, Sagadahoc, and Cumberland Counties (Data.gov, 2017). The least populated areas are located in the Downeast and Acadia Region, which encompasses the northernmost counties (Washington and Hancock) in the State (USCB 2017a).



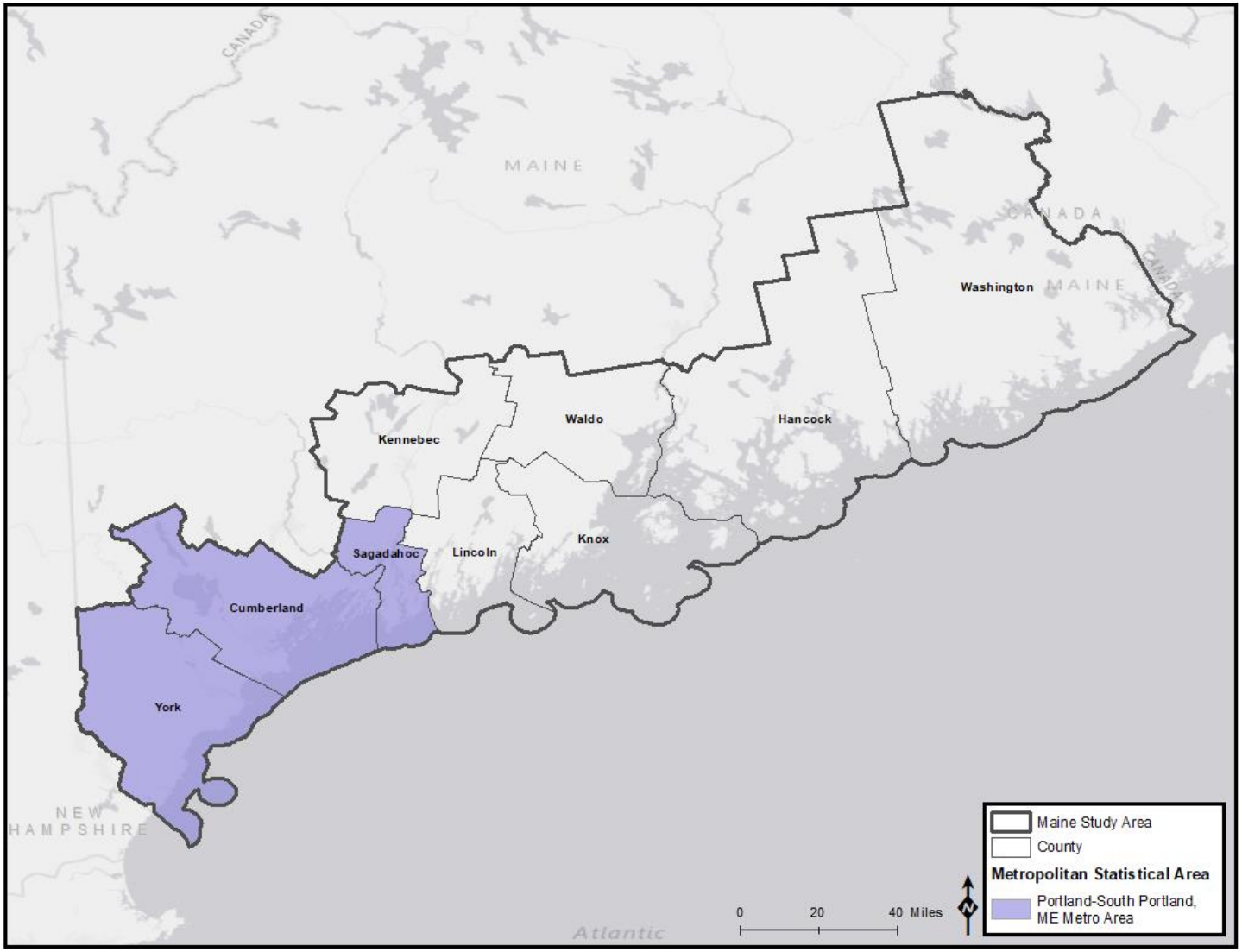
Source: Maine.gov 2019a

Figure 2-19. Demographic Regions of the Maine Study Area



Source: USCB 2017r

Figure 2-20. Population in the Maine Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 2-21. Metropolitan Statistical Areas Located within the Maine Study Area

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties were home to 52% of the Nation's population in 2010 but account for less than 20% of the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is reflected in Maine. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 2-9, the Study Area is 8,649.0 square miles, representing 28.0% of the State's total land area of 30,842.9 square miles. Therefore, more than half (63.6%) of Maine's population resided in 28.0% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.

According to NOAA, in 2010 approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 2-22, which shows population density per square mile in the Study Area. Population densities in the Study Area range from 12 persons per square mile in Washington County (located in the rural sparsely-populated Downeast and Acadia Region) to 346 persons per square mile in populous Cumberland County (within the Portland metropolitan area) (USCB 2017d, USCB 2017c, USDA 2013).

2.4.1.2 Population Projections

According to the State, Maine's population is projected to grow 0.6% (7,410 residents) by 2036. Population in the Study Area is projected to grow 2.6% (22,137), significantly more than the State during the same period. This may be attributed to a higher median age in the rural counties outside of the Study Area resulting in greater natural population decrease as compared to the more urban areas along the coast of Maine located within the Study Area. The Nation's population is projected to grow at a significantly faster rate (14.2% to 366.6 million) during the same period (USCB 2017d, USCB 2017c, USCB 2018b, Governor's Office of Planning and Budget 2019a)

As shown in Table 2-8, projections indicate that 64.9% (868,493 people) of the State's population will reside in the Study Area by 2036 as compared to 63.6% (846,356) in 2017 (USCB 2017a, USCB 2017d, USCB 2018b, ME OPM 2019).

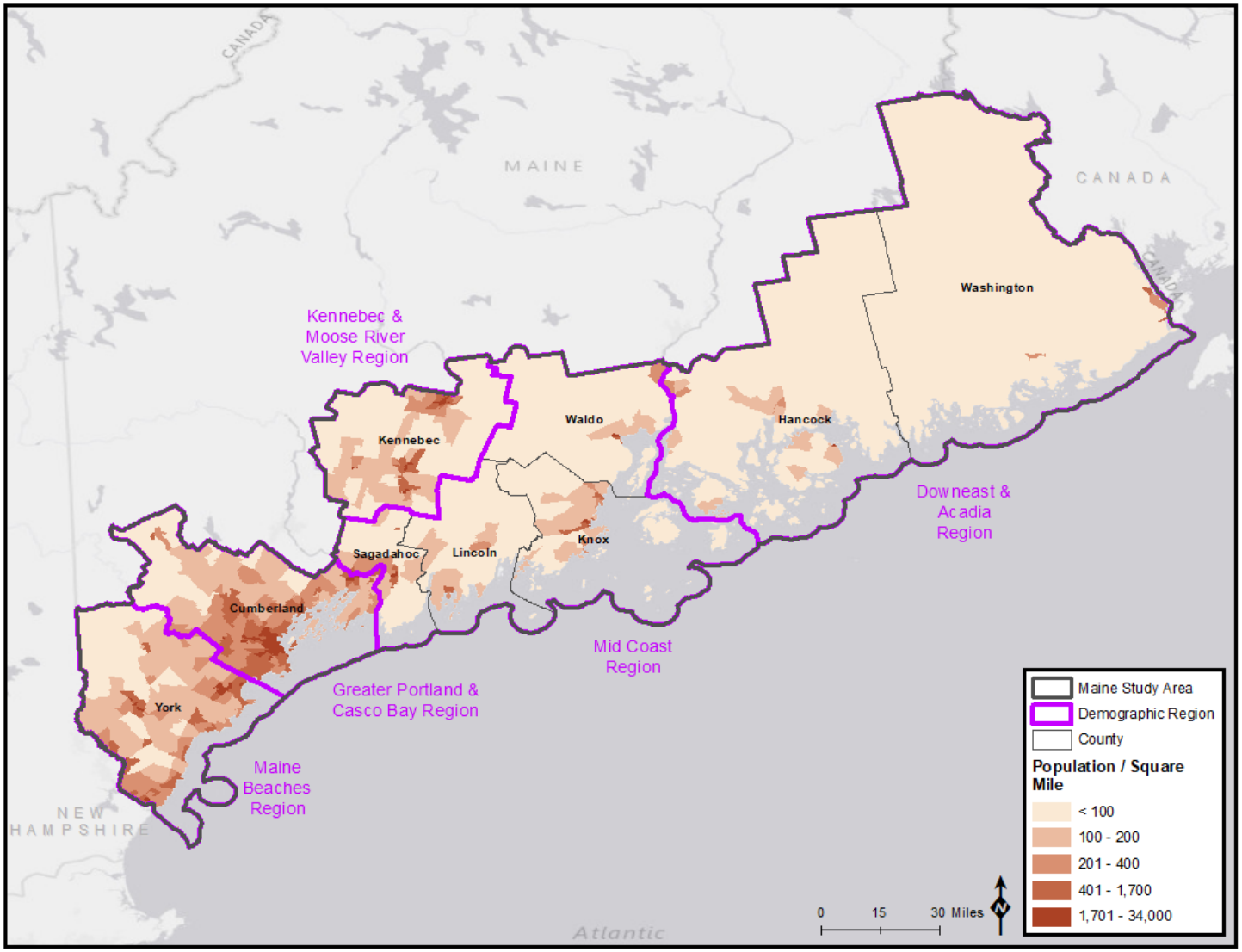
Table 2-8 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2036, delineated by region. As shown in the table, projected growth will not be uniform across the Study Area. Of the nine counties in the Study Area, two (York and Waldo) are projected to increase population while the remaining seven are projected to decrease in population. Figure 2-23 shows the overall projected percent change in population over this period. The greatest population declines are projected in rural Washington and Lincoln Counties. An increase in population of 10% is projected in the Maine Beaches region, as the 2017 population of 201,454 is projected to increase to 220,651 in 2036. This region only contains the County of York, which includes the suburban areas of Portland (USDA 2013, USCB 2017a, USCB 2017d).

Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future. As shown in Table 2-9, this trend is reflected in the Study Area, as population density is projected to increase from 97 persons per square mile in 2017 to 100 persons per square mile in 2036. The population density increase in the Study Area is greater than the increase in density in the State (from 43 persons per square mile in 2017 to 43 persons per square mile in 2036 (USCB 2017d, Governor's Office of Planning and Budget 2019a). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

Table 2-9. 2017 and 2036 Population Density in the Maine Study Area

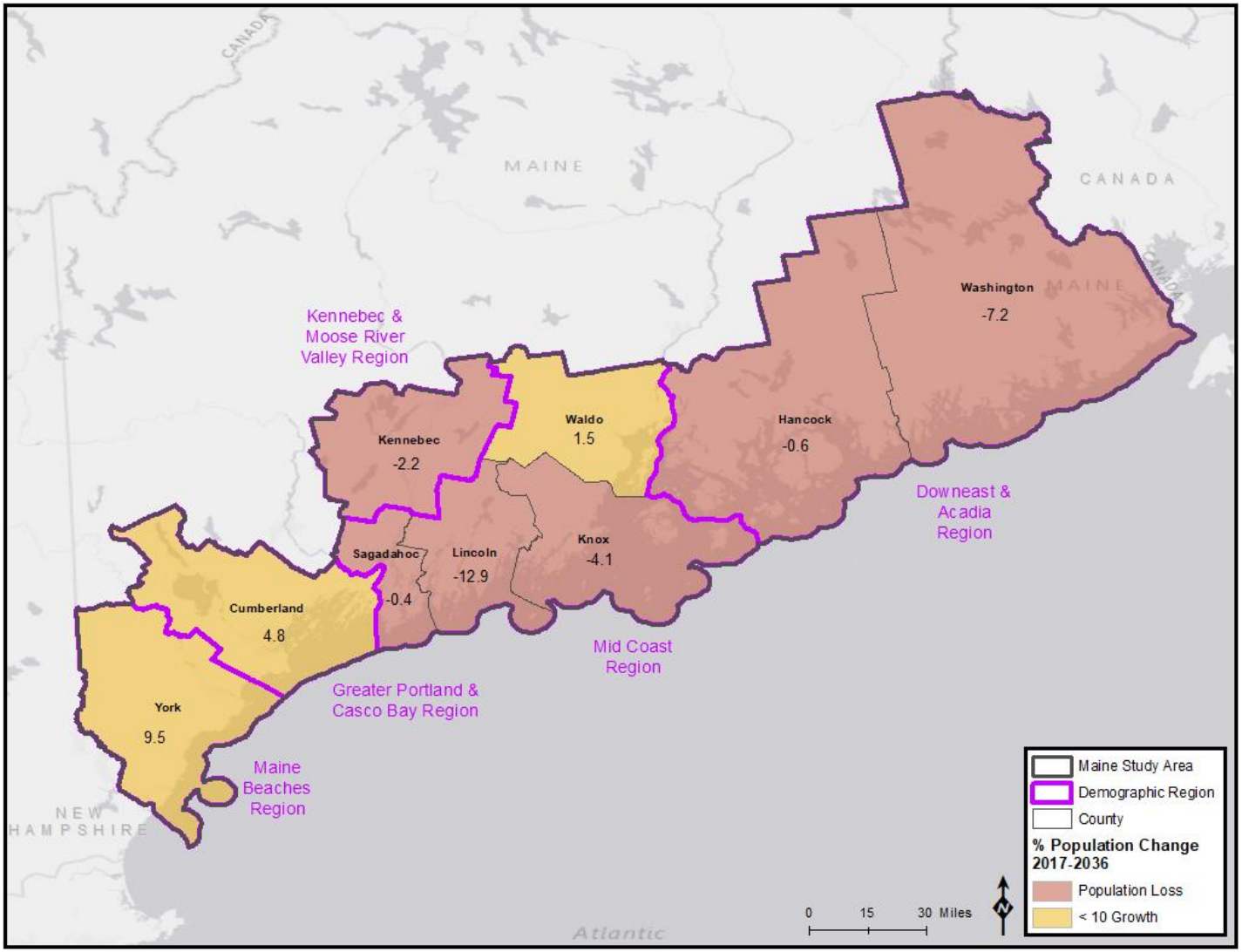
Region	Geographic Unit	Total Population (2017)	Population Projection (2036)	Land Area (Square Miles)	2017 Population Density (people per square mile of land area)	2036 Population Density (people per square mile of land area)
Downeast & Acadia	Hancock	54,468	54,152	1,587.1	34.3	34.1
	Washington	31,822	29,522	2,562.7	12.4	11.5
	Total Downeast & Acadia	***86,290***	***83,674***	**4,149.8**	**46.7**	**45.6**
Greater Portland & Casco Bay	Cumberland	***289,173***	***302,944***	***835.7***	***346.0***	***362.5***
Kennebec & Moose River Valley	Kennebec	***121,289***	***118,667***	***867.5***	***139.8***	***136.8***
Maine Beaches	York	***201,454***	***220,651***	***991.1***	***203.3***	***222.6***
Mid Coast	Knox	39,700	38,080	365.1	108.7	104.3
	Lincoln	34,021	29,605	455.9	74.6	64.9
	Sagadahoc	35,149	34,994	254.0	138.4	137.8
	Waldo	39,280	39,879	730.0	53.8	54.6
	Total Mid Coast	**148,150**	**142,558**	**1,804.9**	**375.6**	**361.7**
	Study Area Total	**846,356**	**868,493**	**8,649.0**	**97.9**	**100.4**
	Maine	**1,330,158**	**1,337,568**	**30,842.9**	**43.1**	**43.4**
	United States	**321,004,407**	**366,676,000**	**3,531,905.0**	**90.9**	**103.8**

Source: USCB 2017a, USCB 2017d, USCB 2018b, ME OPM 2019



Source: USCB 2017r

Figure 2-22. Population Density in the Maine Study Area by Census Block Group



Source: Maine.gov 2019a

Figure 2-23. Overall Projected Population Change from 2017-2036 in the Maine Study Area by County

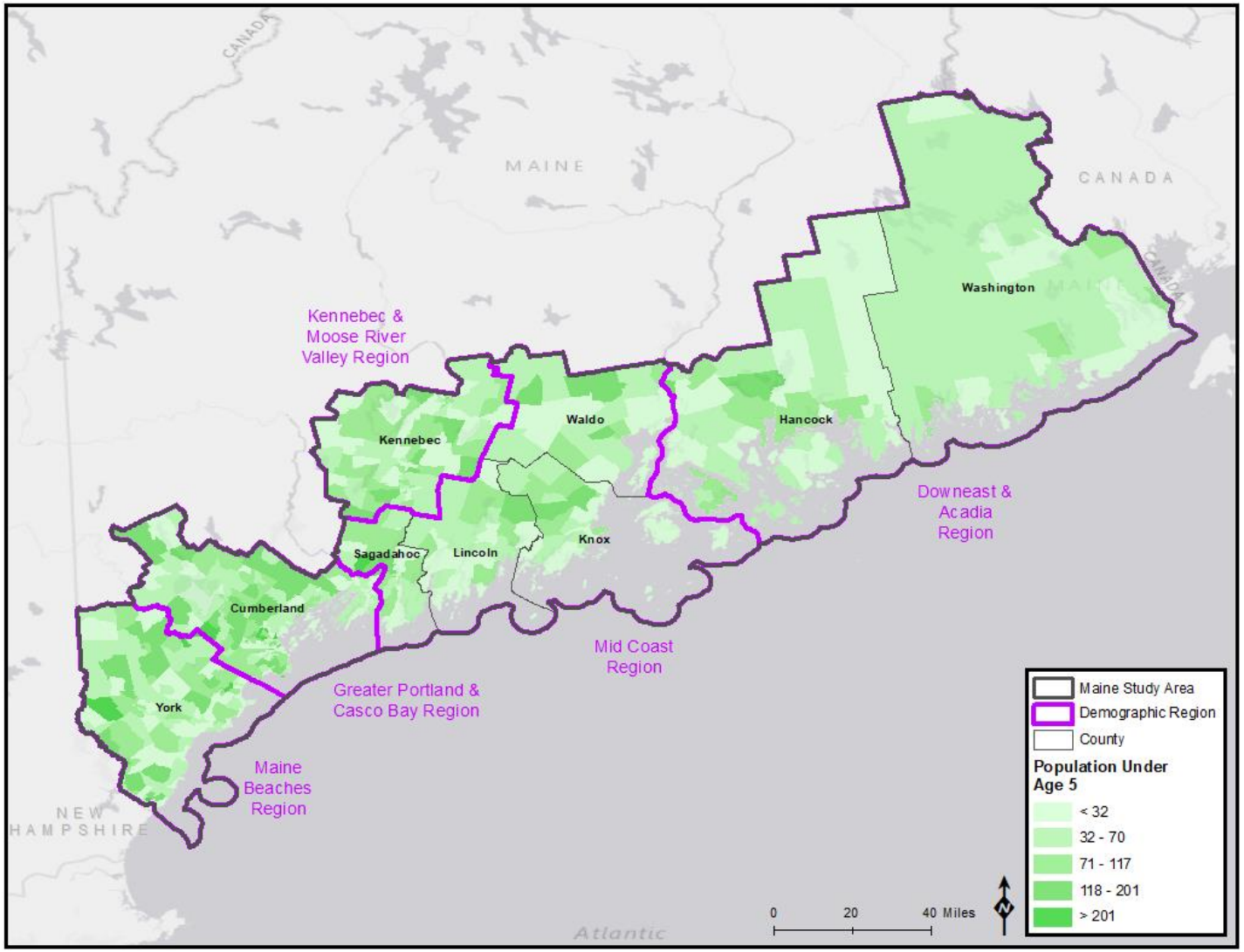
2.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Maine and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services (Brookings Institute 2018).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. (USCB 2017b). According to the Maine State Economist, one of the driving factors in Maine's demographic situation is the larger percentage of baby boomers in Maine's 2017 population (28.0%) as compared to the Nation (22.6%) (Maine State Economist 2018). The size of the baby boom generation increases the median age in Maine, making it one of the oldest States in the Nation. It also impacts demographic and economic trends in the State. When this generation was growing up, school enrollments increased; when they entered the workforce, employment and the labor force increased. However, with this generation now poised to exit the workforce and with smaller generations following, labor constraints are starting to be felt around the State. Aging baby boomers have impact on health care, as the need for a broad spectrum of health care-related services in the State will also increase while the workforce in this field is also aging. Demand for new health care workers will come not only from expansions in the industry but from retiring baby boomer health care professionals. These factors combine to create a dwindling workforce, which stunts the general economy (Maine State Economist 2018, Maine.gov 2016).

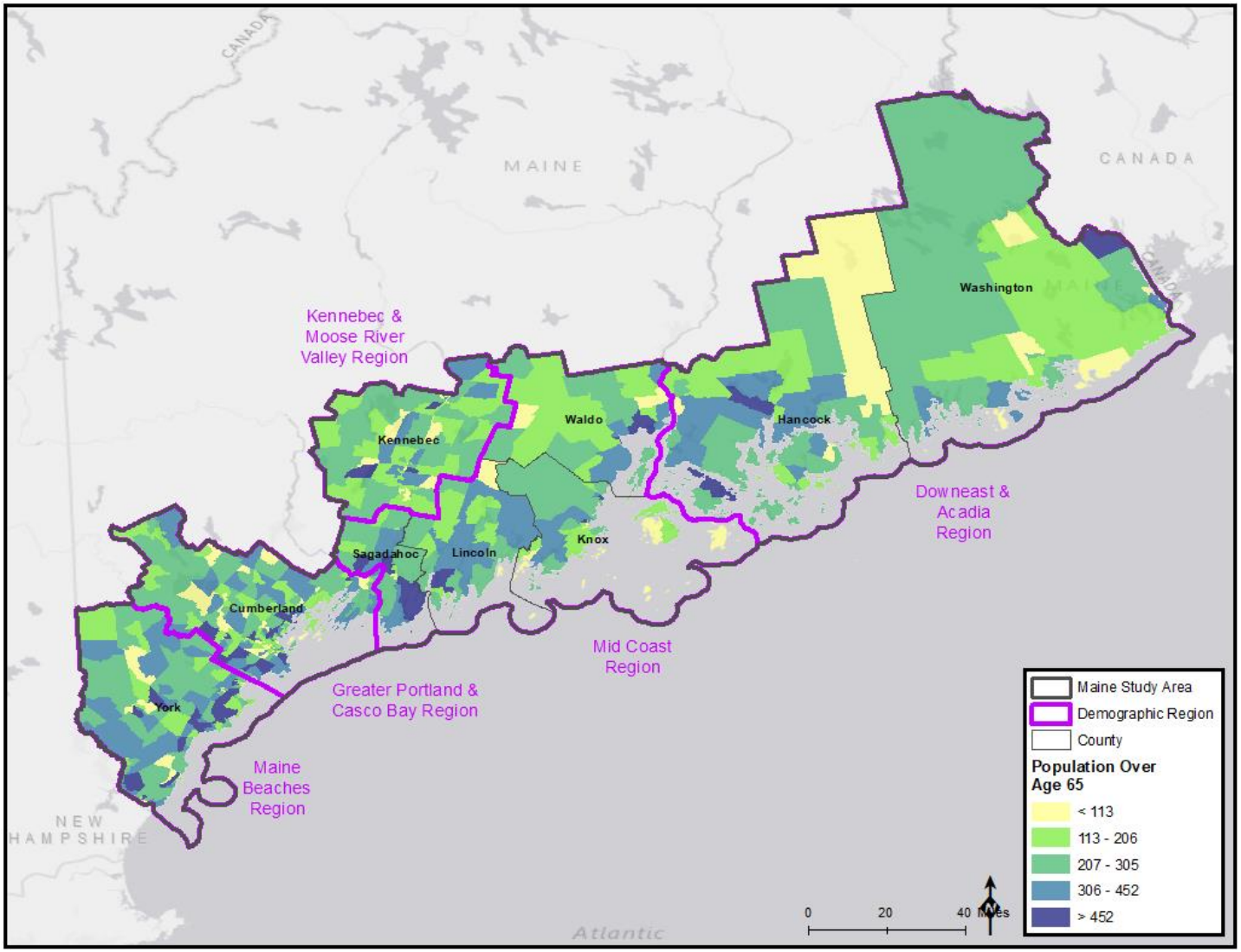
Figure 2-24 and Figure 2-25 show the 2017 estimated population Under Age 5 and Over Age 65, respectively. Figure 2-26 and Figure 2-27 show the projected change in these groups by 2036. Table 2-10 shows age distribution by region for these groups for the 2017 estimated population and 2036 projected population in the U.S., Maine, and the Study Area.

According to 2017 estimates, the population of people "Under Age 5" represented 6.2% of the U.S. population; 4.8% in Maine, and 4.8% in the Study Area. While the number of young children is projected to rise in the U.S. overall, the percentage of this group in comparison to the overall population is projected to decline, reflecting an aging of the general population due to a lower natural increase. Table 2-10 shows the breakdown by demographic region. Projections by the year 2036 indicate a decline in the national percentage to 5.8%, and in the State and Study Area percentages (each to 4.2%). The Mid Coast and Downeast and Acadia regions had the smallest percentage (4.5%) of this population in 2017; a slight increase to 4.6% is projected by 2036 for the Downeast and Acadia region, and a slight decrease (to 4.1%) is projected for the Mid Coast region. For the study area, this is an overall decline of 0.6% in the proportion of the population under age 5 from 2017-2036 (USCB 2017b, USCB 2018b, Governor's Office of Planning and Budget 2019a).



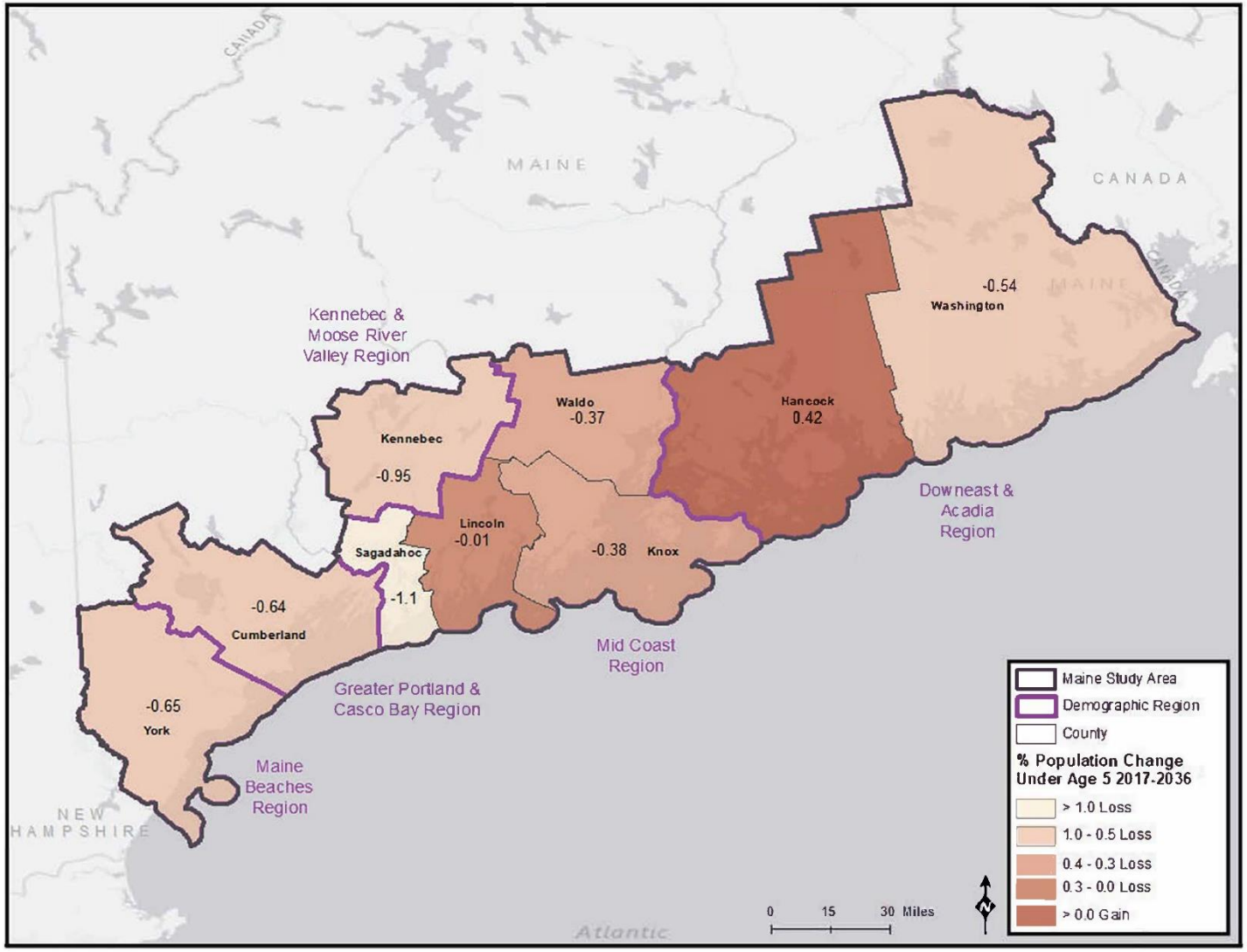
Source: USCB 2017r

Figure 2-24. Population Under Age 5 in the Maine Study Area by Census Block Group



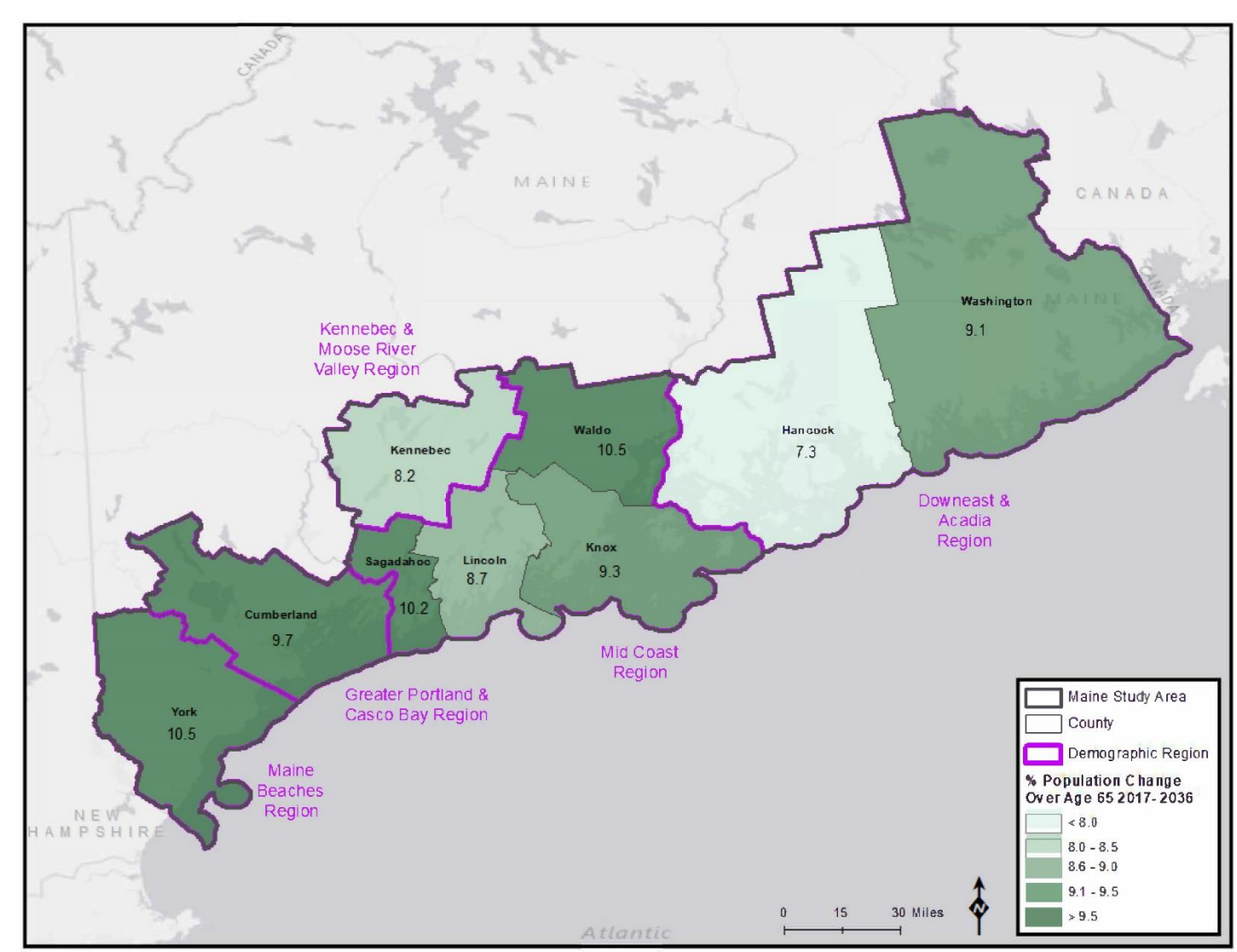
Source: USCB 2017r

Figure 2-25. Population Over Age 65 in the Maine Study Area by Census Block Group



Source: Maine.gov 2019a

Figure 2-26. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Maine Study Area by 2036



Source: Maine.gov 2019a

Figure 2-27. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Maine Study Area by 2036

Table 2-10. Population Under Age 5 and Over Age 65 in the Maine Study Area

Region	Geographic Unit	2017 Estimates					Projected 2036				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2036)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Downeast & Acadia	Hancock	54,468	2,385	4.4	12,158	22.3	54,152	2,598	4.8	16,038	29.6
	Washington	31,822	1,532	4.8	7,218	22.7	29,522	1,261	4.3	9,381	31.8
	Total Downeast & Acadia	***86,290***	***3,917***	***4.5***	***19,376***	***22.0***	***22.5%***	***3,859***	***4.6***	***25,419***	***30.0***
Greater Portland & Casco Bay	Cumberland	***289,173***	***14,157***	***4.9***	***48,521***	***16.8***	***302,944***	***12,892***	***4.3***	***80,347***	***26.5***
Kennebec & Moose River Valley	Kennebec	***121,289***	***6,110***	***5.0***	***22,066***	***18.2***	***118,667***	***4,849***	***4.1***	***31,278***	***26.4***
Maine Beaches	York	***201,454***	***9,533***	***4.7***	***37,461***	***18.6***	***220,651***	***8,997***	***4.1***	***64,328***	***29.2***
Mid Coast	Knox	39,700	1,760	4.4	9,102	22.9	38,080	1,543	4.1	12,274	32.2
	Lincoln	34,021	1,333	3.9	8,761	25.8	29,605	1,156	3.9	10,191	34.4
	Sagadahoc	35,149	1,798	5.1	7,026	20.0	34,994	1,418	4.1	10,564	30.2
	Waldo	39,280	1,818	4.6	7,963	20.3	39,879	1,700	4.3	12,274	30.8
	Total Mid Coast	***148,150***	***6,709***	***4.5***	***32,852***	***22.2***	***142,558***	***5,817***	***4.1***	***45,303***	***31.8***
	Study Area Total	**846,356**	**40,426**	**4.8**	**160,276**	**18.9**	**868,493**	**36,414**	**4.2**	**246,674**	**28.4**
	Maine	**1,330,158**	**64,394**	**4.8**	**250,131**	**18.8**	**1,337,568**	**56,144**	**4.2**	**379,423**	**28.4**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: USCB 2017b, USCB 2018b, ME OPM 2019
Note: U.S. projections are for 2035

According to 2017 estimates, the elderly represented 14.9% of the U.S. population; 18.8% in Maine, and 18.9% in the Study Area. Maine's higher percentage of the elderly indicates an aging population. Table 2-10 shows the breakdown by region. The population of the elderly is projected to rise, fueled by aging Baby Boomers (Maine.gov 2016). By 2036, the population of elderly Americans is projected to increase to 21.4% in the U.S. and 28.4% in the State and the Study Area. Within the Study Area, each region projects an increase in the elderly population. The Downeast and Acadia region had the largest percentage (22.5%) of this population in 2017; a further increase to 30.4% is projected by 2036. For the study area, this is an overall increase of 9.6% in the proportion of the population over age 65 from 2017-2036 (Governor's Office of Planning and Budget 2019a, USCB 2017b, USCB 2018b, Luminary Labs 2019)

2.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 2-11.

As shown in Table 2-11, in 2017 homeownership in Maine was 72.0%, higher than the Nation (63.8%) but slightly lower than the Study Area (72.4%). Renters comprised approximately 28.0% of the State population in 2017, more than the Study Area (27.6%) but less than the Nation (36.2%) (USCB 2017m). This may be attributed to older populations preferring to own their home rather than rent. The percentage of owner-occupied housing was lowest in Cumberland County, indicating a larger number of renters in the populous metropolitan area.

Figure 2-28 illustrates median home value in the Study Area. According to the State of Maine's Department of Administrative and Financial Services November 2019 report, existing single-family home sales in Maine were up 11% in September 2019 as compared to September 2018. Additionally, over the September 2018-August 2019 period, average monthly housing building permits were 9.4% higher than the previous year. The median home price in the State of Maine increased by 3.2% over the same year while, for example, in Cumberland County the median home price increased by 7.2% over that same period. Mortgage delinquency rates in Maine increased by 2.9% in the second quarter of 2019, in contrast to the national rate of 2.6% during that same period. Additionally, the foreclosure rate in Maine was 0.39% during that same quarter of 2019, an increase from 0.26% in the previous quarter (USCB 2017l, State of Maine 2019).

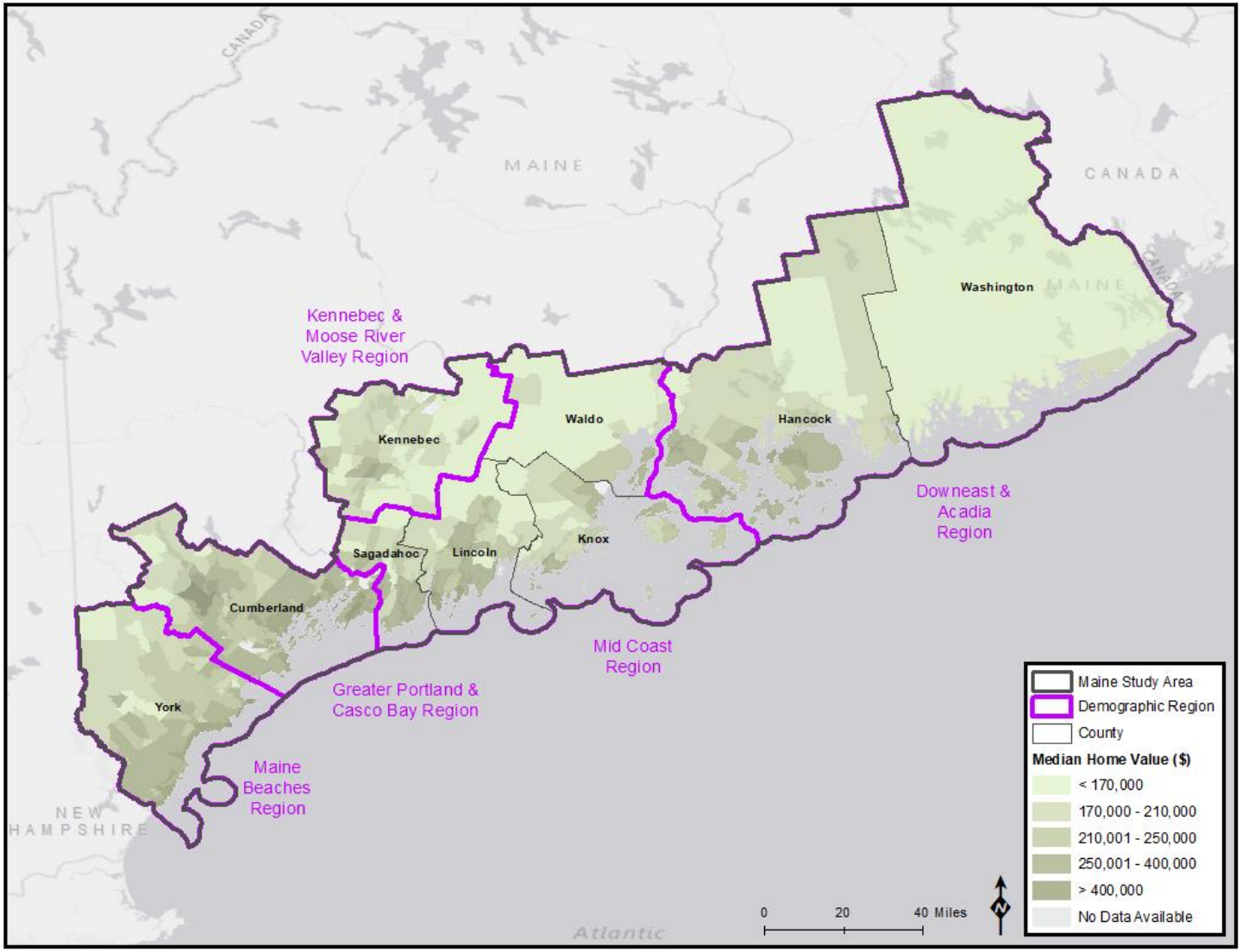
The single family existing-home sales in Maine were up 3.2% in August 2019 compared to the previous year, though the median sales price of single-family homes remained static at $230,000. Single unit housing building permits issued in Maine increased 27% from the previous year in August 2019, though prices did experience a temporary dip over the year. As defined by the Federal Housing Finance Agency, the House Price Index "measures average price changes in repeat sales or refinancing on the same properties" (State of Maine 2019). In the second quarter of 2019, Maine's house price index increased by 4.5% from the same quarter in 2018, demonstrating local growth rates similar to national growth rates and higher than overall New England growth rates. Positive growth in house price indexes throughout the beginning of 2019 were recorded in the larger urban population areas (State of Maine 2019).

A recent property investment brochure stated that although Maine was a somewhat risky state for rental property investment due to a low population growth rate, certain areas and markets were viable. For example, Maine's popularity as a retirement living destination, a large rental market, a growing tourism market, and relatively low home prices make Maine a good area to invest in single family rental properties. Additionally, rents in Portland have increased dramatically between 2000 and 2015, with 97% of rental units renting for over $2000 a month (HomeUnion 2019).

Table 2-11. Housing Utilization and Vacancy Rates in the Maine Study Area

Region	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Downeast & Acadia	Hancock	40,916	23,674	17,242	42.1	17,455	73.7	6,219	26.3	$207,300	$812
	Washington	23,247	14,017	9,230	39.7	10,604	75.7	3,413	24.3	$110,000	$619
	Total Downeast & Acadia	***64,163***	***37,691***	***26,472***	***41.3***	***28,059***	***74.4***	***9,632***	***25.6***	***NA***	***NA***
Greater Portland & Casco Bay	Cumberland	***142,251***	***118,807***	***23,444***	***16.5***	***81,526***	***68.6***	***37,281***	***31.4***	***$259,400***	***$1,029***
Kennebec & Moose River Valley	Kennebec	***62,225***	***51,055***	***11,170***	***18.0***	***35,827***	***70.2***	***15,228***	***29.8***	***$154,500***	***$727***
Maine Beaches	York	***108,609***	***83,324***	***25,285***	***23.3***	***62,103***	***74.5***	***21,221***	***25.5***	***$233,000***	***$926***
Mid Coast	Knox	24,215	17,022	7,193	29.7	12,983	76.3	4,039	23.7	$199,600	$790
	Lincoln	23,833	15,241	8,592	36.1	11,941	78.3	3,300	21.7	$211,900	$761
	Sagadahoc	18,638	15,810	2,828	15.2	11,980	75.8	3,830	24.2	$199,400	$843
	Waldo	22,167	16,954	5,213	23.5	13,427	79.2	3,527	20.8	$159,800	$791
	Total Mid Coast	***88,853***	***65,027***	***23,826***	***41.3***	***50,331***	***77.4***	***14,696***	***22.6***	***NA***	***NA***
	Study Area Total	**466,101**	**355,904**	**110,197**	**23.6**	**257,846**	**72.4**	**98,058**	**27.6**	**$199,600**	**$791**
	Maine	**735,711**	**554,061**	**181,650**	**24.7**	**399,142**	**72.0**	**154,919**	**28.0**	**$179,900**	**$808**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

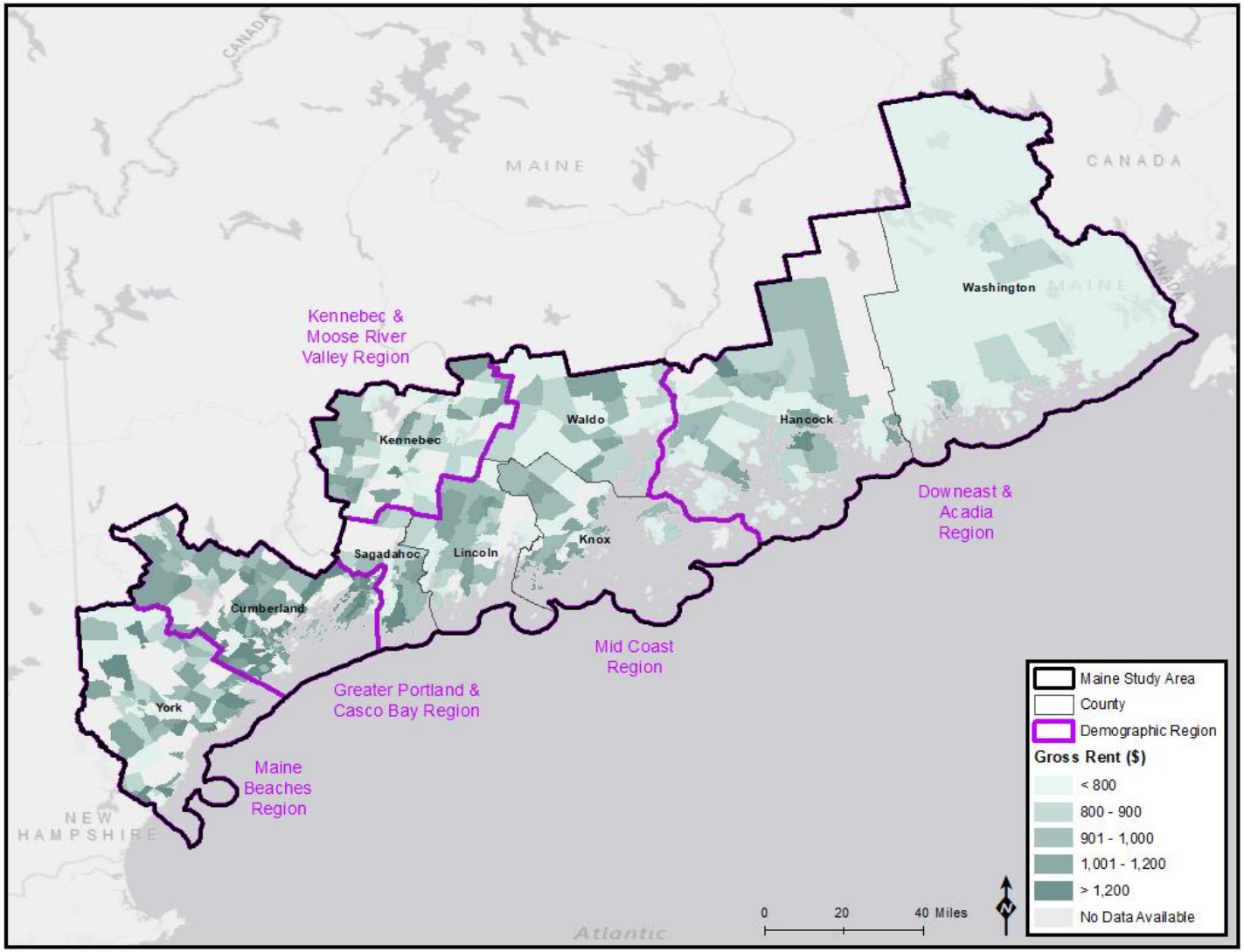
Figure 2-28. Median Home Value in the Maine Study Area by Census Block Group

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Figure 2-29 illustrates median gross rent, indicating the higher rents in the Greater Portland and Casco Bay and Maine Beaches regions. Median rents in Cumberland and York Counties are $1,029 and $926, respectively. Rents are lowest in rural Washington County in the Downeast and Acadia region at $619. Data from the National Low Income Housing Coalition tabulated from 2017 ACS data show that 29.0% of rental households in Maine are considered extremely low income (household income below $24,600 for a 4-person household). The largest demographic types within this category include persons in the labor force, seniors, and disabled persons, a large portion of which are on a fixed income. The Coalition estimates that there is a shortage of over 20,000 affordable rental units across the State and that 53.0% of extremely low-income households have a severe cost burden due to rental prices and availability. A minimum wage worker would have to work more than one full time job in order to afford a one bedroom fair market rate home (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b, USDA 2013).

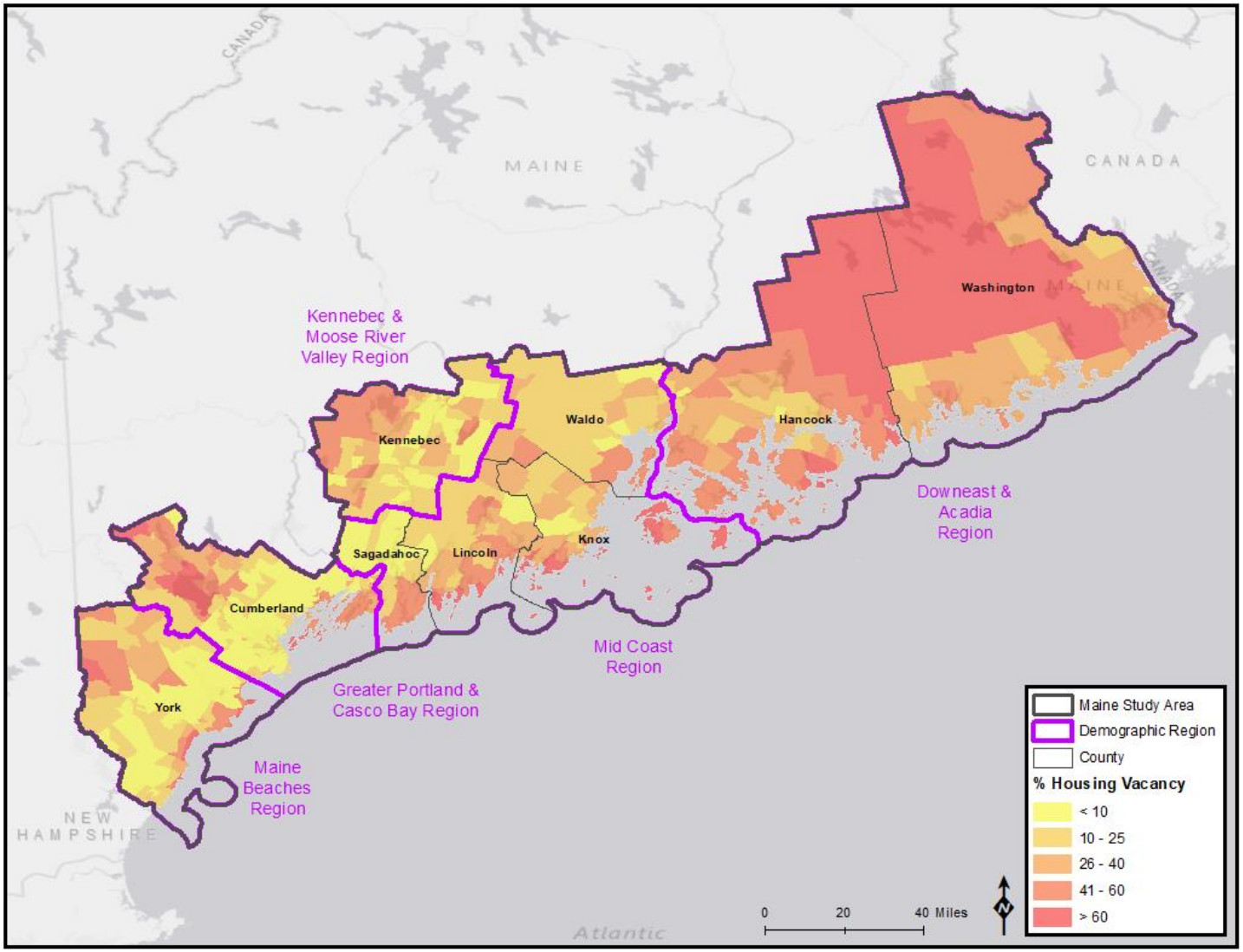
The calculated affordability index compares median income with median home prices. According to the Maine State Housing Authority, the index for the overall State of Maine has been decreasing since 2014, indicating homes are becoming less affordable. Within the Study Area, in 2018, the index ranged from 0.77 in Cumberland and Knox Counties to 1.11 in Franklin and Kennebec Counties. An index of less than one means that homes in the area are generally unaffordable. Only three counties in the Study Area have affordability indices over one. The percentage of households unable to afford the median priced home also rose between 2014 and 2018, from 49.5% to 56.3%. In 2018, within the Study Area, Knox County had the highest percentage of households that could not afford a home (64.1%) with Cumberland and York Counties close behind at 63.3% and 60.0%, respectively. The lowest percentage of households unable to purchase a home was in sparsely populated Washington County (45.3%) (MaineHousing 2018).

As shown in Table 2-11, home vacancy rates in Maine (24.7%) are significantly higher than the Nation's vacancy rates (12.2%) (USCB 2017g). However, the historic trend of rental vacancy rates for Maine published by the St. Louis Federal Reserve Bank indicates current vacancy rates are lower than previous peaks in the early 1990s and the 2008 economic crisis (FRED 2019). Within the Study Area, the lowest vacancy rates are in Cumberland, Kennebec, and Sagadahoc Counties. This is likely due to the presence of the City of Portland and the higher population densities in these counties. The highest vacancy rates are in the less-populated counties of Washington and Hancock. Figure 2-30 shows vacancy rates in the Study Area by census block group. The figure illustrates high vacancy rates along the coast and in the interior of the northern counties (Washington and Hancock), most likely caused by properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals.



Source: USCB 2017r

Figure 2-29. Median Gross Rent in the Maine Study Area by Census Block Group



Source: USCB 2017r

Figure 2-30. Housing Vacancy Rates in the Maine Study Area by Census Block Group

Vacation rentals and short-term rentals are on the rise in Maine as well as in the Nation. Maine is a popular tourist destination; there were 36.7 million tourists to the State in 2017. In 2018, tourist visits increased by 2.5% statewide and 6% in Portland. Statewide, the short-term rental market, including Airbnb, experienced substantial growth in 2017, an increase of 62% in just 1 year (HomeUnion 2019). In the summer of 2018, based on data from Airbnb, Mashvisor similarly reported significant grown in the number of Airbnb listings in the Maine real estate market with 5,000 Airbnb hosts renting to nearly 229,000 Airbnb guests. In 2018, this total represented an increase of approximately 71,000 compared to the summer of 2017. The company further reported that the typical Maine Airbnb host earned $4,800 in rental income in the summer of 2018 (Hamed 2018).

2.4.4 Employment

2.4.4.1 Types of Employment

Employment data by industry sector is presented in Table 2-12. In 2017, the Study Area had a total employment of over 433,000 jobs, representing more than half (65.8%) of the total jobs in the State. Maine had a total employment of over 658,000 jobs, representing 0.4% of the total jobs in the U.S. (USCB 2017p).

Table 2-12. Census Bureau Labor and Industry Statistics for the U.S., Maine, and the Maine Study Area (number of jobs)

Industry	United States	Percent (%)	Maine	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**658,693**		**433,470**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	16,670	2.5	10,212	2.4
Construction	9,564,541	6.4	44,995	6.8	28,728	6.6
Manufacturing	15,477,389	10.3	60,167	9.1	38,547	8.9
Wholesale trade	4,042,867	2.7	14,776	2.2	10,251	2.4
Retail trade	17,167,000	11.4	86,841	13.2	55,580	12.8
Transportation and warehousing, and utilities	7,681,579	5.1	24,306	3.7	14,087	3.2
Information	3,173,300	2.1	11,847	1.8	8,441	1.9
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	40,099	6.1	29,552	6.8
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	57,940	8.8	42,839	9.9
Educational services, and health care and social assistance	34,781,348	23.1	183,400	27.8	116,190	26.8
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	58,892	8.9	39,838	9.2
Other services, except public administration	7,371,226	4.9	30,488	4.6	20,180	4.7
Public administration	7,025,870	4.7	28,272	4.3	19,025	4.4

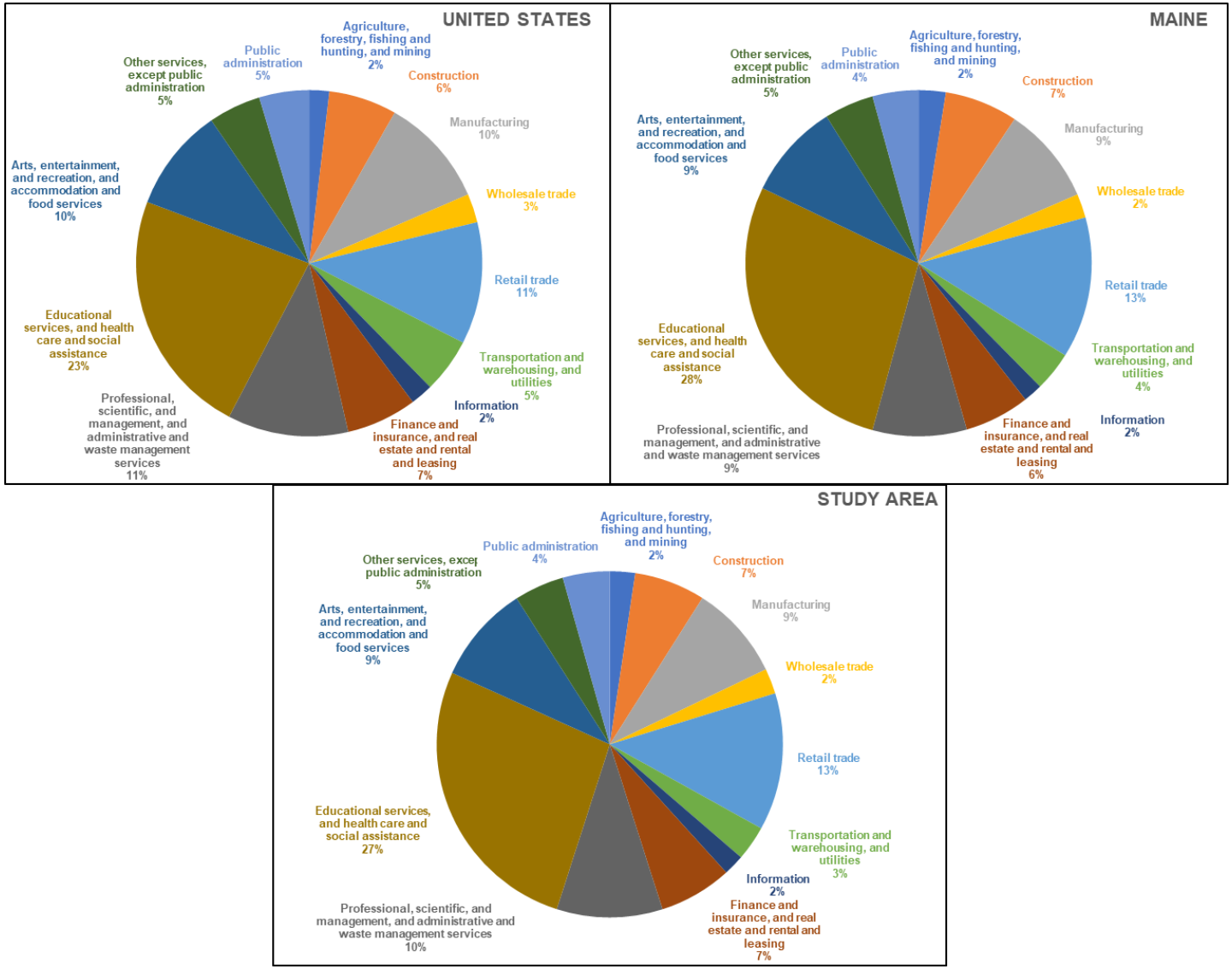
Source: USCB 2017p

Maine's 2018 Annual Gross Domestic Product was 64.8 billion, which represented 0.3% of the Nation's gross domestic product (BEA 2019). Maine has experienced a transition in recent decades in terms of the top industries, as measured by employment, in the State. Previously, the State's leading industries were shipbuilding and papermaking with agriculture and fishing also of significant importance. While these industries are still present within the State, they are no longer as extensive as they were previously. As of 2015, Maine was still home to one of the Nation's largest ship manufacturers, and still produced more paper, farmed more wild strawberries, and caught more lobster than most other States combined. Maine's Bath Iron Works (shipbuilding) has been in business since 1884 and is the largest private employer in the State (City of Bath 2019). Maine's manufacturing industry employs 8.3% of Maine's workforce, and has increased steadily from 2015 to 2017 (NAM 2019). The top sectors for manufacturing job growth in Maine in 2018 were aerospace products and parts and lumber product manufacturing (NAM 2019). Agriculture in Maine comprises of livestock, crops of potatoes and hay, and wild blueberries (USDA 2019f). The State also boasts a thriving aquaculture industry that is due in part to almost 3,500 miles of coastline and rich marine past (MaineDOT 2019a).

However, there has been a shift away from these industries that involve making goods towards more service-based industries such as technology and tourism. As of 2015, Maine's top five industries were health care, retail, tourism, education services, and construction (Staggs 2015). As shown in Table 2-12 and Figure 2-31, similar industry sectors dominated the Study Area in 2017: educational services; and health care and social assistance (27.8%); retail trade (13.2%); manufacturing (9.1%); arts, entertainment, and recreation; and accommodation and food services (8.9%) (USCB 2017p). Maine's healthcare system accounts for 15% of all people working in Maine, and the system is equipped with a workforce to support itself and the growing needs of an aging State population (MHA 2018). The retail industry is the number one private industry employer in Maine, and the third largest contributor to the State's gross domestic product. Manufacturing output has increased in Maine, with aerospace/transportation equipment and wood/paper products as the top two manufacturing sectors (NRF 2014).

In 2000, the Maine State Chamber of Commerce and Maine Development Foundation collaborated to produce *Making Maine Work: Critical Investments for the Maine Economy*. That report contained 12 recommendations for consideration by the candidates for State office. During the intervening years, additional Making Maine Work reports were produced to address other critical issues such as preschool education, the role of the university system, workforce growth, workforce skills, and immigration. As mentioned previously, Maine is also experiencing an aging population. In fact, in 2016-2017, Maine and West Virginia were the only two States in the country that had more deaths than births. Maine has a decreasing proportion of working area adults to seniors; meaning the State has many more people approaching retirement than young people approaching the age to enter the workforce. Based on the population projections described previously, this discrepancy is only going to continue to grow. While Maine's workforce grew by more than 20% per decade in the 1960s and 1970s, it has been in a steady decline since that time growing by around 10% per decade during the 1980s and 1990s to around 1-2% in the current decade. Projections are the workforce will remain essentially flat in the decade to come (Maine Chamber of Commerce 2018).

Maine's current and projected future demographic composition creates some workforce challenges for the local businesses and industries. With a strong economy, a lack of workers to fill all available jobs, competition for the available workers is strong and unemployment is near a record low in the State. Workforce shortages across all industries are driving companies to try creative ways to attract new hires. Evidence of net-migration in addition to Maine's continued employment growth show some progress on this front, though most much of the economic activity and population growth in recent years has been in the urban centers of southern Maine (Maine State Economist 2018).



Source: USCB 2017p

Figure 2-31. Number of Jobs by Industry Sector for the U.S., Maine, and the Maine Study Area

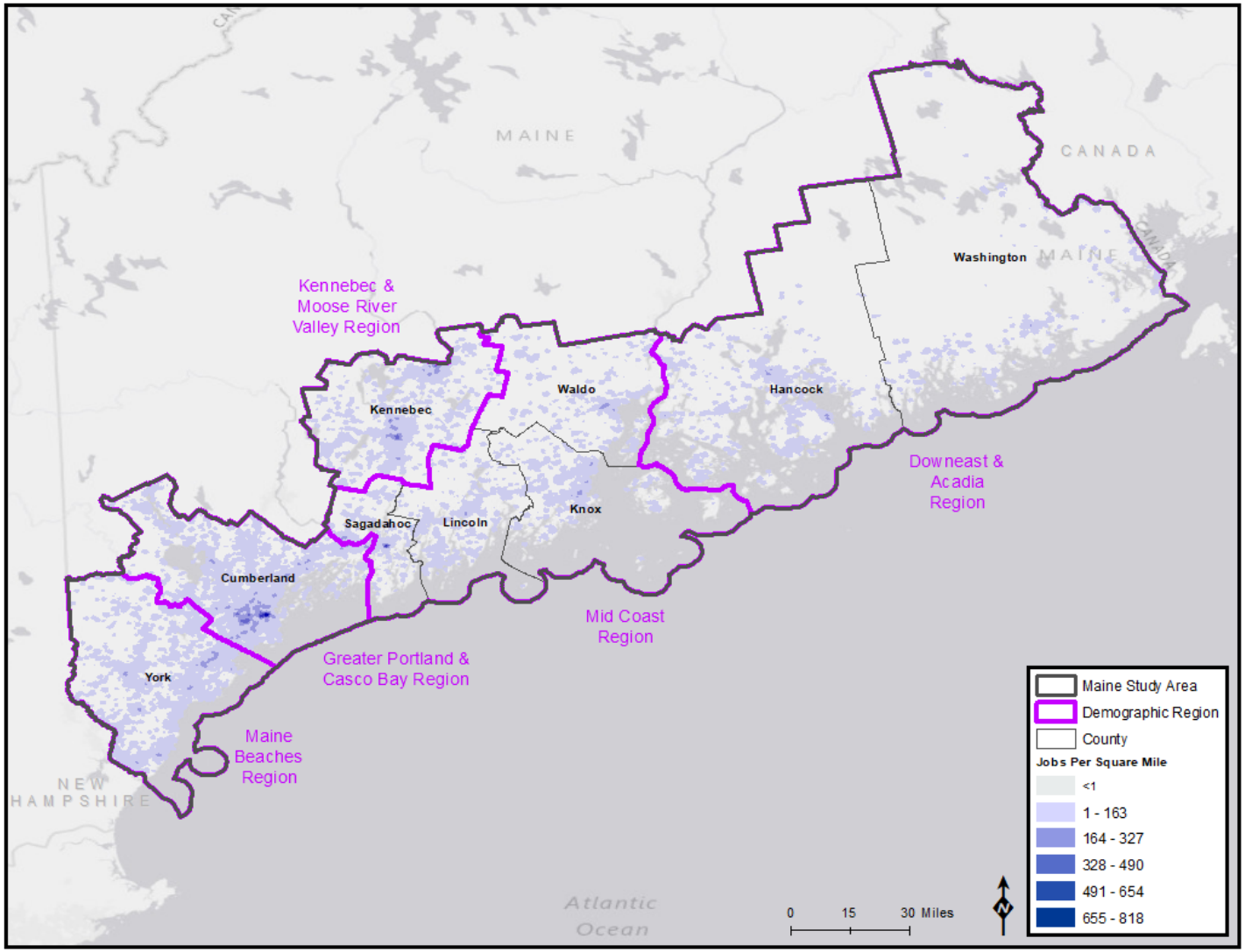
Maine's State Workforce Development Board developed the State of Maine 2020-2023 Unified State Plan, a 4-year strategic and operational plan for workforce development. The State Workforce Development Board is part of Maine's Workforce Development System, which includes other State agencies such as the Department of Health and Human Services, the Department of Education, Adult Education, and College and University System, and employers. The plan includes a wide array of initiatives offered by the State, private employers, and educational institutions that serve as job pipelines. Innovative approaches using industry sector strategies and career destination marketing are employed to attract new and former residents, as well as immigrants to Maine (Schreiber 2019, Maine.gov 2017).

The Maine Center for Economic Policy released a report on the State of Maine's workforce in 2017 (MECEP 2017). The State has failed to recover from the Great Recession (which lasted from 2007 to 2009) as quickly as other parts of the Nation (Rich 2013). While statewide economic growth has been limited, the report authors conclude the that regional differences have contributed to the issue. The report discusses what has come to be known as the "two Maines." Economic growth has been consistent, if slow, in the Greater Portland metropolitan area. However, in the other, less urban parts of the State, the economy has essentially been in freefall over the past decade. Rural parts of the State historically had a greater dependency on the large manufacturers that have downsized or closed. At the same time, the State's economic center has increasingly shifted toward Portland. There has been a corresponding shift in residents as well, with migration from rural areas to the urban centers, thus depleting the workforce in the rest of the State. Some parts of rural Maine fare better than others. For example, the Central-Midcoast area of Maine has experienced less economic challenges than in the "Rim Counties," which border Canada and New Hampshire. These differences can be attributed to several anchor cities in the Central-Midcoast area as well as the presence of the University of Maine's flagship campus at Orono, other colleges, and the State government in Augusta. The Midcoast also has a significant tourism sector and receives modest in-migration of retirees from other States. The Rim Counties are more sparsely populated with industries historically focused on natural resources (particularly wood products). Crumbling transportation infrastructure and the need for updated communications networks also undermine the potential for new business and tourism in the Rim Counties (MECEP 2017). Within the Study Area, only Washington County is considered part of the Rim Counties.

Figure 2-32 shows the location of jobs within the Study Area. There are more jobs in counties with high density populations near the Portland metropolitan area. Job distribution is sparse in rural areas, such as Washington and Hancock Counties. Rural areas tend to have fewer locally available options and less economic development. Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services (USCB 2017i, USDA 2013).

2.4.4.1.1 Maine's Ocean Economy

Overall, Maine's ocean economy ranked ninth in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 2-13, Maine's ocean economy accounted for 58,161 maritime jobs, accounting for 9.9% of Maine's employment. Within the State, 62.2% of maritime jobs were in the tourism and recreation sector. The sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b, USCB 2017i, NOAA 2019d).



Source: USCB 2017r

Figure 2-32. Jobs per Square Mile in the Maine Study Area by Census Block Group

Table 2-13. Employment Data in the Maine Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Downeast & Acadia	Hancock	28,199	28,125	26,527	1,598	5.7	19,997	6,236	31.2	$51,438	$31,178
	Washington	14,046	13,981	12,881	1,100	7.9	9,344	2,640	28.3	$40,328	$24,311
	Total Downeast & Acadia	***42,245***	***42,106***	***39,408***	***2,698***	***6.4***	***29,341***	***8,876***	***30.3***	***$45,883***	***$27,745***
Greater Portland & Casco Bay	Cumberland	***164,354***	***163,894***	***157,303***	***6,591***	***4.0***	***184,061***	***19,182***	***10.4***	***$65,702***	***$36,780***
Kennebec & Moose River Valley	Kennebec	***62,014***	***61,867***	***58,332***	***3,535***	***5.7***	***59,035***	***0***	***0.0***	***$50,116***	***$27,336***
Maine Beaches	York	***111,191***	***110,674***	***105,307***	***5,367***	***4.8***	***63,258***	***14,652***	***23.2***	***$62,618***	***$33,635***
Mid Coast	Knox	20,562	20,523	19,568	955	4.7	17,014	4,311	25.3	$53,117	$29,806
	Lincoln	17,212	17,171	16,588	583	3.4	10,131	2,644	26.1	$54,041	$31,522
	Sagadahoc	19,096	19,052	18,266	786	4.1	16,080	6,764	42.1	$60,457	$32,947
	Waldo	20,087	19,995	18,698	1,297	6.5	11,555	1,469	12.7	$50,162	$27,763
	Total Mid Coast	***76,957***	***76,741***	***73,120***	***3,621***	***4.7***	***54,780***	***15,188***	***27.7***	***$54,220***	***$30,586***
	Study Area Total	**456,761**	**455,282**	**433,470**	**21,812**	**4.8**	**390,475**	**57,898**	**14.8**	**$54,220**	**$30,586**
	Maine	**697,342**	**695,483**	**658,693**	**36,790**	**5.3**	**585,901**	**58,161**	**9.9**	**$53,024**	**$29,886**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n

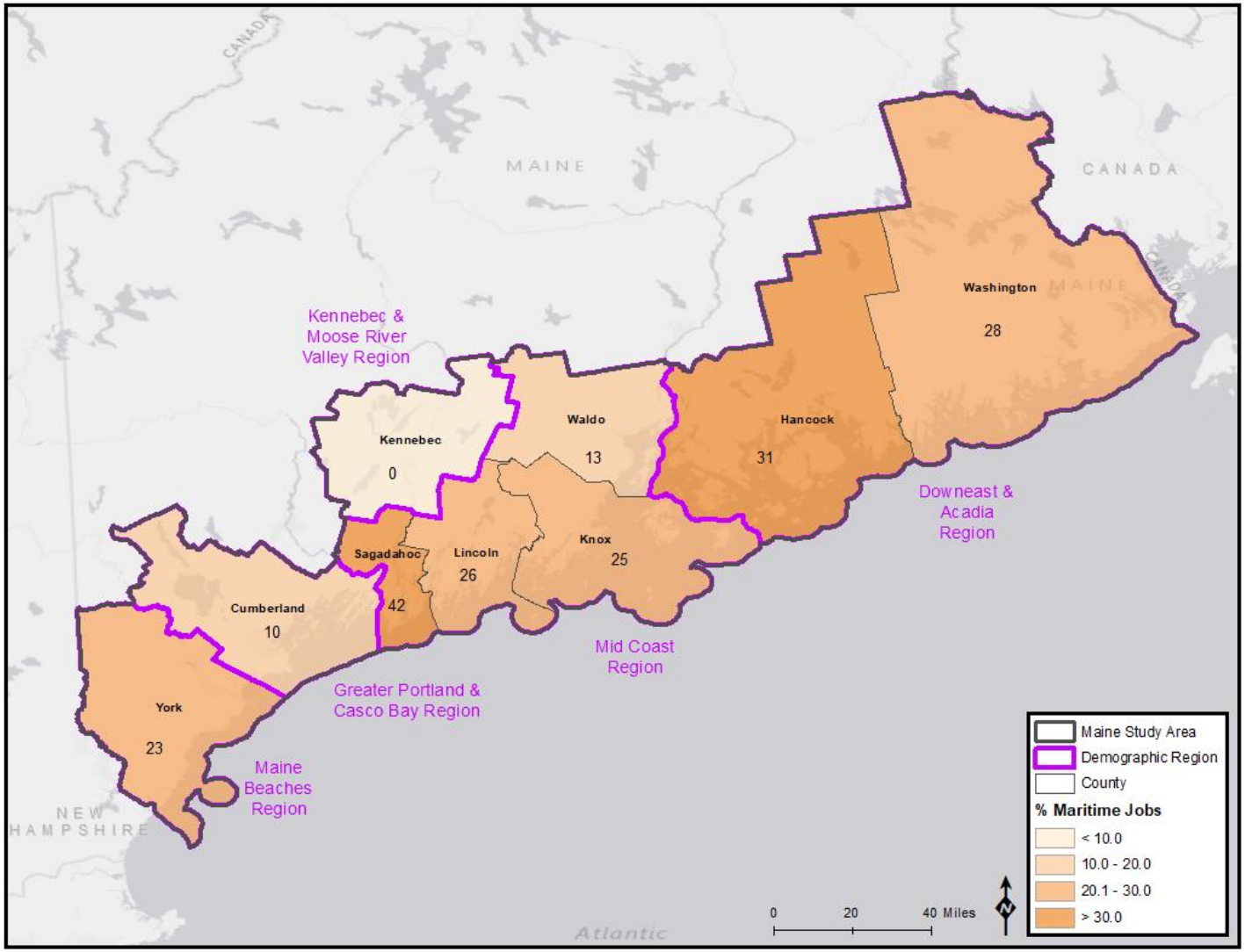
As shown in Table 2-13, the Study Area had 57,898 maritime jobs, representing 99.6% of total maritime jobs in the State. Cumberland County had the greatest number of maritime jobs (19,182), representing 32.9% of maritime jobs in the Study Area. Counties with more than 10,000 maritime jobs were Cumberland (19,182) and York (14,652). At a regional level, Maine's southernmost regions, i.e., Greater Portland and Casco Bay and the Maine Beaches, had the greatest number of maritime jobs at 19,182 and 15,188, respectively. Figure 2-33 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. The highest percentage of maritime jobs to overall county jobs were in Sagadahoc (42.1%) and Hancock (31.2%) Counties, indicative of less economic diversity in rural areas (USCB 2017h, USCB 2017i, USCB 2017k, USCB 2017n, NOAA 2016b).

2.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 2-13, Maine lags behind the U.S. in both median household income and per capita income (USCB 2017k, USCB 2017n). According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, Maine had a median income of $53,024 (8.7% lower than the Nation's median income) and a per capita income of $29,886 (4.1% lower than the Nation's per capita income). Median and per capita income in the Study Area is slightly higher than the State at $54,220 and $30,586, respectively (USCB 2017g, USCB 2017i).

Maine's aging population also impacts income levels. According to a 2017 report by the Maine Center for Economic Policy, in 2001, just one in five Maine residents between the ages of 65 to 74 was in the labor force; by 2016, that proportion had risen to one in three. This can partially be explained by the phenomenon of modern "retirement," in which most Americans have to continue working as long as possible because they have inadequate retirement benefits. In Maine, 53% of seniors have no retirement income beyond Social Security. The average Social Security income for these individuals is less than $19,000 a year. This situation is a problem nationwide because of the shift in traditional benefits provided by employers to workers throughout the later decades of the twentieth century. For example, fewer than one in five (18%) of private-sector workers in the Nation was able to participate in a defined-benefit retirement plan in 2016. Additionally, one in three (34%) had no access to any kind of retirement plan through their employer (MECEP 2017).

The decline of certain industries particularly in rural Maine has led to decline in middle-class jobs and a corresponding decline in the number of jobs that pay a living wage. Researchers from the Massachusetts Institute of Technology conducted an evaluation of living wages in 2016. The living wages the MIT team cited are based on a 40 hour-per-week, 52 weeks-per-year work schedule, and include the costs of food, housing, childcare, health insurance, transportation, and other basic necessities. According to the researchers, in 2016, the living wage for a Maine family varied from $10.33/hour for a single person living alone to $22.34/hour for a single parent. This research is supported by data from the US Census Bureau, which show that in 2017, 38% of Mainers lived in households in which wage-earners did not make this living wage. For many Mainers, jobs did not support a basic standard of living, and according to this research, close to one in three of Maine's working families lived below, or near, the poverty line. The situation for low-income workers in Maine will be discussed in further detail in Chapter 2.4.5.1.2. These issues are most evident in Maine's Rim Counties (the interior rural areas – including only Washington County for the Study Area) (MECEP 2017, USDA 2013).



Source: USCB 2017r

Figure 2-33. Maritime Jobs in the Maine Study Area by County

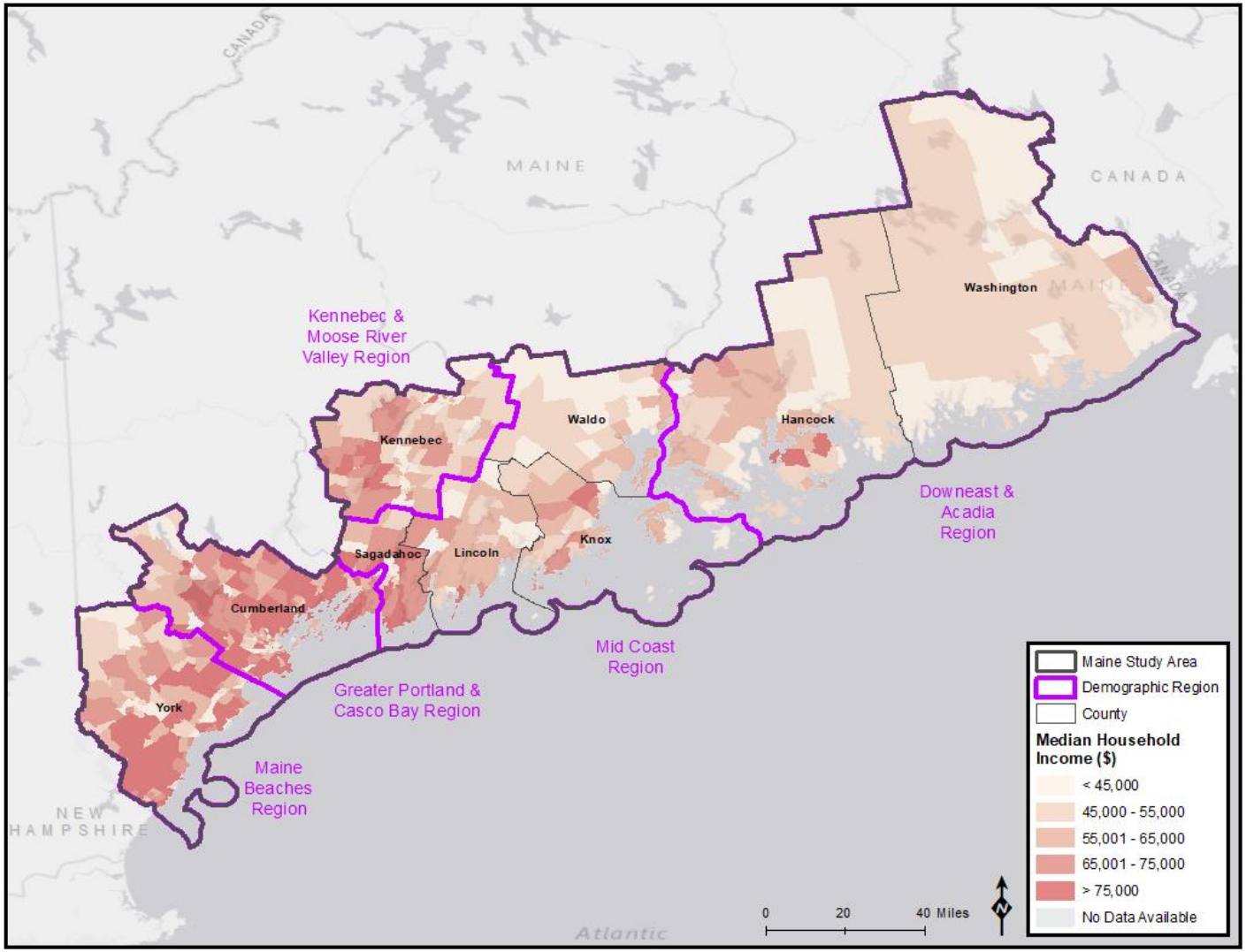
Maine, in concert with the rest of the U.S., has experienced wage stagnation/inequality in wage growth in recent years. Between 2002 and 2016, while real wages for the highest paid 10% of workers rose over 8%, wages for Mainers in the middle of the income distribution increased just 3%, and in other large sectors of the population wages fell, including by as much as 3% for the lowest-earning 10% of the workforce. This inequality in wage growth prevents spending by the lowest-earning workers, who happen to be the ones most likely to spend additional earnings locally on goods and services; thus, the overall effect is an undermining of the economy. The highest wage earners also can grow their income through investments, which are taxed at lower rates than wage income. After the Great Recession, the Dow Jones stock index doubled, further widening the income gap between these groups. According to the Maine Center for Economic Policy, approximately 31% of all real household income growth between 2012 and 2015 went to the wealthiest 5% of Maine households, while the poorest 25% of households realized just 0.2% of the total income growth (MECEP 2017).

Figure 2-34 and Figure 2-35 show median household and per capita income in the Study Area, respectively. The figures portray higher incomes in the southern part of the State near and within the city of Portland and the Portland-South Portland, Maine MSA which encompasses Sagadahoc, York and Cumberland Counties. Median household and per capita income are lower in the rural counties in northern part of the study area (USCB 2017k, USCB 2017n).

2.4.4.3 Unemployment Rates

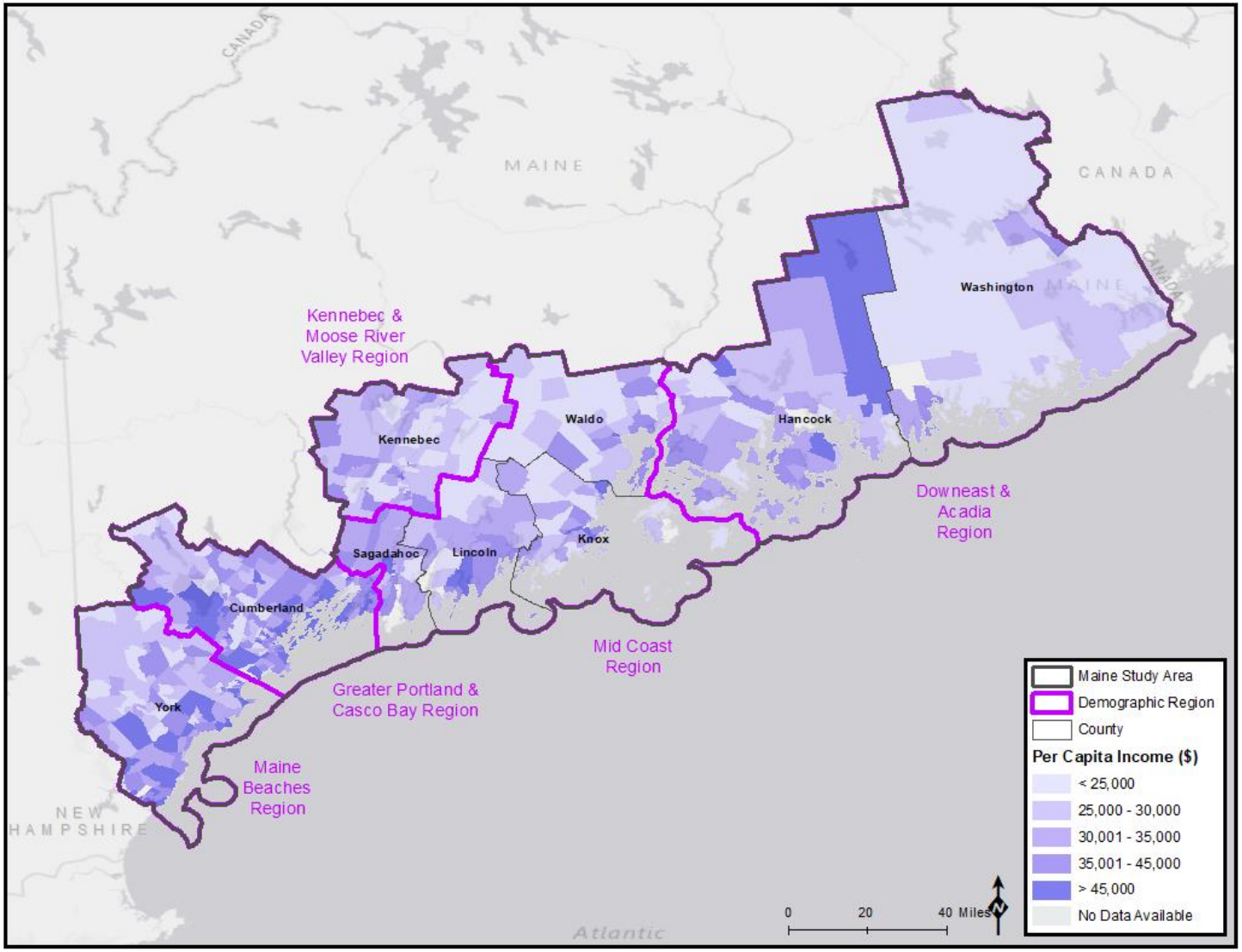
Figure 2-36 shows the 2017 unemployment rates in the counties of the Study Area by census block group. The average unemployment rate in the Study Area was 4.8%, similar to the State (5.3%) and slightly lower than the Nation (6.6%). Unemployment rates ranged from 3.4% in Lincoln County to 7.9% in Washington County. Table 2-13 presents unemployment rates for each county in the Study Area grouped by demographic region (USCB 2017h).

In a 2017 report by the Maine Center for Economic Policy, analysts stated that the labor force participation rate among prime-age workers, those whom economists define as age 25 to 54, has fallen dramatically in Maine, from 87% in 2001 to 82% in 2017. This change represents 30,000 Mainers of working age who are no longer participating in the economy. Typical unemployment rates as reported in the media, only includes individuals who actively sought work in the last four weeks. Were the unemployment numbers to include the 30,000 working age individuals who have left the labor force entirely, Maine's unemployment rate would be twice as high as it is today. As described in Chapter 2.4.4.2, many workers in Maine and elsewhere in the U.S. are remaining in the workforce well into their 60s and 70s. Therefore, the definition of "prime-age workers" may need to be reexamined in future analyses to better understand unemployment rates. Meanwhile, businesses in Maine struggle to find the skilled workers they need to sustain and expand their operations. This demonstrates that unemployment statistics cannot be the sole metric used to analyze the strength of the economy. For in Maine, there is a paradox between the current unemployment rate being one of the lowest on record while the economy as a whole is in actuality facing numerous challenges (MECEP 2017).



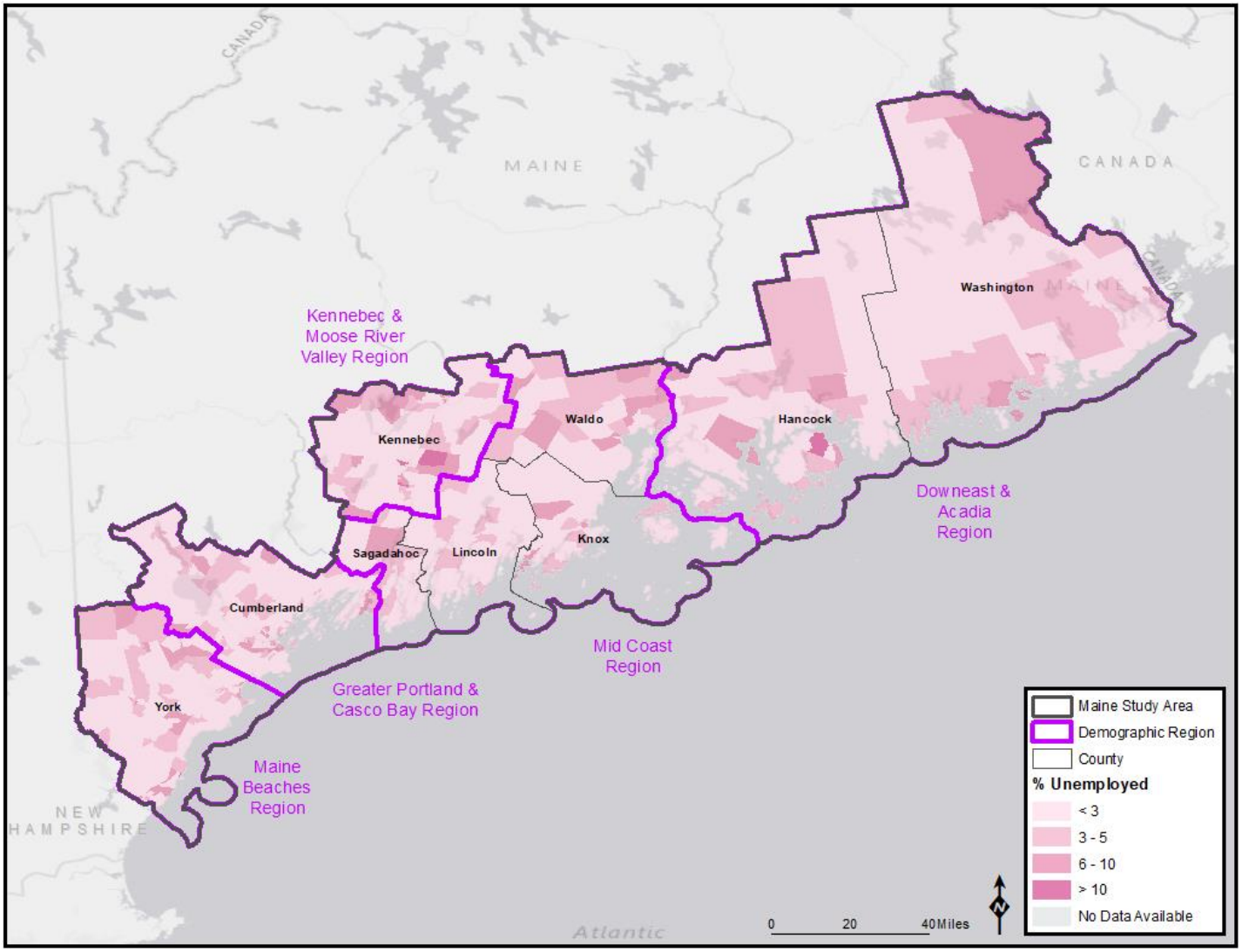
Source: USCB 2017r

Figure 2-34. Median Household Income in the Maine Study Area by Census Block Group



Source: USCB 2017r

Figure 2-35. Per Capita Income in the Maine Study Area by Census Block Group



Source: USCB 2017r

Figure 2-36. Unemployment Rates in the Maine Study Area by Census Block Group

According to the report, the quality of the available jobs is inadequate to meet the needs of many middle-class workers. Middle-class jobs that can support a family and require relatively little training or education have decreased significantly and been replaced by low-wage jobs, largely in the service, retail, and the tourism sector. Since 2001, Maine has lost a net of 37,000 middle-class jobs, mostly in manufacturing, that have not been replaced by equivalent opportunities. There has been limited growth in high-wage jobs; however, many of these jobs (in sectors like education, health care, and technology) require training, education, or experience, which limits the ability of former manufacturing workers to access them. The loss of these middle-class jobs has hit hardest in rural Maine, where even low-wage jobs have not replaced all the losses in manufacturing and other industries (MECEP 2017). Within the Study Area, only Washington County is considered part of rural Maine.

As described above, Maine has experienced rises in long-term unemployment (or labor-force nonparticipation) and poverty. There has been a steady increase in poverty rates outside the Greater Portland since 2001. According to the Main Center for Economic Policy, between 2001 and 2015, people living in poverty rose from 14% to 18% in the rural counties and from 10% to 13% in Central-Midcoast Maine. Only in the Greater Portland area has the percentage of Mainers living below the poverty line fallen in recent years, from a high of 11% in 2011 to 10% in 2015. While it is common for families to move in and out of poverty due to volatile working conditions, in Maine, the data suggest that the persistence of high poverty rates and decreased participation in the labor force are becoming a long-term issue. Between 2006 and 2017, the labor force shrunk and the percentage of working-age Mainers no longer participating in the workforce grew. According to the report, in 2017, one in eight Mainers of typical work-age reported they had been out of work for more than five years. The longer a worker is out of the workforce, the harder it will be for them to return to work in the future due to changes in expectations of experience from employers in addition to changes in technology. Studies cited in the Maine Center for Economic Policy report have found that the probability of finding a job decreases by 50% after just eight months of unemployment (MECEP 2017).

2.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 2-14 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate’s degree, bachelor's degree, and graduate degree in counties comprising the Study Area, the State, and the Nation (USCB 2017t).

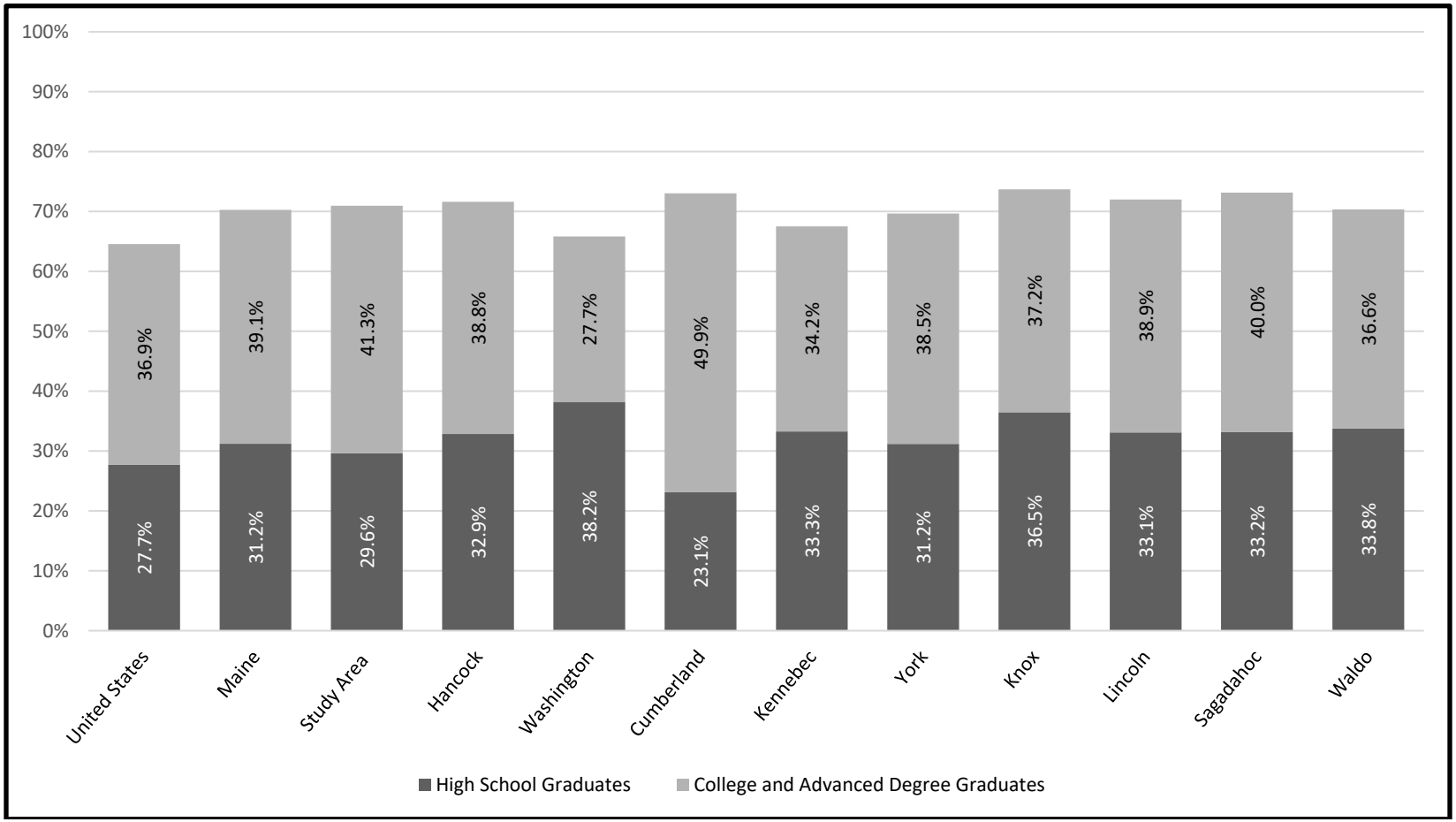
Figure 2-37 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (i.e., associates, bachelor’s, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Maine, 31.2% of the working-age population earned only a high school diploma; 39.1% earned a college or advanced degree.
- In the Study Area, 29.6% of the working-age population earned only a high school diploma; 41.3% earned a college or advanced degree (USCB 2017q).

Table 2-14. Educational Attainment in the Maine Study Area

Region	Geographic Unit	Number							Total	Percent						
		Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less Than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Downeast & Acadia	Hancock	809	1,983	14,758	9,964	3,631	8,358	5,422	44,925	1.8	4.4	32.9	22.2	8.1	18.6	12.1
	Washington	1,090	2,124	9,847	5,603	2,129	3,314	1,695	25,802	4.2	8.2	38.2	21.7	8.3	12.8	6.6
	Total Downeast & Acadia	***1,899***	***4,107***	***24,605***	***15,567***	***5,760***	***11,672***	***7,117***	***70,727***	***2.7***	***5.8***	***34.8***	***22.0***	***8.1***	***16.5***	***10.1***
Greater Portland & Casco Bay	Cumberland	***3,626***	***9,679***	***53,897***	***49,602***	***19,112***	***62,333***	***34,943***	***233,192***	***1.6***	***4.2***	***23.1***	***21.3***	***8.2***	***26.7***	***15.0***
Kennebec & Moose River Valley	Kennebec	***3,164***	***5,563***	***32,396***	***22,901***	***9,214***	***15,172***	***8,958***	***97,368***	***3.2***	***5.7***	***33.3***	***23.5***	***9.5***	***15.6***	***9.2***
Maine Beaches	York	***3,965***	***8,244***	***50,542***	***36,966***	***15,294***	***31,918***	***15,097***	***162,026***	***2.4***	***5.1***	***31.2***	***22.8***	***9.4***	***19.7***	***9.3***
Mid Coast	Knox	394	1,884	11,826	6,255	2,830	6,007	3,227	32,423	1.2	5.8	36.5	19.3	8.7	18.5	10.0
	Lincoln	538	1,688	9,335	5,671	2,123	5,118	3,734	28,207	1.9	6.0	33.1	20.1	7.5	18.1	13.2
	Sagadahoc	389	1,178	9,390	6,040	2,279	5,827	3,222	28,325	1.4	4.2	33.2	21.3	8.0	20.6	11.4
	Waldo	575	1,793	10,710	7,032	2,659	5,817	3,112	31,698	1.8	5.7	33.8	22.2	8.4	18.4	9.8
	Total Mid Coast	***1,896***	***6,543***	***41,261***	***24,998***	***9,891***	***22,769***	***13,295***	***120,653***	***1.6***	***5.4***	***34.2***	***20.7***	***8.2***	***18.9***	***11.0***
	Study Area Total	**14,550**	**34,136**	**202,701**	**150,034**	**59,271**	**143,864**	**79,410**	**683,966**	**2.1**	**5.0**	**29.6**	**21.9**	**8.7**	**21.0**	**11.6**
	Maine	**25,574**	**61,884**	**337,497**	**234,069**	**100,214**	**204,720**	**117,747**	**1,081,705**	**2.4**	**5.7**	**31.2**	**21.6**	**9.3**	**18.9**	**10.9**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 2-37. High School, College, and Advanced Degree Graduate Rates in the Maine Study Area

As shown in Table 2-14, in all counties within the Study Area, the percentage of workers earning only a high school diploma is less than the national average. The same is true for all but Washington County with regard to workers with only some high school. All but Cumberland County exceed the national percentage of workers with only a high school degree. Kennebec County slightly exceeds the national percentage of workers with only some college while all other counties in the Study Area have a slightly lower percentage. All counties in the Study Area exceed the national percentage of workers with only an associate's degree. For workers with a bachelor's degree only, Washington and Kennebec Counties both have a lower percentage than the Nation. The other counties exceed the national percentage with Cumberland County, at 26.7% exceeding by over 8%. For workers with a graduate or professional degree, Washington County falls under the national percentage while all other counties exceed the Nation with Cumberland County exceeding by the greatest margin. These results are consistent with Washington County's other characteristics. Washington County is located the farthest north and has the lowest urban and job density in comparison to the other counties within the Study Area.

Figure 2-38 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

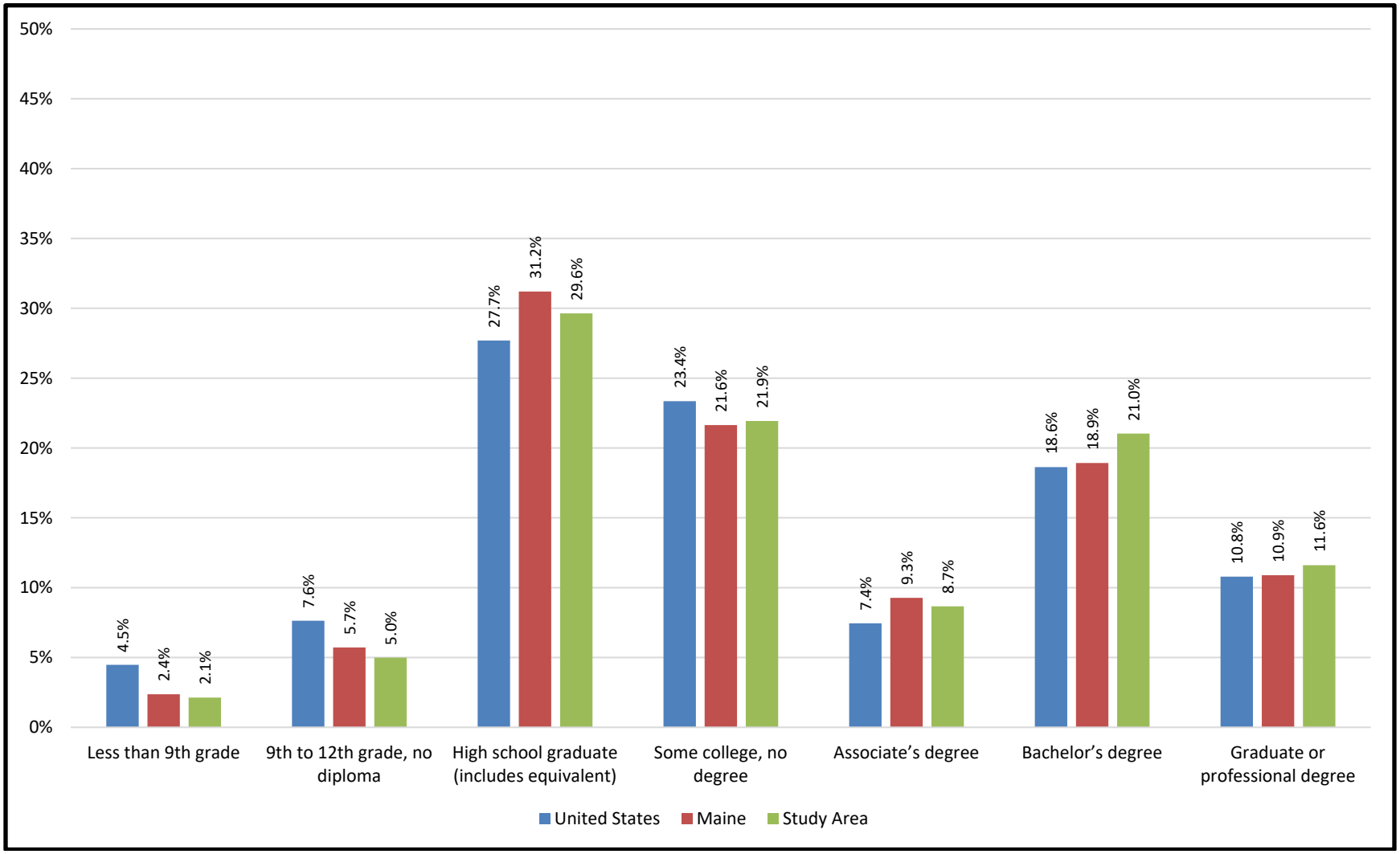
Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

2.4.5 Vulnerable Populations

As described in Chapter 1.6.5, identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with development on the OCS. Chapter 1.6.5.2 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are listed below.

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the CEQ and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3), including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.



Source: USCB 2017q

Figure 2-38. Educational Attainment in the Maine Study Area

2.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 2-39 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898. There are no overlapping areas of minority and low-income block groups in the Study Area.

2.4.5.1.1 Minority Populations

As compared to all Study Areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Maine Study Area has strikingly small minority populations. Even though the populations are small in comparison, the Maine Study Area contains minority populations subject to consideration as potential environmental justice communities of concern.

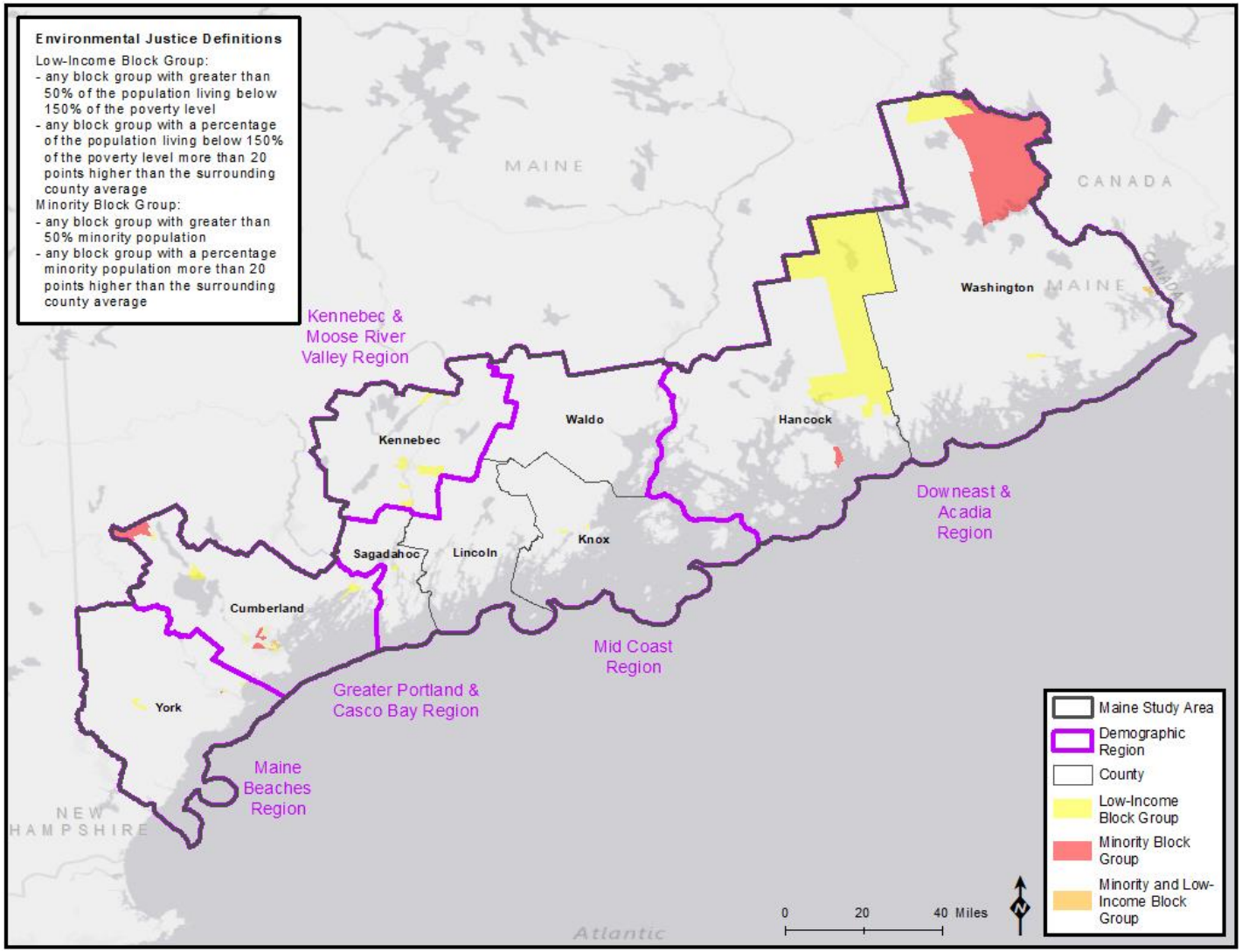
Table 2-15 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 846,356 people living in the Study Area, approximately 56,297 (6.7%) are minority; this is consistent with the State (6.4%) and significantly lower than the Nation (38.5%). Therefore, the Study Area contains a small percentage of sensitive populations subject to environmental justice consideration. Of the 676 census block groups in the Study Area, approximately 1.8% (12 census block groups) are considered minority populations. Within the overall Study Area the largest minority group is Black or African-American (1.4%) followed by Asian (1.3%) (USCB 2017f).

Counties with the highest percentages of minority populations in census block groups are Washington (5.7%), Cumberland (3.8%) and Hancock (2.0%). York County also has a small minority population. As illustrated in Figure 2-39, rural Washington County in the northernmost part of the State contains a large area of minority block groups (USDA 2013). The highest proportion of the minority community is Black or African American followed by Hispanic or Latino. The remainder of the counties in the Study Area do not have census block groups which are predominantly minority (USCB 2017f).

2.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to environmental justice consideration as potential environmental justice communities of concern. Table 2-15 presents population and environmental justice -related characteristics for the Study Area regarding low-income populations. Of the population of 826,172 people for whom poverty status is determined living in the Study Area, approximately 158,446 (19.2%) have incomes less than 150% of the poverty level. This is less than the percentage in both the State (22.1%) and the Nation (23.7%). Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 676 census block groups in the Study Area, approximately 7.8% (53 census block groups) are considered low-income populations.

As shown in Figure 2-39 and Table 2-15, Kennebec County contains census block groups with relatively high percentages of low-income populations (13.6%). The remainder of the counties in the Study Area contain less than 10% low-income populations (USCB 2017o).



Source: USCB 2017r

Figure 2-39. Minority and Low-Income Population in the Maine Study Area by Census Block Group

Table 2-15. Low-Income and Minority Populations in the Maine Study Area

Region	Geographic Unit	Total Population (2017)	White, Nonhispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Census Block Groups	Percent of Low-Income Census Block Groups (%)	Number of Minority Census Block Groups	Percent of Minority Census Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Downeast & Acadia	Hancock	54,468	51,781	2,687	4.9	49	2	4.1	1	2.0	53,074	10,929	20.6
	Washington	31,822	28,659	3,163	9.9	35	3	8.6	2	5.7	30,830	9,759	31.7
	Total Downeast & Acadia	***86,290***	***80,440***	***5,850***	***6.8***	***84***	***5***	***6.0***	***3***	***3.6***	***83,904***	***20,688***	***24.7***
Greater Portland & Casco Bay	**Cumberland**	***289,173***	***262,323***	***26,850***	***9.3***	***212***	***21***	***9.9***	***8***	***3.8***	***281,447***	***47,699***	***16.9***
Kennebec & Moose River Valley	**Kennebec**	***121,289***	***115,092***	***6,197***	***5.1***	***103***	***14***	***13.6***	***0***	***0.0***	***117,507***	***28,557***	***24.3***
Maine Beaches	**York**	***201,454***	***190,567***	***10,887***	***5.4***	***140***	***10***	***7.1***	***1***	***0.7***	***198,168***	***30,537***	***15.4***
Mid Coast	**Knox**	39,700	37,968	1,732	4.4	40	2	5.0	0	0.0	38,455	7,515	19.5
	Lincoln	34,021	32,717	1,304	3.8	35	0	0.0	0	0.0	33,466	7,157	21.4
	Sagadahoc	35,149	33,341	1,808	5.1	28	1	3.6	0	0.0	34,851	6,755	19.4
	Waldo	39,280	37,611	1,669	4.2	34	0	0.0	0	0.0	38,374	9,538	24.9
	Total Mid Coast	***148,150***	***141,637***	***6,513***	***4.4***	***137***	***3***	***2.2***	***0***	***0***	***145,146***	***30,965***	***21.3***
	Study Area Total	**846,356**	**790,059**	**56,297**	**6.7**	**676**	**53**	**7.8**	**12**	**1.8**	**826,172**	**158,446**	**19.2**
	Maine	**1,330,158**	**1,244,859**	**85,299**	**6.4**						**1,294,998**	**286,456**	**22.1**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

A 2017 report by the Maine Center for Economic Policy stated that long-term unemployment and poverty present serious health concerns that affect individuals, their families, the overall economy. According to the report, serious mental illness or suicidal thoughts are more than twice as prevalent in Americans in poverty as compared to those significantly above the poverty line. Both general health and mental health issues are also more common in individuals unemployed or out of the labor force. According to the report, it is unclear whether chronic poverty and labor force nonparticipation are the prime causes of poor health, but the trend is certainly cyclical. Low-income residents have fewer options to treat existing health problems and are more likely to develop new untreated conditions in general; without good income or employment, these issues are exasperated. Without health insurance, low-income individuals also tend to forego many preventive care measures. Smoking is also more prevalent among low-income individuals and can contribute to health issues. The report notes that preventive care rates are higher for both higher-income Mainers as well as low-income Mainers with insurance as compared to those without insurance. Poor health and lack of employment also contribute to issues with alcoholism and drug use (MECEP 2017).

2.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and discussed in detail in Fishing Communities (Chapter 2.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 2-40 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present a more detailed analysis discussing this figure. Most counties have some populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coast of the Study Area, especially in Washington and Waldo Counties. The NOAA SVI is used in Chapter 2.4.5.3.1 to discuss vulnerability as it relates to fishing communities, generally identified by NOAA as places associated with fishing industry, or in the context of a legal definition of "fishing community" granting special status under the Magnuson-Stevens Fishery Conservation and Management Act. Washington County is either in the most vulnerable or the third most vulnerable quarter of the CDC vulnerability index. This rating is with respect to overall social vulnerability, with the western portion of the county being most vulnerable. A similar rating is observed for the socioeconomic category and the household composition/disability category. Under the race/ethnicity/language vulnerability rating, the southeastern part of the county is most vulnerable and under the housing/transportation category, the southernmost portion of the county are most vulnerable (CDC 2018b).

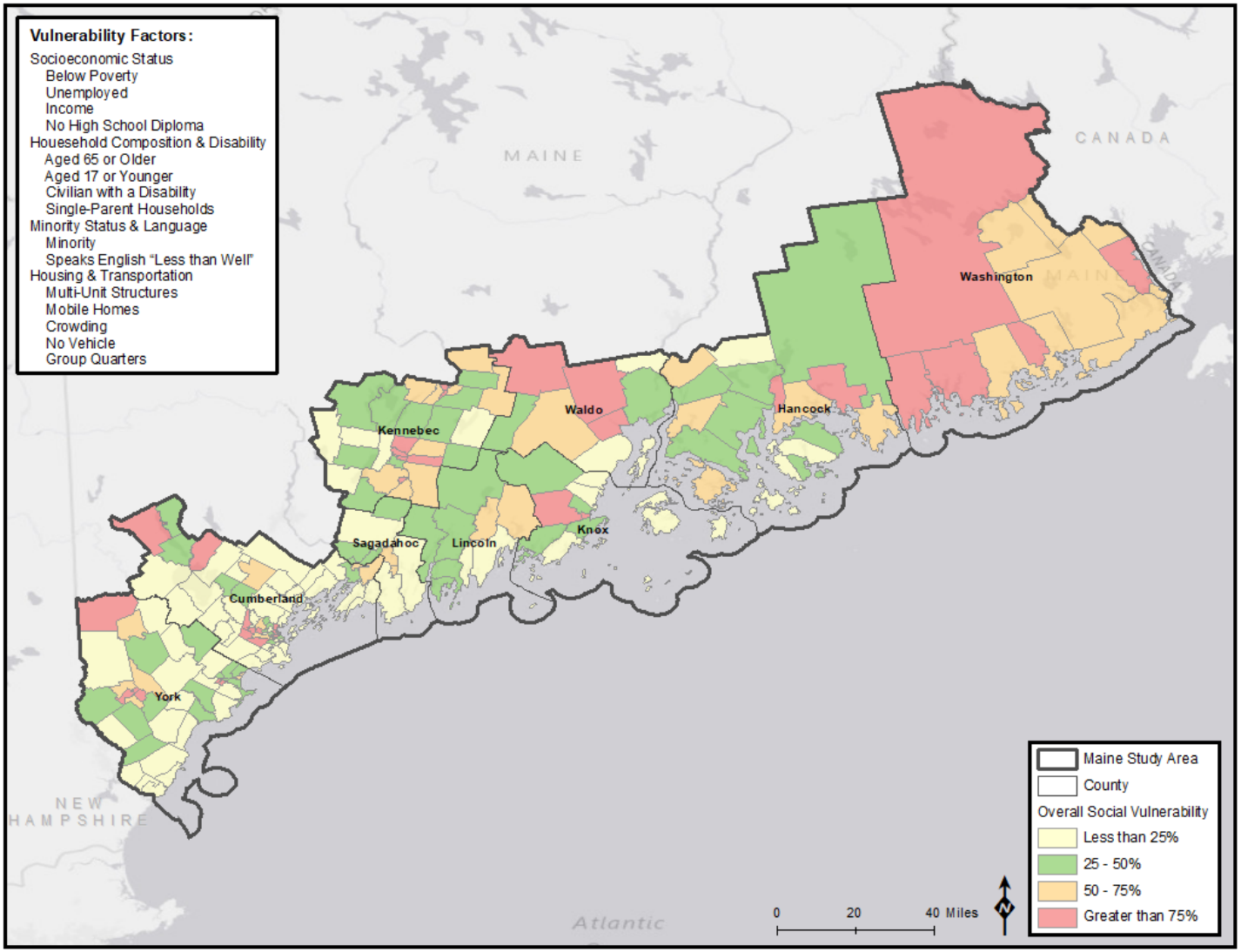
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 2-41 combines the CDC SoVI index as shown in Figure 2-40 with minority and low-income populations as shown in Figure 2-39 (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, especially notable in Washington and Hancock Counties.

Figure 2-42 shows the combined output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. This demonstrates that some vulnerable communities are at risk along the coast for impacts associated with sea level rise. Not shown but also applicable (as discussed in Chapter 2.2.2.2) are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise. Compared to study areas in other Atlantic States, Maine has a relatively low area at risk from sea level rise.

As discussed in Chapter 2.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

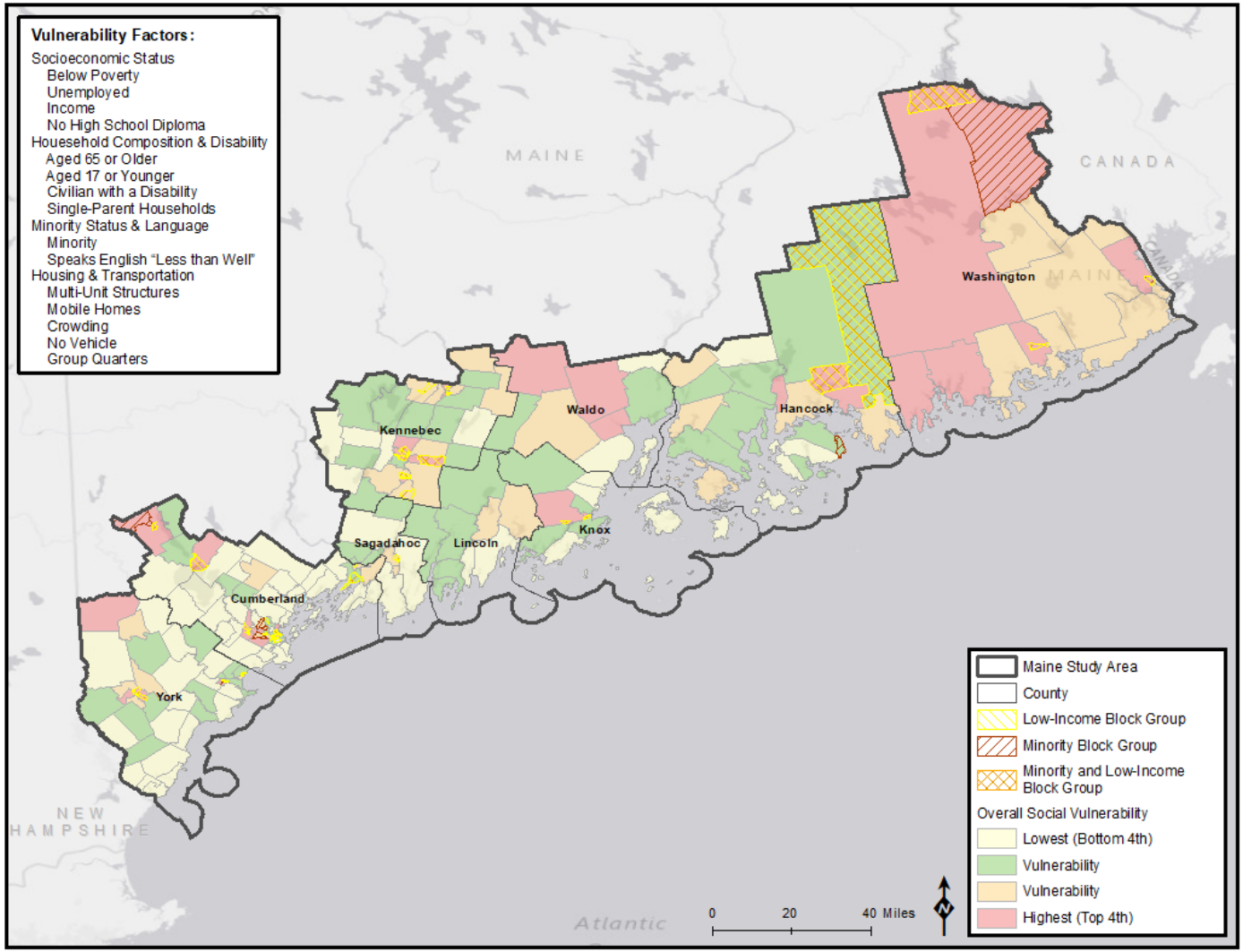
2.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.



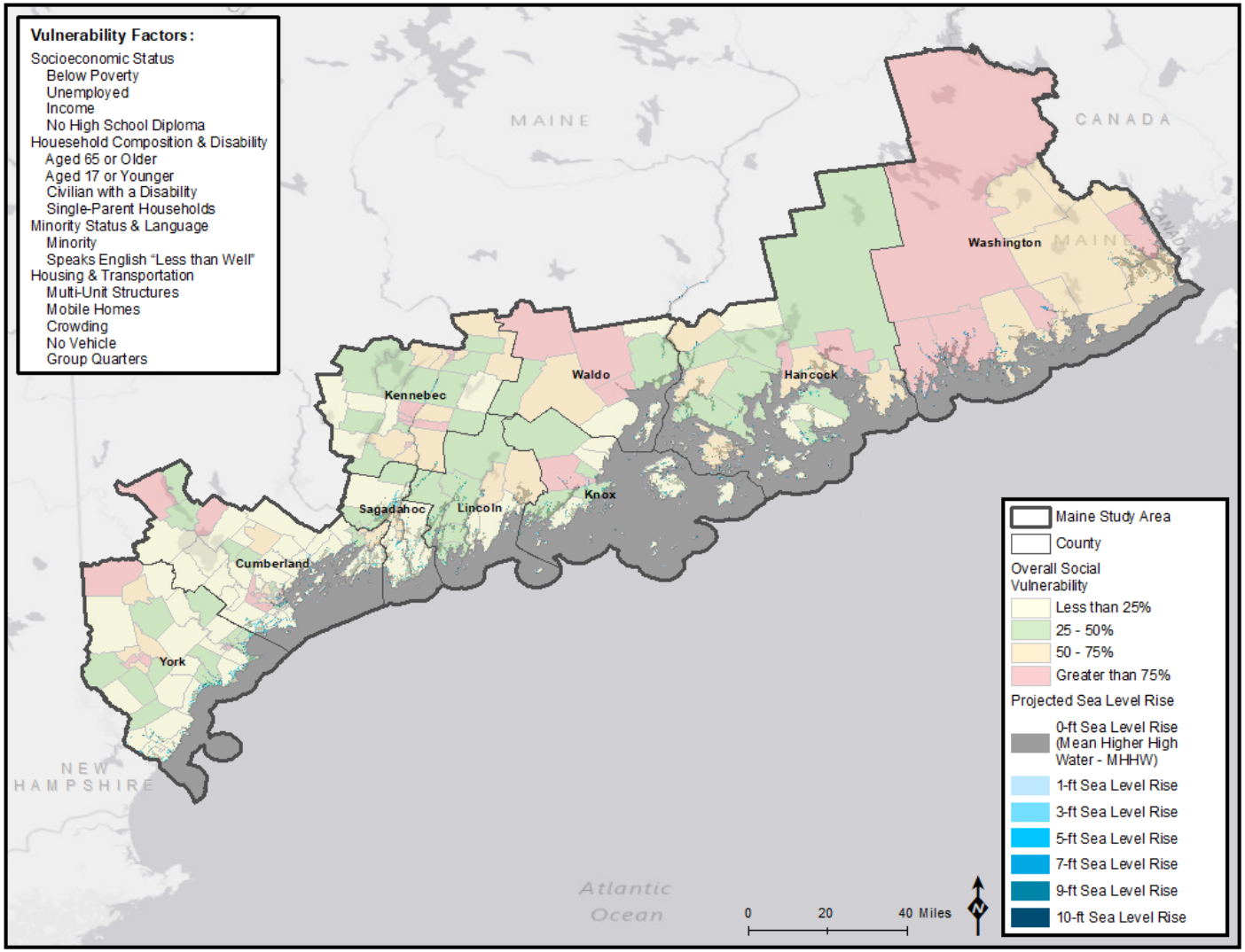
Source: CDC 2016

Figure 2-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Maine Study Area by Census Tract



Source: CDC 2016, USCB 2017r

Figure 2-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Maine Study Area



Source: CDC 2016, NOAA 2018a

Figure 2-42. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Maine Study Area by Census Tract

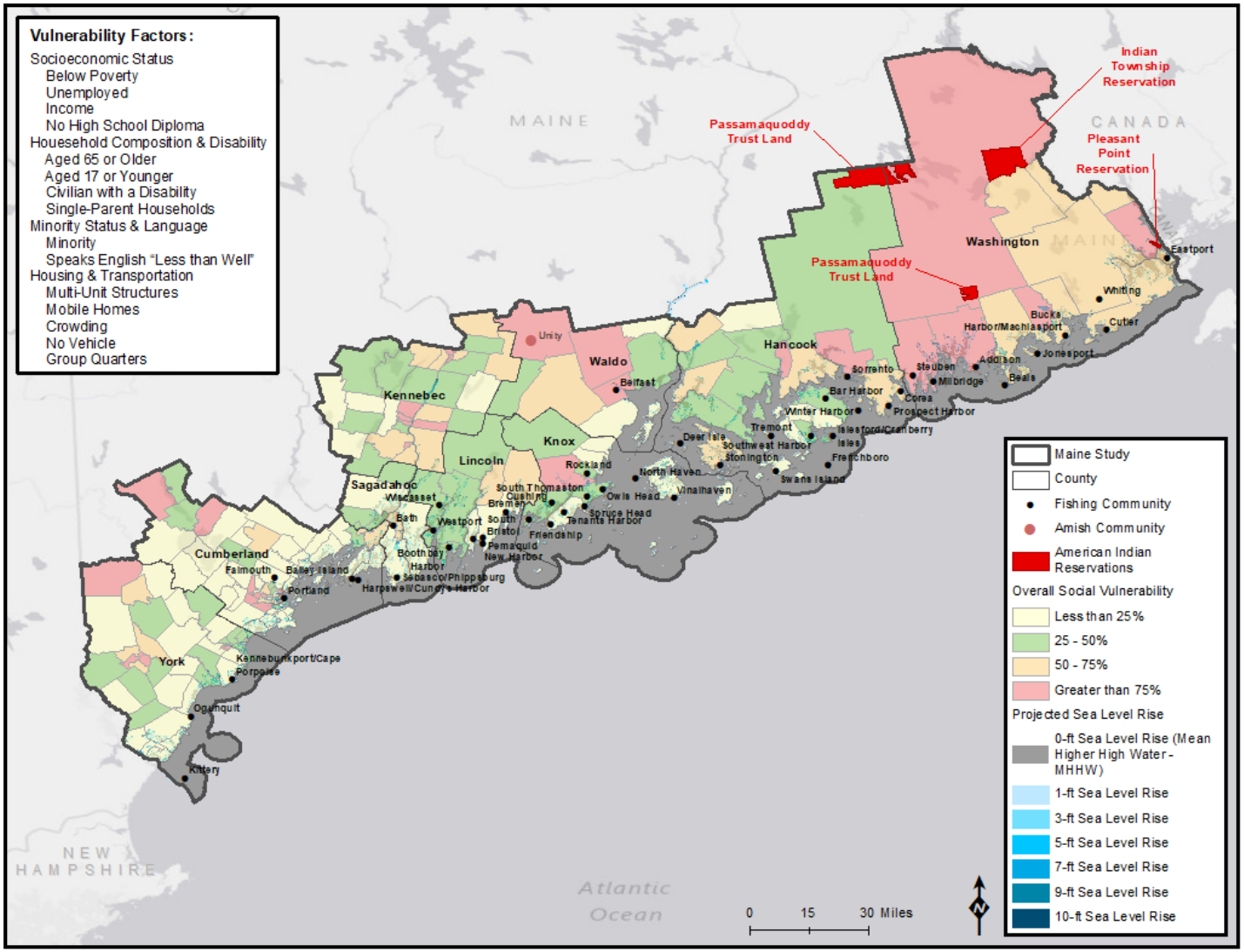
2.4.5.3.1 Fishing Communities

The 48 fishing communities in the Study Area are illustrated in Figure 2-43. These communities are listed below.

- Addison
- Bailey Island
- Bar Harbor
- Bath
- Beals
- Belfast
- Boothbay Harbor
- Bremen
- Bucks Harbor/Machiasport
- Corea
- Cushing
- Cutler
- Deer Isle
- Eastport
- Falmouth
- Frenchboro
- Friendship
- Harpswell/Cundys Harbor
- Islesford/Cranberry Isles
- Jonesport
- Kennebunkport/Cape Porpoise
- Kittery
- Milbridge
- New Harbor
- North Haven
- Ogonquit
- Owls Head
- Pemaquid
- Port Clyde
- Portland
- Prospect Harbor
- Rockland
- Sebasco/Phippsburg
- Sorrento
- South Bristol
- South Thomaston
- Southwest Harbor
- Spruce Head
- Steuben
- Stonington
- Swans Island
- Tenants Harbor
- Tremont
- Vinalhaven
- Westport
- Whiting
- Winter Harbor
- Wiscasset

As can be seen in Figure 2-43, all 48 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 2.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries' website (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Source: NOAA 2018a, NOAA Fisheries 2019k

Figure 2-43. Potential Vulnerable Communities in the Maine Study Area by Census Tract

2.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the *Council on Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, tribe, or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts, in general, and in the Study Area (Figure 2-43). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

2.4.5.3.3 Religious Populations (Amish/Mennonite)

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3.

While New England has seen little Amish settlement, Maine is home to three Amish enclaves. Two settlements (Smyrna and Fort Fairfield) are located in remote areas outside the Study Area in Aroostook County, within 50 miles of Washington County (which lies inside the Study Area). Smyrna was founded in approximately 1996 by Amish families from Tennessee, Michigan, Iowa, and Maryland. Fort Fairfield was founded in 2007 from a family relocated from Amish community in New York. Both settlements are small at present, comprising a single church district. The newest Amish settlement is the farming community of Unity, located within the Study Area in Waldo County. Unity was founded in 2008 by families from the Smyrna settlement in Aroostook County, as well as migrating families from Missouri and Kentucky. The groups described being welcomed by the local communities. Relatively cheaper land prices and low population are features attractive to the Amish when considering new locations for

settlements (Amish America 2019). Figure 2-43 shows the location of the single Amish community located in the Study Area, which is in Waldo County.

2.4.5.4 Tribes

The State of Maine has five federally recognized tribes that have historical ties to the State, but there are no State-recognized tribes in Maine (NCSL 2019). Of the five federally recognized tribes, two tribes reside in the Study Area. Table 2-16 lists the federally recognized tribes in Maine.

Table 2-16. Federally Recognized Tribes with Historical Ties to Maine

Tribe	Federal Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes within the Study Area			
Passamaquoddy Tribe – Indian Township	Yes	Yes	Tribal members in Maine currently reside on Indian Township Reservation in the Study Area (Washington County).
Passamaquoddy Tribe – Pleasant Point	Yes	Yes	Tribal members in Maine currently reside on Pleasant Point Reservation in the Study Area (Washington County).
Federally Recognized Tribes Outside the Study Area			
Aroostook Band of Micmac Indians	Yes	No	Tribal members in Maine currently reside outside the Study Area in Aroostook County.
Houlton Band of Maliseet Indians	Yes	No	Tribal members in Maine currently reside outside the Study Area in Houlton County and Aroostook County.
Penobscot Nation	Yes	No	Tribal members in Maine currently reside in Indian Island and Penobscot County.

Sources: Maine An Encyclopedia 2019c, Aroostook Band of Micmacs 2019, Aroostook County Tourism 2019, Wabanaki 2019, HUD 2019b

The Passamaquoddy Tribe has tribal lands within the Study Area with a total of 3,369 members who live in two locations in Washington County (Indian Township Reservation and Pleasant Point Reservation). The tribe is represented by the Joint Tribal Council, which consists of the councils from both locations; the Tribal Councils of Indian Township is based in Princeton and the Pleasant Point Reservation (Sipayik) is in Perry. The Passamaquoddy ancestral homeland spans the US/Canada International boundary and is bisected by the St. Croix River (previously known as the Passamaquoddy River) (Passamaquoddy 2019).

Although the Aroostook Band of Micmacs (Micmacs), Houlton, and Penobscot tribes do not currently possess tribal lands within the Study Area, these tribes have historical interest in the area. The Micmac Indians do not currently reside on a reservation but they have historically occupied the lands south and east of the Gulf of Saint Lawrence, the Maritime Provinces and other regions along the Atlantic Seaboard of northeastern America. At present, the population of the Micmac Nation today is approximately 30,000 people split between 29 bands in seven districts (Aroostook Band of Micmacs 2019). The Houlton Band of Maliseet Indians consists of approximately 1,700 members and is considered a smaller band of the Maliseet Nation based out of New Brunswick, Canada (Houlton Band of Maliseet Indians 2019) and primarily live in Aroostook County, which is outside of the Study Area; however, the tribe is currently considering land acquisition proposals for additional acres throughout the State. They are presently engaged in deciding policy on the type and amount of land to invest in (Aroostook County Tourism 2019). The Penobscot Nation currently has a population of 2,398. The tribes ancestral territory included all the watersheds from the Machias River in the east, to Cape Ann in Massachusetts. The reservation in Penobscot County includes 4,840 acres in the island system, 24 acres in the Matagamon Reservation, one

acre on Smith Island, approximately 86,000 acres in thrust, and approximately 24,000 acres in fee land (PCHR 2019).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC SoVI, as shown in Figure 2-43. Overall social vulnerability for Washington County is from 50% to greater than 75% (CDC 2016). Also shown in Figure 2-43 is NOAA's sea level rise data, indicating that tribal communities in Washington County could be subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the National Historic Preservation Act requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

2.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

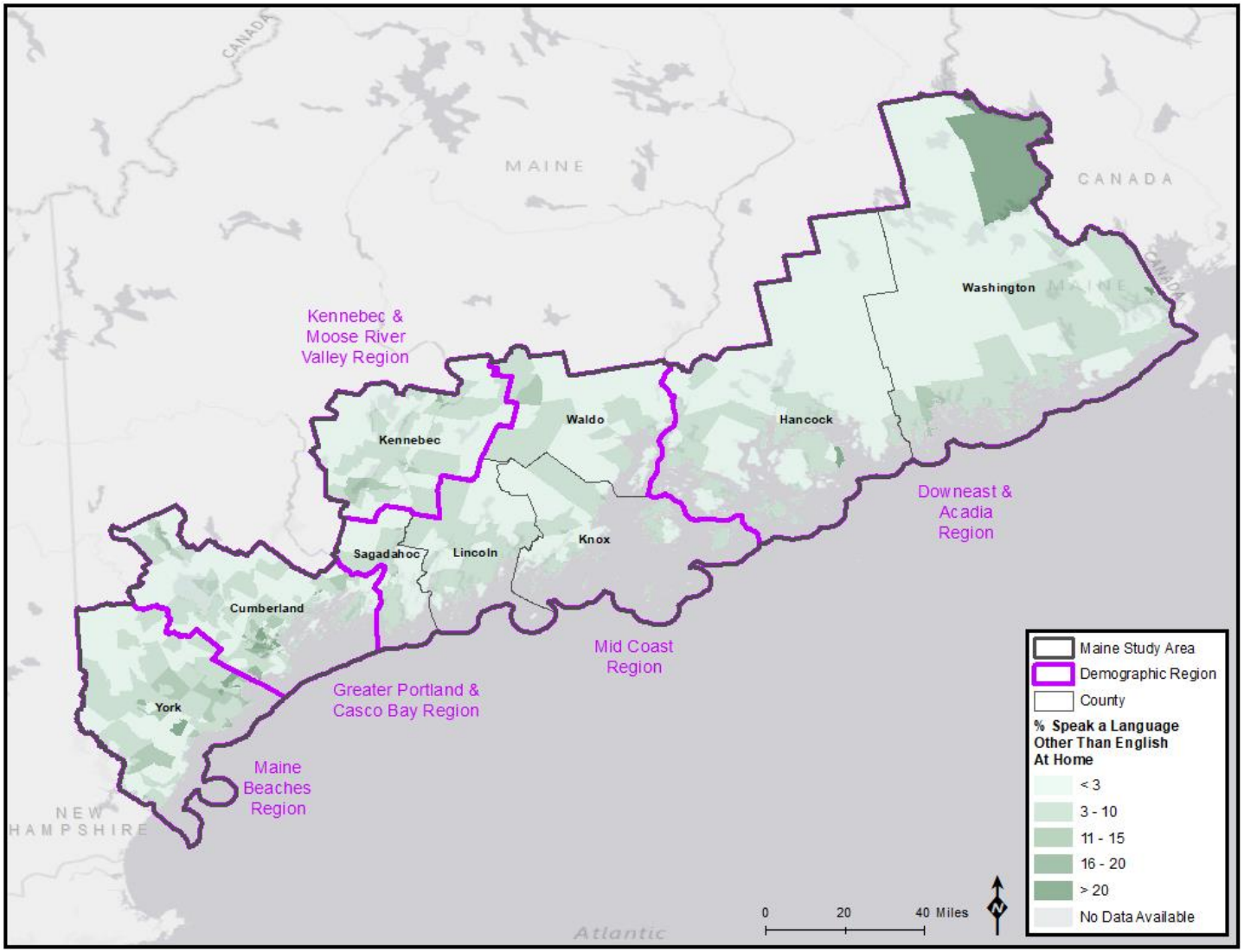
Table 2-17 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within Maine and the Study Area, there are significantly less non-English speaking populations. Only 6.2% and 5.9% of the population do not speak English at home in the State and Study Area, respectively. The Maine Beaches Region has the highest percentage (6.8%) of this population within the Study Area. Indo-European languages are spoken by the majority (25,993 people or 3.2%) of non-English speakers at home within the Study Area population (USCB 2017e). Spanish is spoken by 1.0% (8,283 people) of non-English speakers at home within the Study Area population (USCB 2017e).

Figure 2-44 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Cumberland (7.5%), York (6.8%), and Washington (5.8%). As shown in Figure 2-44, sea level rise is likely to affect certain portions of these counties, which could increase vulnerability of any of these communities located along the coast.

Table 2-17. People who Speak a Language Other than English at Home in the Maine Study Area by Census Block Group

Region	Geographical Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Downeast & Acadia	Hancock	52,083	1,714	3.3	337	868	404	105
	Washington	30,290	1,760	5.8	465	507	93	695
	Total Downeast & Acadia	***82,373***	***3,474***	***4.2***	***802***	***1,375***	***497***	***800***
Greater Portland & Casco Bay	Cumberland	***275,016***	***20,645***	***7.5***	***3,514***	***9,222***	***3,849***	***4,060***
Kennebec & Moose River Valley	Kennebec	***115,179***	***5,743***	***5.0***	***966***	***3,531***	***937***	***309***
Maine Beaches	York	***191,921***	***13,114***	***6.8***	***1,781***	***8,928***	***1,458***	***947***
Mid Coast	Knox	37,940	1,339	3.5	368	725	116	130
	Lincoln	32,688	1,068	3.3	148	727	139	54
	Sagadahoc	33,351	1,260	3.8	343	753	132	32
	Waldo	37,462	1,291	3.4	361	732	136	62
	Total Mid Coast	***141,441***	***4,958***	***3.5***	***1,220***	***2,937***	***523***	***278***
	Study Area Total	**805,930**	**47,934**	**5.9**	**8,283**	**25,993**	**7,264**	**6,394**
	Maine	**1,265,764**	**79,015**	**6.2**	**11,186**	**49,881**	**9,651**	**8,297**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Source: USCB 2017r, USCB 2017e

Figure 2-44. Percent of People Who Speak a Language Other than English at Home in the Maine Study Area by Census Block Group

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for and emergency planning.

2.4.6 Summary – Demographics and Socioeconomics

Maine is growing but much more slowly than the Nation. Maine has a very high median age due to the large presence of aging baby boomers. The resulting low fertility rate caused several years of natural population decrease, which was mostly offset by positive net migration, resulting in overall slight growth. Growth is not uniform; overall, population is declining in rural areas while increasing in metropolitan areas. In order to keep growing, Maine needs in-migration to offset these trends (Maine.gov 2016).

The population in the Study Area is projected to increase by 2.6% by 2036, with the largest increases in the Maine Beaches Region (9.5%). The population in the Study Area was estimated at 546,356 in 2017; with projected growth the population will be 868,493 in 2036. In 2017, the most populated counties in the Study Area were York and Cumberland Counties, with respective populations of 201,454 and 289,173. The least populated counties in the Study Area were rural Washington and Lincoln Counties, with 29,522 and 29,605, respectively (USCB 2017a, USCB 2017d, USCB 2018b, ME OPM 2019).

Population growth is closely linked to economic growth. The slow growth rate of Maine's population is a concern due to the potential lack of available workforce, changes in product needs and amounts, and a decline in the potential tax revenue. Lack of tax revenue can lead to additional out-migration due to impacts to local infrastructure, public education, and public health initiatives. Population distribution will also be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

Sensitive populations of children and the elderly are present in the Study Area. Maine has a high median age, low fertility rates and high mortality rates. The proportion of elderly in Maine was greater than the Nation, reflecting its larger numbers of baby boomers. According to 2017 estimates, the population of people "Under Age 5" represented 6.2% of the U.S. population and 4.8% in Maine and the Study Area. By 2036, the proportion of young children in the State and the Study Area are projected to decline to 4.2%, a smaller decline as compared to the national proportion of 5.7%, reflecting declining fertility rates of an aging generation. According to 2017 estimates, the population of people "Over Age 65" represented 14.9% of the U.S. population; 18.8% in Maine, and 18.9% in the Study Area. Maine's larger number of elderly people is reflective of Maine's large population of retirees. By 2036, the percentage of the elderly in the State and the Study Area are projected to increase to 28.4%. The national percentage is projected to be 21.6% (USCB 2017b, USCB 2018b, ME OPM 2019).

Homeownership in the Nation has reached its lowest level in at least 20 years (63.8%) of households in the U.S. The homeownership rate of the State (72.0%) and the Study Area (72.4%) is significantly greater than the national rate. This may be attributed to the baby boomer preferences and ability to own a home instead of rent (USCB 2017m).

Home vacancy rates in Maine (24.7%) are significantly higher than the Nation's vacancy rates (12.2%) (USCB 2017g) because second homes, investment properties, and residences rented as short-term rentals are counted as vacant by the Census Bureau (Daily Mail 2019). The highest vacancy rates are in the northern counties in the less populated areas, indicating the presence of properties used for vacations homes and short term-rentals; the lowest vacancy rates are in the southern counties surrounding the metropolitan Portland area (USCB 2017g).

Housing affordability for low- and moderate-income workers is a problem in Maine. A large proportion of the State (29%) is considered extremely low income, and of these households, 53% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

The Study Area has a total employment of almost 400,000 jobs. Approximately 14.8% of those jobs are maritime-related and concentrated along the Atlantic Coast, or the along the major rivers. The majority of the non-maritime jobs are concentrated in the urban areas throughout the Study Area. This is consistent with the population distribution, land use, and business/industrial facilities distribution. Correspondingly, the northern counties have a lower job density, which is consistent with natural land uses in this region (USCB 2017a, USCB 2017c, USCB 2017g). Due to the closure of manufacturing facilities and other industrial employment in the rural areas, the types of jobs available in more rural areas such as Washington County are shifting. Over time, more people will likely move to the more urban areas near Portland for employment, indicating shifts in population and housing (MECEP 2017).

The U.S. economy has experienced long-term real wage stagnation and a persistent lack of economic progress for many workers likely due to the forces of globalization and technological change. Maine lags the U.S. in both median household income and per capita income. Maine's low rate of population growth and aging population are contributing factors to the general declining income trend. Retiring workers often do not have access to sufficient retirement benefits and rely heavily on Social Security benefits. These benefits do not approach the income levels of a full-time employee. Additionally, lack of manufacturing jobs lost in the Great Recession causes difficulty for less-educated workers to find employment, further reducing overall income rates (MECEP 2017).

Populations that speak a language other than English are present within the Study Area. Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise and storm surge are felt at the local level (i.e., by changing drainage, patterns of land use, etc.) (Siegel et al. 2001).

The average unemployment rate in the Study Area is 4.8%, lower than the State (5.3%) and the Nation (6.6%). Unemployment rates ranged from 3.4% in Lincoln County to 7.9% in Washington County (USCB 2017h). Although these unemployment rates may seem low in comparison with the Nation, many workers in Maine are leaving the workforce and are not measured in this statistic. These types of workers include retirees and those who have been unemployed for so long, they are no longer considered part of the workforce. Reasons for prolonged unemployment include loss of unskilled, middle-class manufacturing and industrial jobs and a generally stagnant economy (MECEP 2017). Although workers

may be available for future projects in the Study Area, it is likely that training programs will be necessary for skilled or focused labor.

The Study Area contains low-income and minority populations. However, in comparison to all Study Areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Maine Study Area has strikingly small minority populations. Of the 676 census block groups in the Study Area, approximately 7.8% (53 census block groups) are considered low-income populations and 1.8% (12 census block groups) are considered minority populations. As illustrated in Figure 2-39, Hancock, Washington, and Cumberland counties contain areas with high percentages of census block groups with both low-income and minority populations. The remainder of the counties in the Study Area contain small pockets of low-income populations (USCB 2017f, USCB 2017o).

Low-income and minority populations are subject to environmental justice consideration under NEPA, as they have the potential to be "environmental justice communities of concern." These communities may have other attributes of vulnerability. Additionally, low-income populations are more susceptible to health and health care struggles due to lack of financial resources and health insurance. These communities may need to be further assessed during the OCS-related planning process (MECEP 2017).

Concentrations of populations with high overall social vulnerability exist along the coast of the Study Area, especially in Washington and Waldo Counties. Some of these counties with high overall social vulnerability contain communities with other vulnerability factors. There are 48 fishing communities in the Study Area, including both Washington and Waldo Counties. Communities that are dependent on commercial fishing can be more socially vulnerable than other communities because of a variety of factors as discussed in Chapter 1.6.5.3.1 (NOAA Fisheries 2019e). There is one Amish community located in the town of Unity in Waldo County. There is one federally recognized tribe (Passamaquoddy Tribe) located in Washington County. Each of these populations could have vulnerability factors and should be considered during future OCS-related project analysis once site-specific information is known.

2.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

2.5.1 Regional Observations

The Study Area is somewhat unique in comparison to the rest of the Project Areas in land cover, land use, population distribution and demographics, employment, and social vulnerability. Most of the Study Area is forest or wetland, and only 7.3% is developed. As shown in Figure 2-9, most of the development is centered around the greater Portland area and coastal communities of southern Maine.

With the exception of Portland, the Study Area tends to have fewer industrial areas, a more diffuse transportation network, lacks large urban centers, and has a higher proportion of natural/agricultural areas compared with the other States within the overall Project Area. Northern counties in the Study Area are more rural, have less infrastructure, and slower population growth than southern counties. It is likely there would be less resources and infrastructure available farther north within the Study Area to support large OCS-related projects, and there may be greater challenges associated with approval of projects in this area. The population of Maine is aging, leading to a lack of "prime-age workers." Homes are becoming less affordable, and there is a lack of middle-class jobs, especially in rural counties to the north. Outside of Portland, poverty is rising.

The Portland area in Cumberland County and neighboring counties in the south have greater resources and more developed infrastructure and transportation networks than other parts of the Study Area. These southern counties host a major metropolitan area (Portland) and therefore would likely have the workforce to support OCS-related projects. However, several of these counties are also the most susceptible to projected sea level change and storm surge effects.

2.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Based on an analysis of the general land cover, land use, socioeconomics, and demographics within the Study Area, it seems most likely that York, Cumberland, and Sagadahoc Counties would be the most suitable counties to accommodate future industrial projects.
- The overall Study Area is relatively undeveloped compared to other States and the preservation of natural resources is a priority for the State of Maine. Therefore, Maine has several laws that need to be considered prior to future land development. The Site Law that requires review of development projects that may have a substantial effect on the environment, including projects occupying more than 20 acres, large structures and subdivisions, and oil terminal facilities. The Natural Resources Protection Act is a law focused on the protection of natural resources when activities (e.g., dredging, bulldozing, removing or displacing soil, sand, vegetation) will be located in, on, or over any protected resource, or located adjacent to specific types of protected natural resources. The Mandatory Shoreland Zoning Act pertains to shoreline zoning regulations that are meant to prevent pollution and protect shoreline natural resources. Potential future projects will need to be well versed in these laws when considering site selection and planning.
- Potential future projects will also need to consider project consistency with regard to the Maine Land Use Planning Commission's Comprehensive Land Use Plan, Bureau of Parks and Lands 15-year Management Plans, Maine Historic Preservation Commission plans, and Maine's Statewide Historic Preservation Plan. Projects contradictory to these land use and management plans would likely face challenges gaining approval.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- While Maine has multiple ports, Maine has also instituted a three-port development strategy focused both on preserving the coastal resources of Maine and spurring industrial port development specifically at the ports at East Port, Searsport, and Portland. Potential future projects will need to consider this during site selection and planning to determine if proposed projects are consistent with Maines three port development strategy.
- Projects will need to take Maine's unique cultural, historical, and recreation sites, landmarks, destinations, recreational opportunities, and events into account during project planning. Many Maine cultural sites have significance on a national as well as State and local level; therefore, potential impacts to such sites could have national implications. As site selection progresses, projects will want to examine these cultural and recreational aspects on a local scale building on the baseline analysis presented in this study.
- Projects should consider the need for transportation resources and examine the Study Area's existing resources as well as potential future development that may be planned in the area. Searching the MaineDOT or local municipality development websites should generate information about planned future development projects that may provide useful information.

- Projects should consider the locations of socially vulnerable communities during the site selection and project planning process. For some communities, future project development could be a beneficial change while for others it could be detrimental. Many factors contribute to social vulnerability. Projects should examine the resources discussed above to gain the most current information about these communities as project planning begins. Working with community planners and municipalities can help projects find suitable locations that benefit both the project and the community.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis are relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 3

NEW HAMPSHIRE

3 New Hampshire

3.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of New Hampshire to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS-related planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

New Hampshire is located near the North Atlantic Planning Area. Two counties are located within the New Hampshire Study Area (Study Area) along the New Hampshire coastline. Counties range in population size from around 9,400 in Stafford County to over 62,500 in Rockingham County. There are two cities in the Study Area with a population over 30,000; they are Dover with a population of over 32,000 and Rochester with a population over 31,000 (ESRI 2019a). New Hampshire cities and counties include diverse populations regarding demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and resort and vacation destinations, natural areas, and private property. Although New Hampshire has geographical commonalities with many of the other Atlantic States, such as open coastlines protected by barrier islands, it is unique in that it only has 13 miles of coastline. Regardless, the New Hampshire coastline includes estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes two counties located within the State of New Hampshire. The Study Area is shown in Figure 3-1 and Figure 3-2 and includes Rockingham and Stafford Counties.

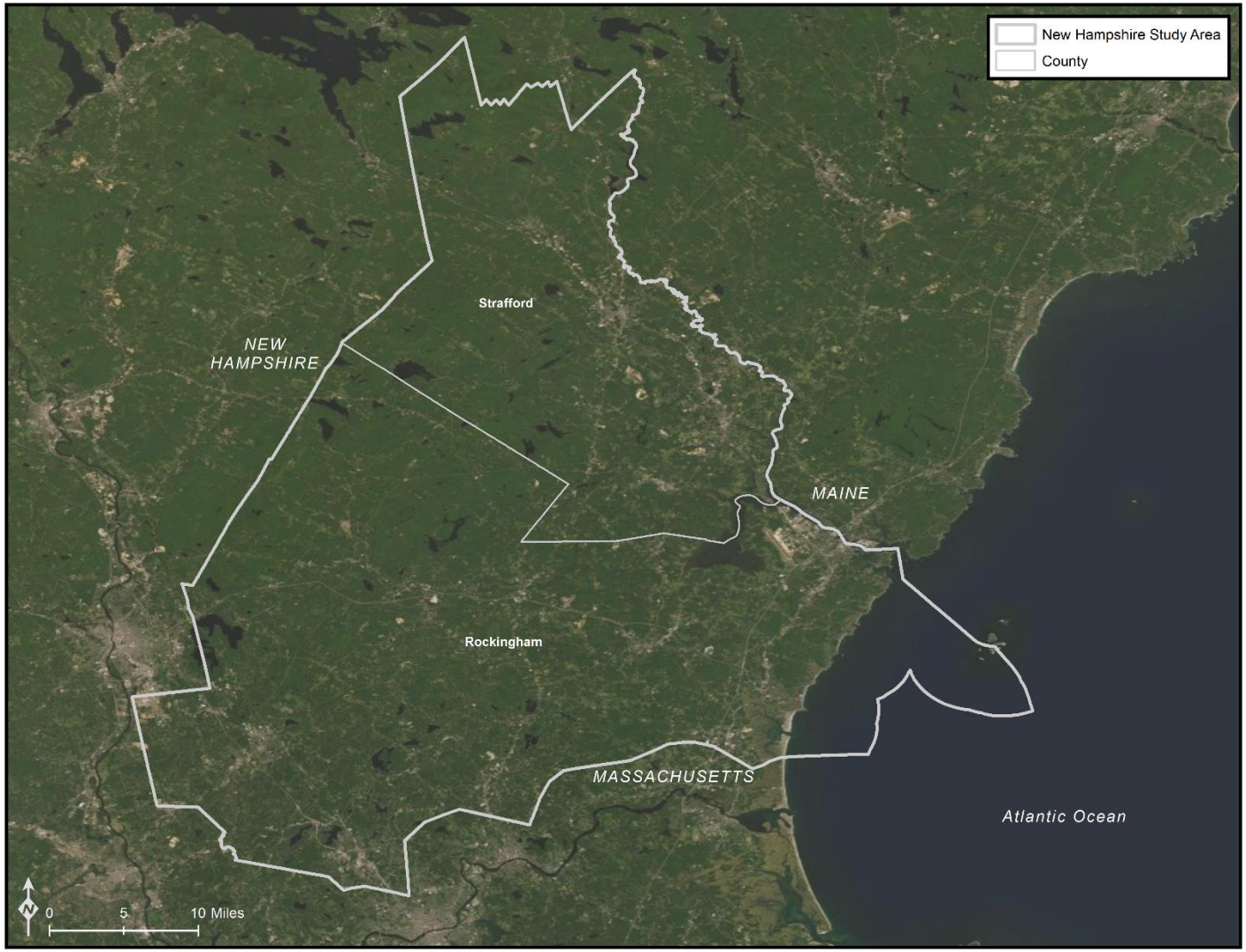
3.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of New Hampshire are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

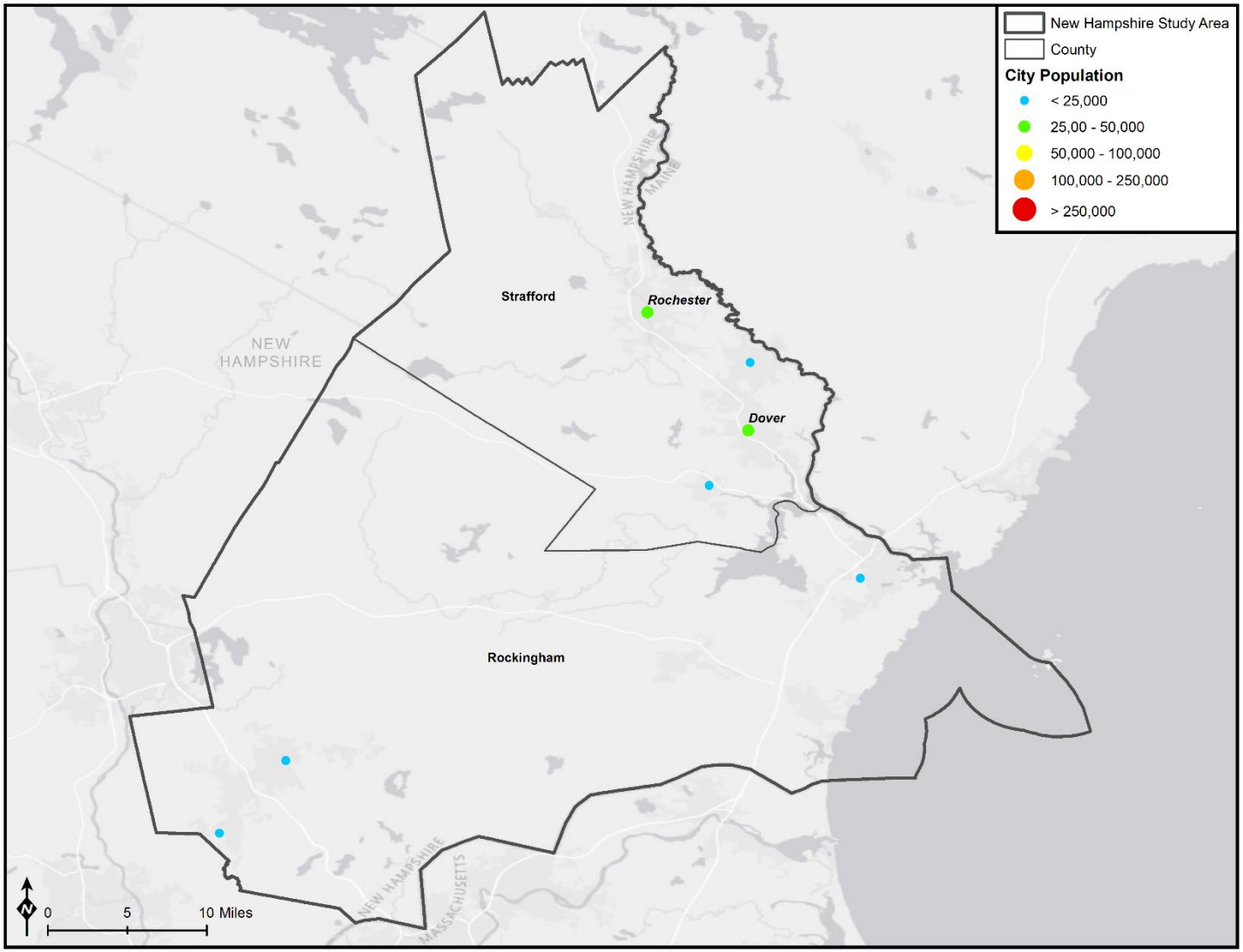
- New Hampshire Geodata Portal
- New Hampshire Office of Strategic Initiatives
- New Hampshire Department of Transportation

The metadata database for New Hampshire data sources is included in Appendix A.



Source: ESRI 2019a

Figure 3-1. State of New Hampshire Study Area



Source: ESRI 2019a

Figure 3-2. Cities in the New Hampshire Study Area

3.2 Physical Characteristics

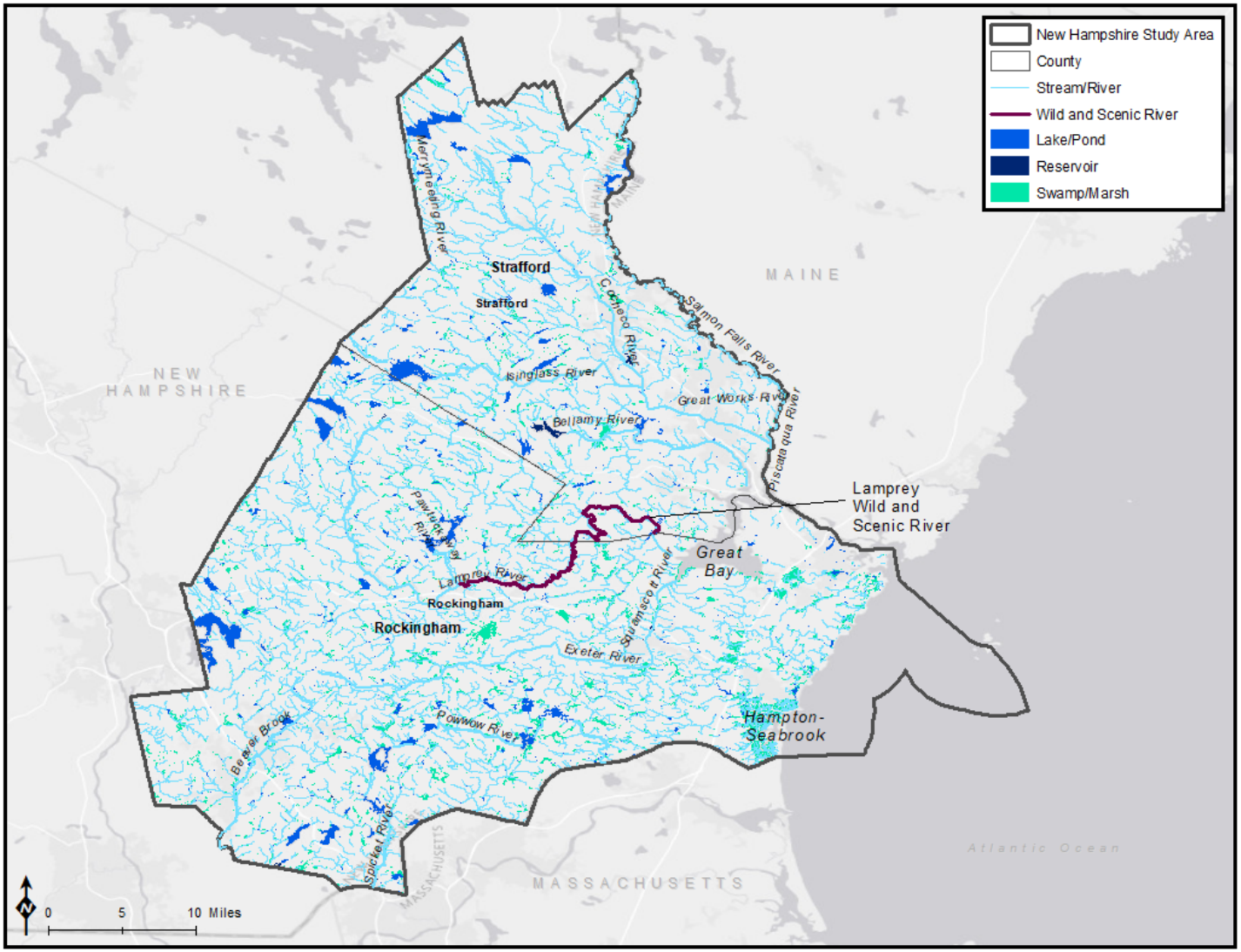
This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

3.2.1 Water Resources

With almost 17,000 miles of rivers and streams and 238 miles of ocean and estuarine coastline, New Hampshire's water resources include the Gulf of Maine, the Great Bay Estuary, rivers, floodplains, and wetlands (NHDES 2008). Water resources may shape existing and future land uses as well as population density. The following sections describe various water resources within the Study Area.

3.2.1.1 Bays

Defined by shallow waters at Georges Bank on the south and Browns Bank on the east, the Gulf of Maine, shown in Figure 3-3, is bounded by Massachusetts, New Hampshire, and Maine in the U.S. and by New Brunswick and Nova Scotia in Canada. The Gulf of Maine is a semi-enclosed sea spanning 36,000 square miles with dynamic tides mixing freshwater from 60 rivers in a productive marine ecosystem supporting over 3,000 marine species, including habitat for the endangered Atlantic right whale. With geology similar to coastal New England, igneous and metamorphic rocks are scoured bare in some high points while in other, less energetic locations, end moraines stretch into the till-covered Gulf of Maine underlain with igneous and metamorphic rocks. Twice-daily tides average 9 feet in southern Maine to over 20 feet in northern Maine (DACF 2009, Kelley et al. 1998, Slovinsky 2005, GOM 2019). A prominent feature of New Hampshire water resources is the Great Bay Estuary, a 21-square mile estuary centered on New Hampshire's Great Bay, an interior bay, reached after 12 miles of tidal river. Spanning from the mouth of the Piscataqua River through the Little Bay to Great Bay, the Great Bay Estuary includes more than 144 miles of shoreline with steep wooded banks, cobble and shale beaches, and salt marshes. As shown in Figure 3-3, the Great Bay Estuary is nourished from many tributaries including the Salmon Falls, Isinglass, Cocheco, Bellamy, Oyster, Lamprey, Exeter, Squamscott, and Winnicut Rivers. Designated a National Estuarine Research Reserve in 1989, the Great Bay National Estuarine Research Reserve extends from the General Sullivan Bridge, 7 miles from the mouth of the Piscataqua River, through the tidal reach of the Bellamy, Oyster, Lamprey, Squamscott, and Winnicut Rivers. The 10,235-acre reserve includes a complex coastal region with 7,300 acres of water and wetlands ranging from eelgrass beds and salt marshes to mudflats and rocky intertidal shores along with upland habitats complete with forests, wetlands, and grasslands (NHDES 2008, NOAA 2020b, PREP 2020, USGS 2019e).



Source: USGS 2019e

Figure 3-3. Hydrography in the New Hampshire Study Area

Buffered by its inland nature, tides in the Great Bay Estuary are substantially delayed as they progress inland with lag times up to 2.5 hours from the mouth of the Piscataqua to the Squamscott River on the far end of Great Bay. Because water in the bay may take 39 tidal cycles to migrate to the Atlantic Ocean, inflows from its tributaries may load the Great Bay Estuary with excess nutrients, including nitrogen. These nutrient-rich waters may result in excess seaweed growth and noxious algal blooms followed by extensive die-off, which may cause low-light and low oxygen levels in the Great Bay and its tributaries. These conditions may cause smothered eelgrass meadows, oyster die-offs, and fish kills. In addition, excessive decaying plants may reduce the pH of the Bay, causing fertility reduction and death in shellfish. Because eelgrass and saltmarshes, along with filter feeders like shellfish, help remove nitrogen from the water, their impairment from excess nitrogen further accelerates detrimental nitrogen loading to these waters. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (NHDES 2008, NOAA 2020b).

As shown in Figure 3-4, the New Hampshire coast within the Study Area includes designated critical habitat for the Atlantic sturgeon and North Atlantic right whale (NOAA 2019l, USFWS 2019i, USFWS 2019j).

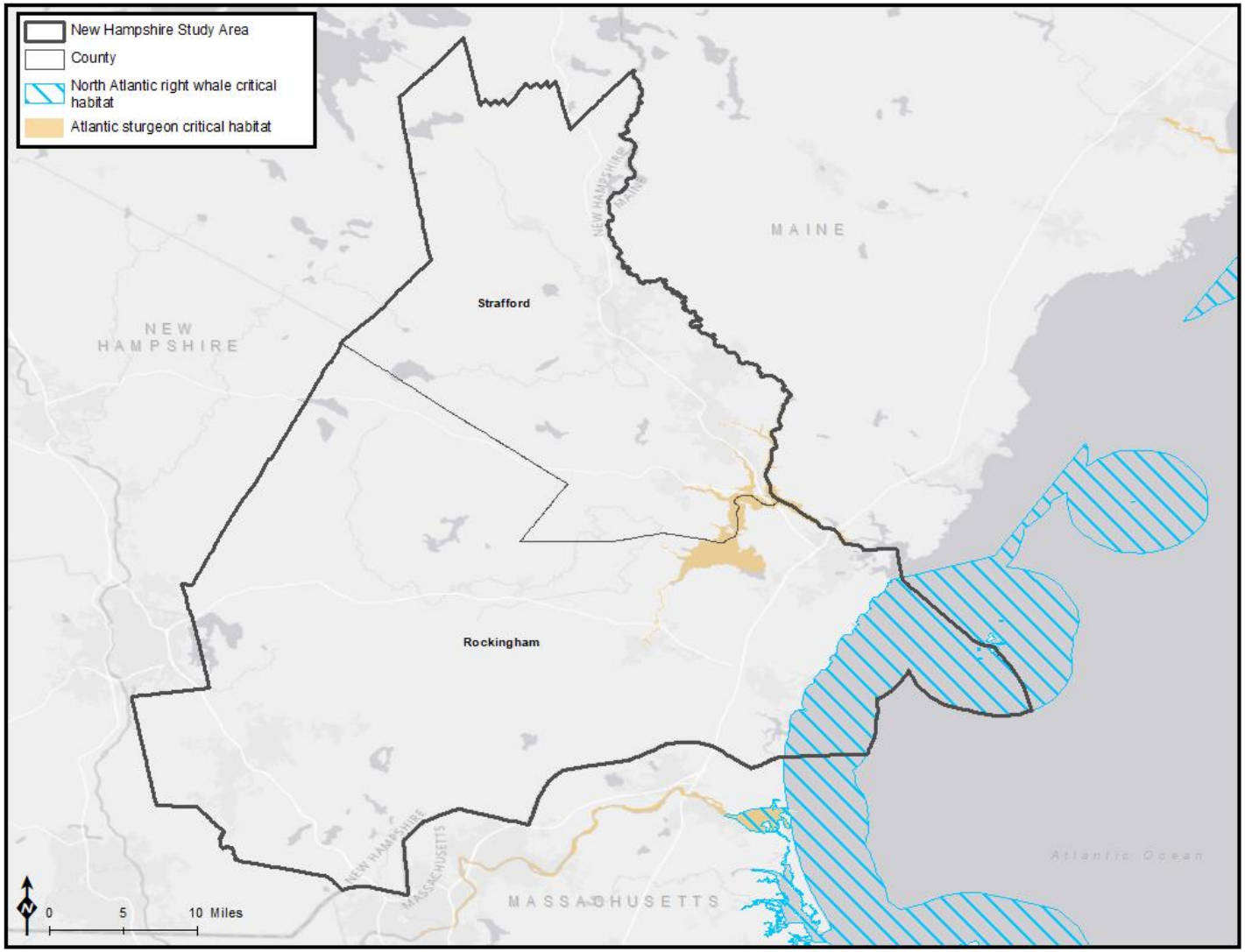
The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to fresh water to spawn. Critical habitat provides essential features for the conservation of the species. Atlantic sturgeon can live up to 60 years; growing up to 14 feet, 800 pounds; and returning multiple times to spawn in fresh water. In New Hampshire, the critical habitat for the Gulf of Maine distinct population segment of the Atlantic sturgeon is the Piscataqua River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

One of the most endangered whale species, the North Atlantic right whale, occurs primarily close to the continental shelf, though it may also be found in deeper waters. The North Atlantic right whale is typically found in New England or Canadian waters in the spring, summer, and fall. The right whale typically winters in the shallow waters from Cape Fear, North Carolina to southern Florida; calves are generally born in the winter in these waters (NOAA Fisheries 2020e).

3.2.1.2 Rivers

Within the Study Area, major drainage basins ultimately flow into the Atlantic Ocean and include the Piscataqua River Basin emptying into Portsmouth Harbor and the Merrimack River Basin flowing into Massachusetts and emptying into Ipswich Bay. Figure 3-3 shows the major surface water bodies within the Study Area. Major rivers in the Study Area include the Salmon Falls and Piscataqua Rivers. The Merrimack River, an important river in the region, is fed by area tributaries and lies to the west and south of the Study Area (NHDES 2008, NHDES 2012, USGS 2019e).

At the northern edge of the Study Area, the Salmon River flows from Great East Lake in Action, Maine and from Wakefield, New Hampshire forming a partial border between the States. Over its reach, Salmon Falls provides water for municipal water systems in both States, including Berwick, Maine and Somersworth, New Hampshire. Salmon Falls flows southeasterly for nearly 38 miles to join with the Cocheco River, forming the Piscataqua River that flows to the Atlantic Ocean (NRCS 2020, PREP 2014, PREP 2015a).



Sources: USFWS 2019i, USFWS 2019j

Figure 3-4. Critical Habitat within the New Hampshire Study Area

At the northeastern edge of the Study Area, the Piscataqua River flows southeasterly from the junction of Salmon Falls and the Cocheco Rivers to the Portsmouth Harbor and the Atlantic Ocean's Gulf of Maine. For the entirety of its 12-mile length, the Piscataqua is tidal and prescribes part of the border between New Hampshire and Maine. The last 6-9 miles of the Piscataqua River are known as Portsmouth Harbor, stretching from Eliot, Maine through Newington, New Hampshire; Kittery, Maine; Portsmouth, New Hampshire; and New Castle, New Hampshire. About 50 miles north of Boston, Portsmouth Harbor is New Hampshire's solitary deep port, annually handling more than 3 million tons of shipping along with submarines, lobster fleets, and fishing vessels (PREP 2014, USACE 2020b).

To the south and west of the Study Area, the Merrimack River flows south from Franklin, New Hampshire, being joined by several rivers in New Hampshire, including the Nashua River flowing northward from Massachusetts, before entering Massachusetts in Middlesex County. Tributaries joining the Merrimack from the Study Area include Beaver Brook and the Spicket River. The Merrimack then swings to flow northeast toward Newbury, widening into an estuary to join the Atlantic Ocean at Newburyport, Massachusetts (NHDES 2012, USGS 2019e).

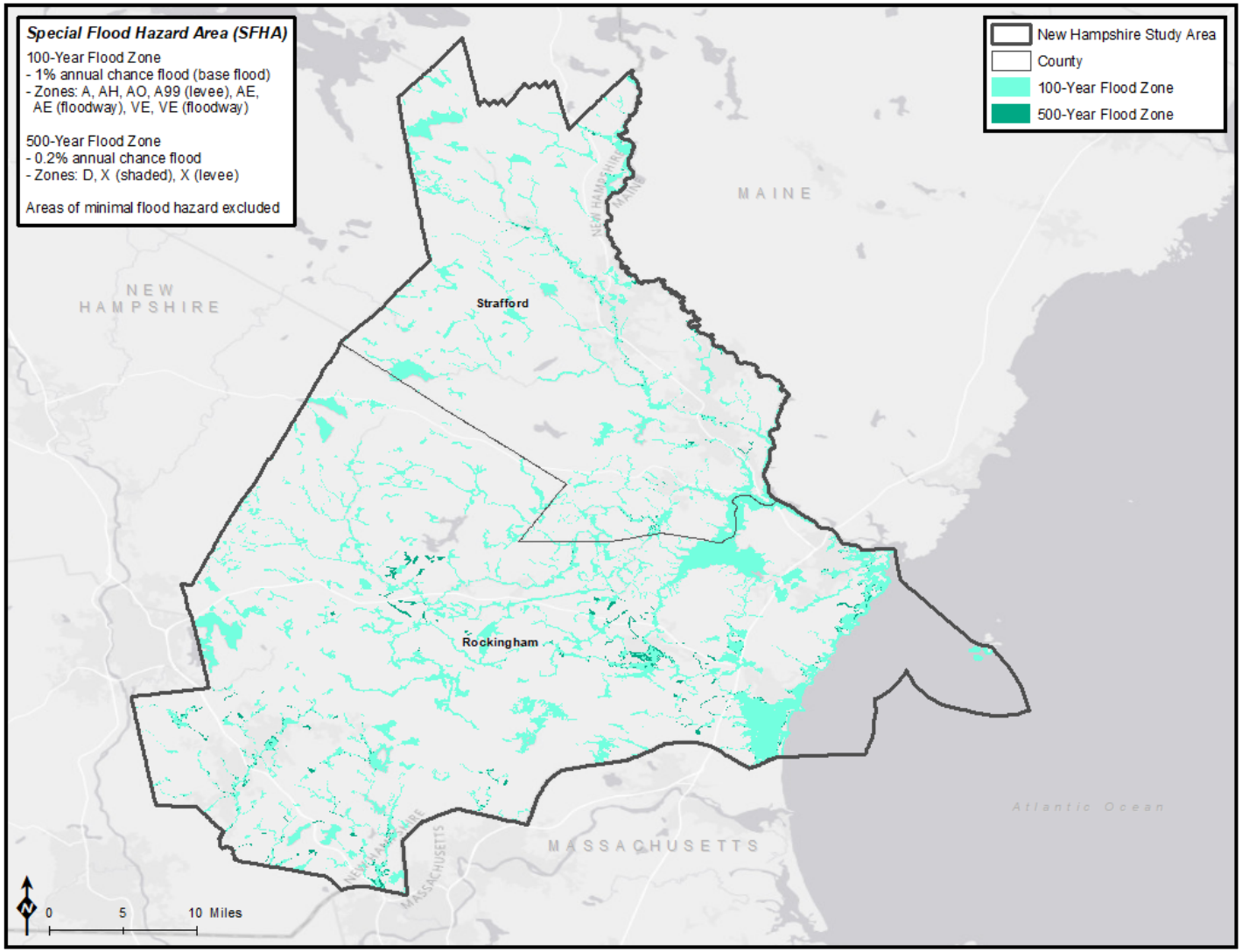
The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of New Hampshire has approximately 10,874 miles of river, only 38 miles are designated wild and scenic rivers. In the Study Area, 23.5 miles of the Lamprey River are designated wild and scenic river. Beginning in 1996 and expanded in 2000, the segment from the Bunker Pond Dam in Epping to the confluence with the Piscassic River near Durham was designated as having exceptional scenic and recreational value. Along with prehistoric and 19th-century archeological sites, the Lamprey has the largest anadromous fish population in the Great Bay watershed and a substantial freshwater mussel population (USFWS 2019a).

New Hampshire surface waters are interconnected to groundwater, which is found in fractured bedrock and in the 100-foot thick surface deposits of sand and gravel left by receding glaciers. Although most groundwater in New Hampshire may be used without treatment as drinking water, its low pH is highly corrosive to water systems. Because impervious surfaces prevent water soaking into the ground, New Hampshire tabulates the percentage of impervious surfaces, estimating that an acre of impervious surface where runoff is routed to surface water prevents an estimated 250,000 to 500,000 gallons of water each year from replenishing the groundwater system (NHDES 2008).

3.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 3-5, floodplains comprise about one-tenth of each county in the Study Area. Table 3-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.



Source: FEMA 2019b

Figure 3-5. Floodplains of the New Hampshire Study Area

Table 3-1. Floodplains in the New Hampshire Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Rockingham	59,999	13.5	3,986	0.9
Strafford	23,547	10.0	699	0.3
Study Area Total	83,546	12.3	4,684	0.7

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

3.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 3-6, wetlands are found in both counties in the Study Area.

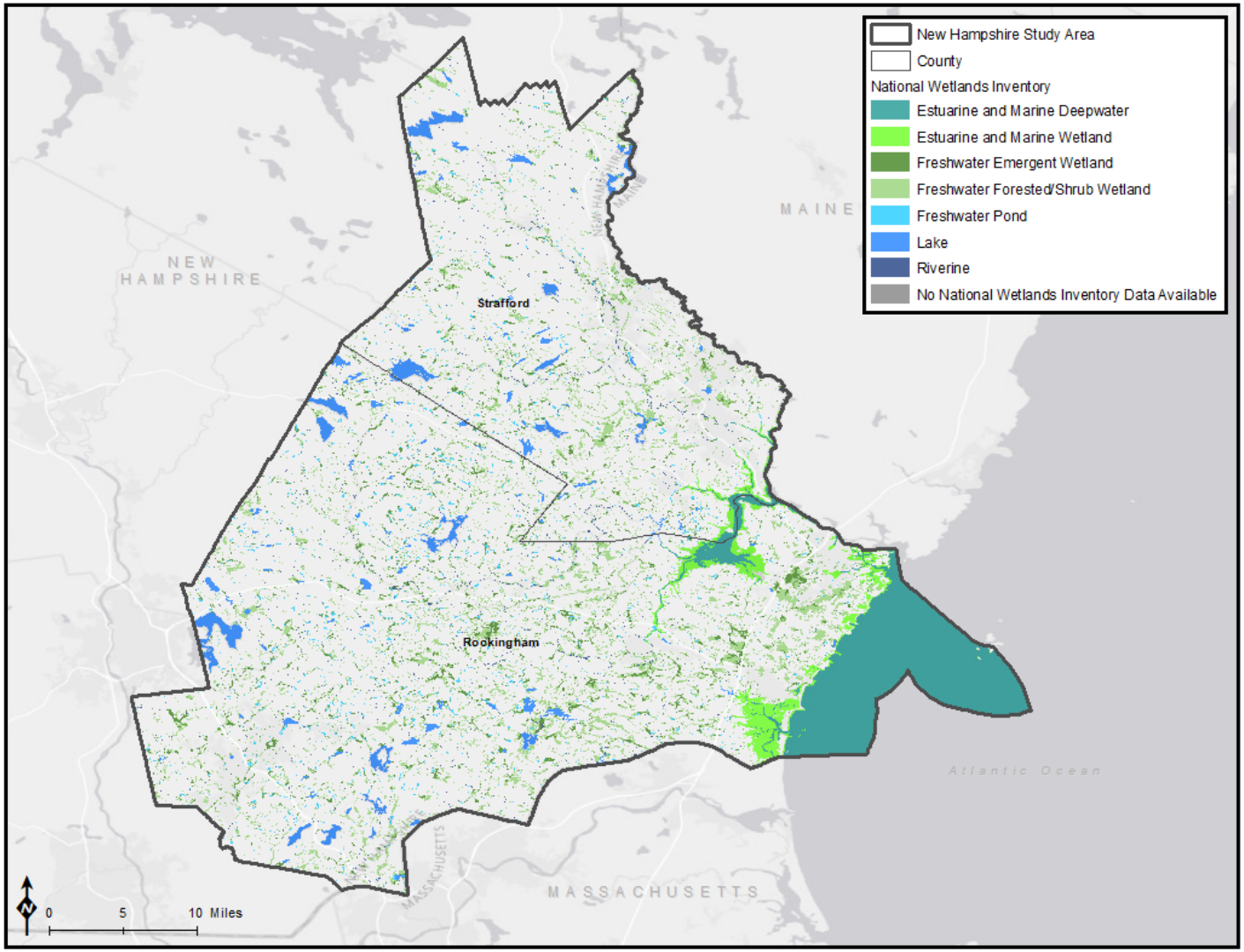
As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 3-2 details the wetland acreage in the Study Area along with other water resources. Wetlands comprise about 10% of the Study Area with a concentration in southeast Rockingham County around Hampton Harbor (USFWS 2018a).

Table 3-2. Wetlands in New Hampshire Study Area

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Rockingham	125,441	10,160	13,761	35,704	48,325	9,829	5,561	2,101
Strafford	31,734	1,618	4,746	14,084	1,407	6,378	1,946	1,554
Study Area Total	**157,174**	**11,778**	**18,507**	**49,788**	**49,733**	**16,207**	**7,507**	**3,655**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

Located behind barrier beaches in southern Rockingham County, Hampton Harbor is home to the Hampton-Seabrook Estuary, the site of New Hampshire's most productive clam flats and last coastal sand dunes. Tributaries to the estuary include the Blackwater, Browns, Hampton Falls, and Taylor Rivers along with Mill and Hunts Island Creeks. At high tide, the Hampton-Seabrook Estuary includes 475 acres with 72 miles of shoreline surrounded by 5,000 acres of salt marsh (PREP 2015b).



Source: USFWS 2018a

Figure 3-6. Wetlands in the New Hampshire Study Area

Providing a rich mix of fresh and salt water, New Hampshire estuaries include a wealth of wetlands. In addition to estuaries along Great Bay and Hampton Bay, unique estuary systems in New Hampshire include bays, harbors, and river outlets. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of pollutant and nitrogen reduction, as well as salt marsh restoration and fish passage restoration (PREP 2014, PREP 2015a, PREP 2015b, NHDES 2010). As such, this is an important natural and cultural resource within the Study Area.

3.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

3.2.2.1 Sea Level Rise

Figure 3-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.

Recognizing the need to prepare for existing and projected coastal flood hazards, the State established the New Hampshire Coastal Risk and Hazards Commission (Commission) to "recommend legislation, rules, and other actions to prepare for projected sea level rise and other coastal and coastal watershed hazards such as storms, increased river flooding, and stormwater runoff, and the risks such hazards pose to municipalities and the State assets in New Hampshire" (NHCRHC 2016). Relative sea level, the combination of land motion and sea level motion, varies greatly by geography and is influenced by subsidence, topography, erosion, and ocean currents. The Commission recognizes two distinct geographic areas that are impacted by coastal hazards: the Atlantic Coast and the Great Bay, including their tidal tributaries. Both of these geographic areas are located within the Study Area. The southern Atlantic Coast consists of a barrier beach system including the extensive salt marshes of the Hampton-Seabrook Estuary to the south and prominent bedrock headlands, small cove beaches, and tidal waterways to the north. New Hampshire's Atlantic Coast communities include Hampton, Hampton Falls, North Hampton, New Castle, Portsmouth, Rye, and Seabrook. Great Bay is part of the Piscataqua River Basin, which includes the Cocheco, Lamprey, Oyster, Exeter, Winnicut, and Salmon Falls Rivers and includes a nationally recognized Estuarine Research Reserve. Communities surrounding New Hampshire's Great Bay municipalities include Dover, Durham, Exeter, Greenland, Madbury, Newfields, Newington, Newmarket, Rollinsford, and Stratham (NHCRHC 2016). As shown in Figure 3-7, sea level rise will be most prominent immediately adjacent to the Atlantic Coast and Great Bay, especially the Hampton-Seabrook Estuary, and along the Piscataque River to Great Bay and its tributaries.

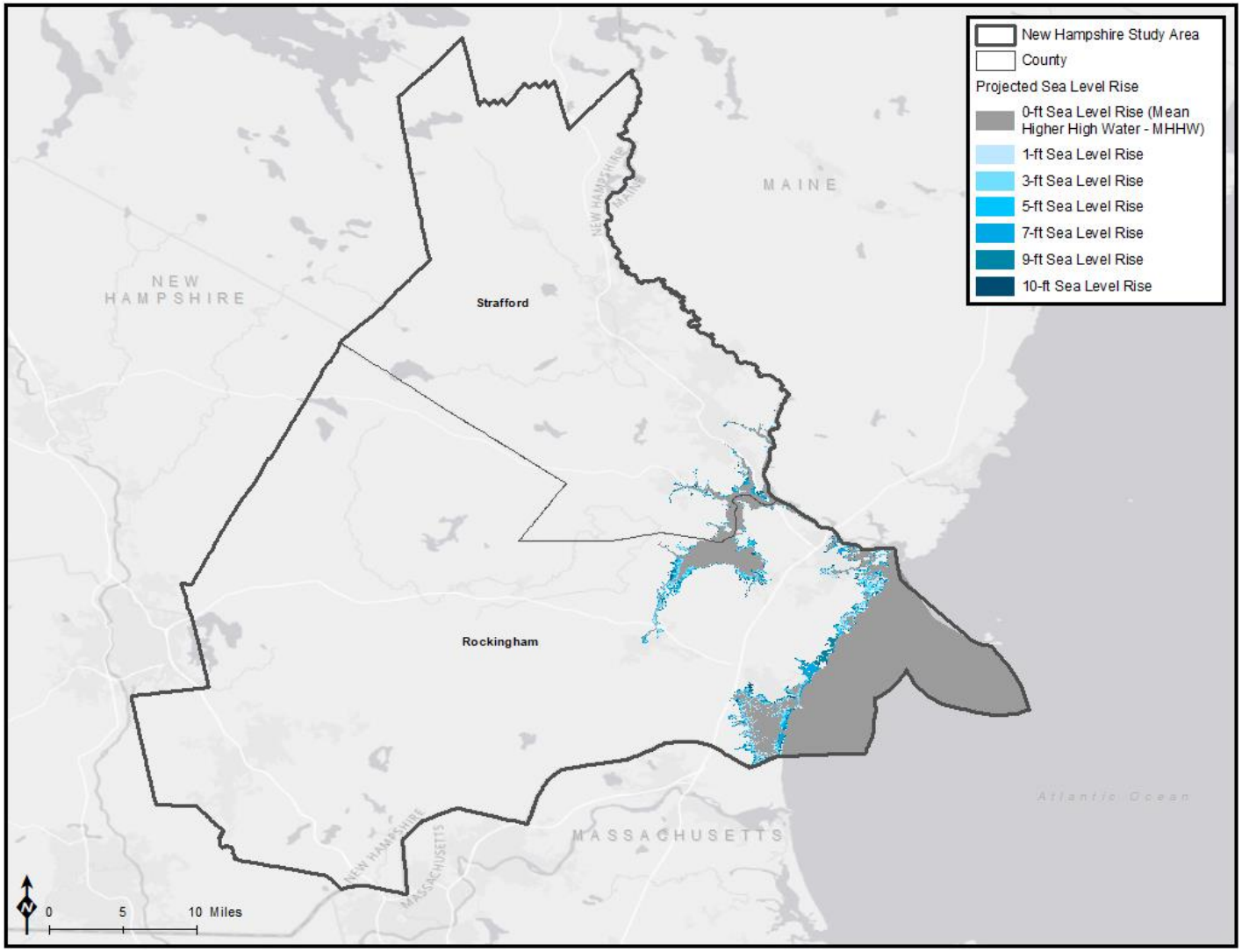
Based on tide gauge data in New Hampshire, and from Portland and Seavey Island Maine, which is located directly adjacent to the Study Area in the Piscataqua River, sea levels in New Hampshire have been rising by an average of 0.7 inches per decade since 1900 (NHCRHC 2016, Wake et al. 2019). The rate of sea level rise has recently increased to approximately 1.3 inches per decade since 1993 (0.13 inches/year) (NHCRHC 2016). The increase in rates of sea level rise in New Hampshire is mostly due to subsidence, which makes New Hampshire particularly vulnerable to an increased rate of sea level rise in the future (SeaLevelRise.org 2019). Subsidence in New England is primarily due to the Earth's crust rebounding from the last Ice Age, although not as pronounced as in the Mid-Atlantic (Wake et al. 2019).

Sea level rise is already impacting coastal communities in New Hampshire. There are already over 2,544 properties at risk from tidal flooding in New Hampshire. Tidal (nuisance) flooding has increased by 260% in some areas of New Hampshire since 2000 (SeaLevelRise.org 2019). Rising groundwater is another consequence of sea level rise. Raised groundwater levels are projected to extend up to 2.5 to 3 miles inland from the coast in coastal New Hampshire as a result of sea level rise, which is approximately three to four times farther inland than current tidal-water inundation. Rising groundwater is a concern in coastal New Hampshire because it contributes to the degradation of coastal road infrastructure and underground utilities, deterioration of historic structures, inundation of cesspools and septic-system leach fields which can lead to contamination of surface water bodies, and the inland and upward movement of the saltwater/freshwater interface, which has the potential to impact drinking water supplies as groundwater is an important source of potable water throughout the State (Wake et al. 2019).

Some scientists forecast that in just the next 15 years, the sea level will have risen by another 6 inches (0.4 inches a year) (SeaLevelRise.org 2019). According to NOAA's measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.08 inches/year (NOAA 2019b). According to research conducted by the Commission and based on mean sea level in 1992, New Hampshire sea levels are expected to rise between 0.6 and 2.0 feet by 2050 and between 1.6 and 6.6 feet by 2100 (NHCRHC 2016). That is a worst-case scenario of 0.73 inches/year average rate of sea level rise. In general, predictions of sea level rise become increasingly variable after 2050 depending on impacts from global climate change. According to some projections, coastal New Hampshire is likely to experience relative a sea level rise of 0.5-1.3 feet between 2000-2050 if global greenhouse gas concentrations stabilize, but there is a possibility (1% chance) that they could exceed 2.0 feet by 2050 (Wake et al. 2019). If greenhouse gas concentrations are not stabilized after 2050, coastal New Hampshire should plan for a relative sea level rise of 1.5-3.8 feet by 2100 (Wake et al. 2019). The Commission's scientific advisory panel suggests building to different specifications depending on the life of a project, based on different sea level scenarios for different time periods, before or after 2050. Up to 2050, leaders should expect 1.3 feet of sea level rise but be prepared to adapt to 2 feet if necessary. If the design or desired time period is after 2050, leaders should expect 3.9 feet of sea level rise but be prepared to adapt to 6.6 feet if necessary. The Commission's panel further encourages project leaders to be aware that the projected sea level rise ranges may change and prepare to adjust design considerations if necessary (NHCRHC 2016).

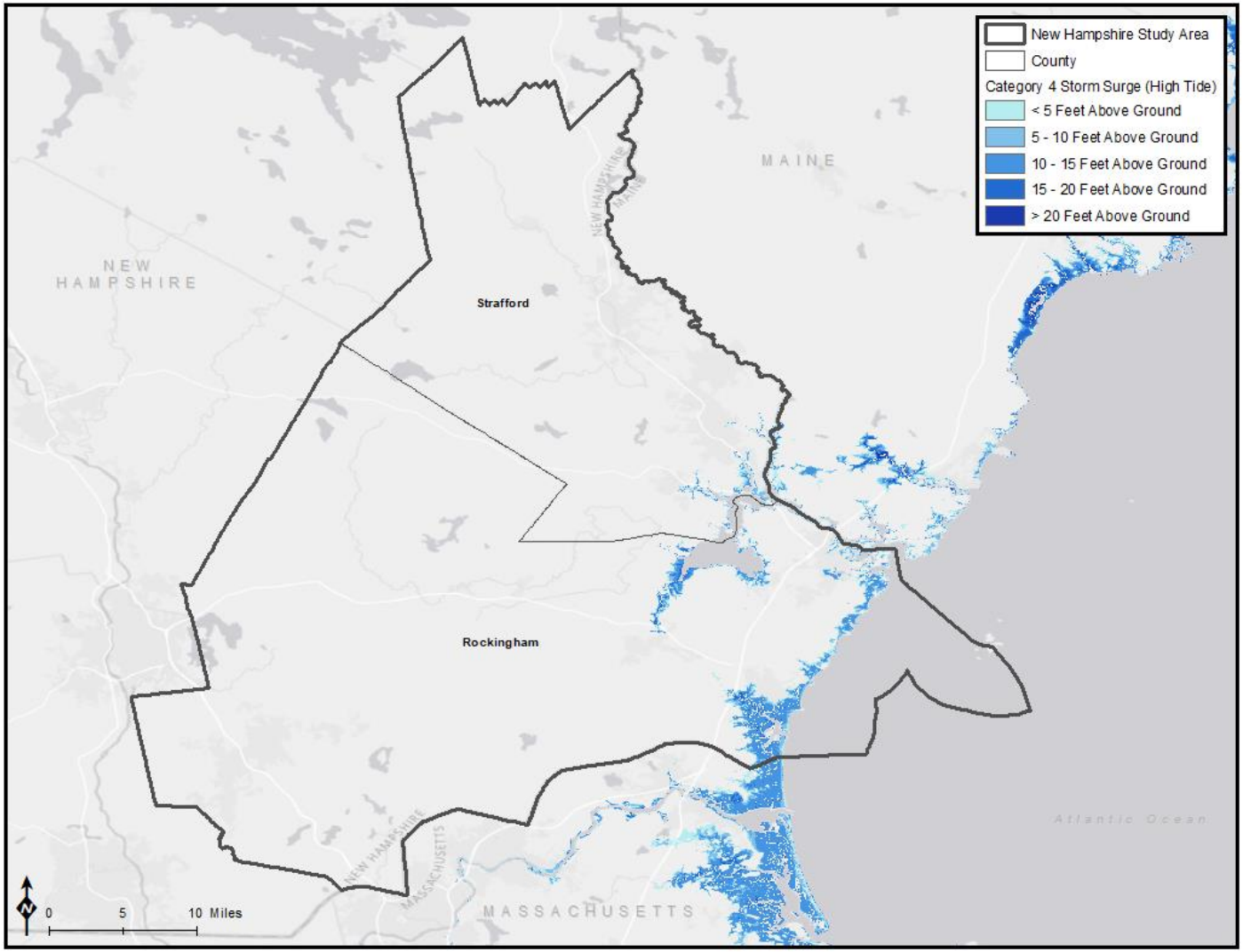
3.2.2.2 Storm Surge

Figure 3-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. Because of its northerly position, it is unlikely that a Category 5 hurricane would strike the New Hampshire coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. As shown in Figure 3-8, storm surge will be most prominent immediately adjacent to the Atlantic Coast and Great Bay, especially the south end of Great Bay and the Hampton-Seabrook Estuary.



Source: NOAA 2018a

Figure 3-7. Projected Sea Level Rise throughout the New Hampshire Study Area



Source: NOAA 2020a

Figure 3-8. Projected Storm Surge throughout the New Hampshire Study Area for a Category 4 Hurricane

New Hampshire experiences both summer tropical storms (hurricanes) and winter nor'easters; these storm systems are described in greater detail in Chapter 1.4.2.2. The 6-foot storm surge from Hurricane Sandy caused over $600,000 worth of damage in New Hampshire (SeaLevelRise.org 2019). The highest tides in New Hampshire occur during nor'easters, especially when combined with seasonal lunar cycles that cause higher than normal tides (SeaLevelRise.org 2019).

High-resolution models examined storm surge for the two major New Hampshire estuarine systems, the Hampton-Seabrook (Atlantic Coast) and Great Bay Estuaries (Great Bay), under various sea level rise scenarios. Results for the two estuaries were quite different. For the Great Bay Estuary, storm surges are dissipated as they progress up the narrow Piscataqua River. In contrast, for the Hampton-Seabrook Estuary, the dissipation through the narrow inlet is relatively small (Wake et al. 2019).

Flood impacts from sea level rise and storm surge scenarios were evaluated for the Atlantic Coast and the Great Bay. Of the current 49,266 acres of upland areas, 3% will experience nuisance flooding at a 1.7-foot sea level rise scenario, 5.3% will experience nuisance flooding at the 4.0-foot scenario, and 7.3% will experience regular flooding at the 6.3-foot sea level rise scenario. The community of Rye will experience relatively more flooding than in other communities because of the extensive low-lying areas around the marshes along Berry's Brook (NHCRHC 2016). Within the Great Bay area, between 1.1% and 3.9% of uplands will be affected under the same scenarios (NHCRHC 2016).

3.2.3 Summary – Physical Characteristics

Two counties are included in the Study Area and these two counties have 13 miles of coastline along the Atlantic Ocean. This New Hampshire coastline is liberally covered with estuaries and wetlands. In addition to the Great Bay and Hampton-Seabrook Estuaries, unique estuary systems in New Hampshire include the bays, harbors, and river outlets. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as salt marsh restoration and fish passage restoration (NHDES 2010, PREP 2014, PREP 2015a, PREP 2015b). As such, estuaries and wetlands are an important natural and cultural resource within the Study Area.

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. To prepare for projected sea level rise and other coastal hazards, a New Hampshire Commission has analyzed two distinct geographic areas in the Study Area that are particularly vulnerable: the Atlantic Coast and the Great Bay (NHCRHC 2016). Sea levels in the Study Area have been rising by an average of 0.7 inches per decade since 1900 (NHCRHC 2016, Wake et al. 2019). The rate of sea level rise has recently increased to approximately 1.3 inches per decade since 1993 (0.13 inches/year), partially due to subsidence. Sea level rise is already impacting coastal communities in New Hampshire (SeaLevelRise.org 2019, NHCRHC 2016). Impacts of concern include nuisance flooding and rising groundwater, both of which contribute to the degradation of community property, public infrastructure, and natural resources. These impacts occur from sea level rise but also from storms increasing in magnitude and frequency. Impacts will be felt throughout the New Hampshire coast but especially in the areas surrounding the Hampton-Seabrook Estuary of the Atlantic Coast, the Great Bay Estuary, and the community of Rye because of the extensive low-lying areas around the marshes along Berry's Brook.

Because predictions of sea level rise become increasingly variable after 2050 depending on impacts from global climate change, the Commission suggests building to different specifications depending on if the life of a project is before or after 2050. Up to 2050, leaders should expect 1.3 feet of sea level rise but be prepared to adapt to 2 feet if necessary. If the design or desired time period is after 2050, leaders should expect 3.9 feet of sea level rise but be prepared to adapt to 6.6 feet if necessary (NHCRHC 2016).

In summary, physical characteristics of the Study Area influence land use and land cover, demographics, and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic region.

3.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

3.3.1 Land Cover

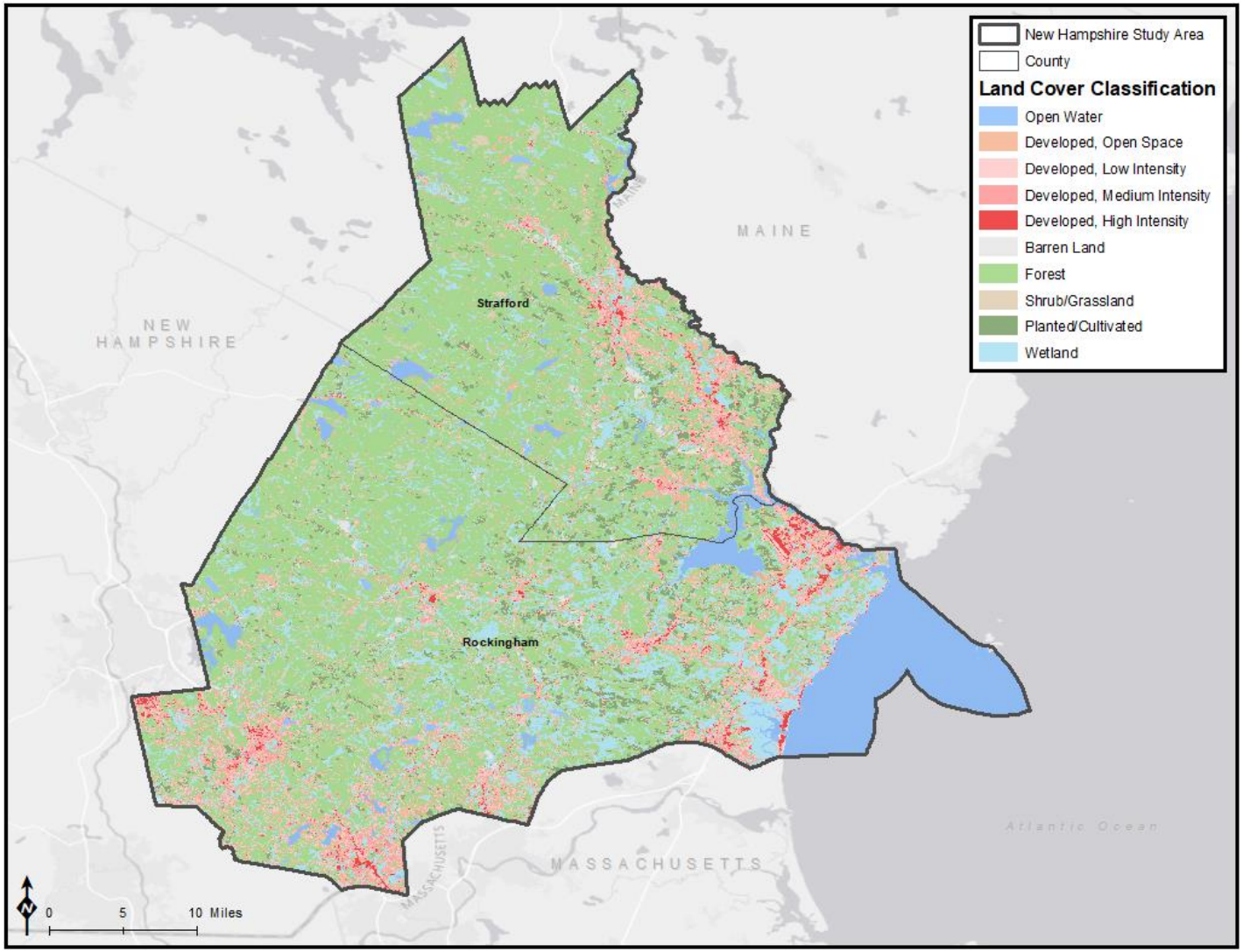
Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The 2016 NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

Figure 3-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 3-3 presents the NLCD data for the two counties within the Study Area by acreage. Table 3-4 presents the NLCD data for each county within the Study Area by percentage and presents a summary of the overall land cover for each geographic unit. Although Table 3-3 includes data for open water land use, open water was ignored in Table 3-4 because this land cover would not be considered for future industrial development. Each county was then categorized based on its land cover trend as shown in Table 3-4 and Figure 3-9. The following section discusses the summary of this analysis.

Table 3-4 presents an assessment of the general land cover for the two counties in the Study Area based on the majority of the land cover within that geographic unit. Based on the assessment presented in Table 3-4, Figure 3-9 shows the majority land cover type within each county in the Study Area.

As shown in Table 3-4, the two counties in the Study Area are predominantly forested, which makes up 58.8% of the landcover. Strafford County has the highest percent forest land cover at 64.8%, while Rockingham has a forested land cover of 53.9%. Rockingham County also has a significant developed (low intensity) land cover of 21.1%. There are 36 towns and 1 city in the county. Derry and Salem, two of the bigger towns in Rockingham County with populations around 30,000, are both situated in the western part of Rockingham County, which could contribute to the low-intensity development in that region of the county.

Most of the developed land cover in the Study Area is the southwest portion of Rockingham County, along the coast and the eastern portion of Strafford County. This is the result of “peripheral sprawl” of the greater Boston area, with population growth rates high among a broad band of communities around the outer edge of the Boston metropolitan area, which includes much of southeastern New Hampshire.



Source: NLCD 2016a

Figure 3-9. National Land Cover in the New Hampshire Study Area

Table 3-3. Acres of Land Cover by NLCD Classifications in New Hampshire Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Rockingham	508,950	32,698	36,287	19,363	5,819	94,168	3,400	240,564	12,158	20,545	75,605	62,510
Strafford	244,857	17,226	11,232	5,080	1,552	35,090	2,210	152,600	7,735	12,316	25,471	9,434
Study Area Total	753,807	49,925	47,519	24,443	7,371	129,258	5,610	393,164	19,894	32,862	101,076	71,944

Source: NLCD 2016a

Table 3-4. Percentage of Land Cover by NLCD Classification (excluding open waters) and Predominant Classification for Counties/Cities in the New Hampshire Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Rockingham	7.3	8.1	4.3	1.3	21.1	0.8	53.9	2.7	4.6	16.9	Forest and Developed
Strafford	7.3	4.8	2.2	0.7	14.9	0.9	64.8	3.3	5.2	10.8	Forest
Study Area Total	7.3	7.0	3.6	1.1	19.0	0.8	57.7	2.9	4.8	14.8	Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once. In New Hampshire, 4.9% of the land cover in the Study Area changed at least once. Figure 3-10 and Table 3-5 show the land cover change within the Study Area from 2001 to 2016. Strafford County experienced the most land cover change at 5.1%, followed closely by Rockingham County at 4.9%. These were largely changes from or to any one of the urban land cover types and from or to any of the forested land cover types (USDA 2019c). Therefore, it is possible the land cover changes can potentially be attributed to urban development in the area.

Table 3-5. Land Cover Change in the New Hampshire Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Rockingham	508,959	24,773	4.9
Strafford	244,857	12,475	5.1
Study Area Total	**753,815**	**37,248**	**4.9**

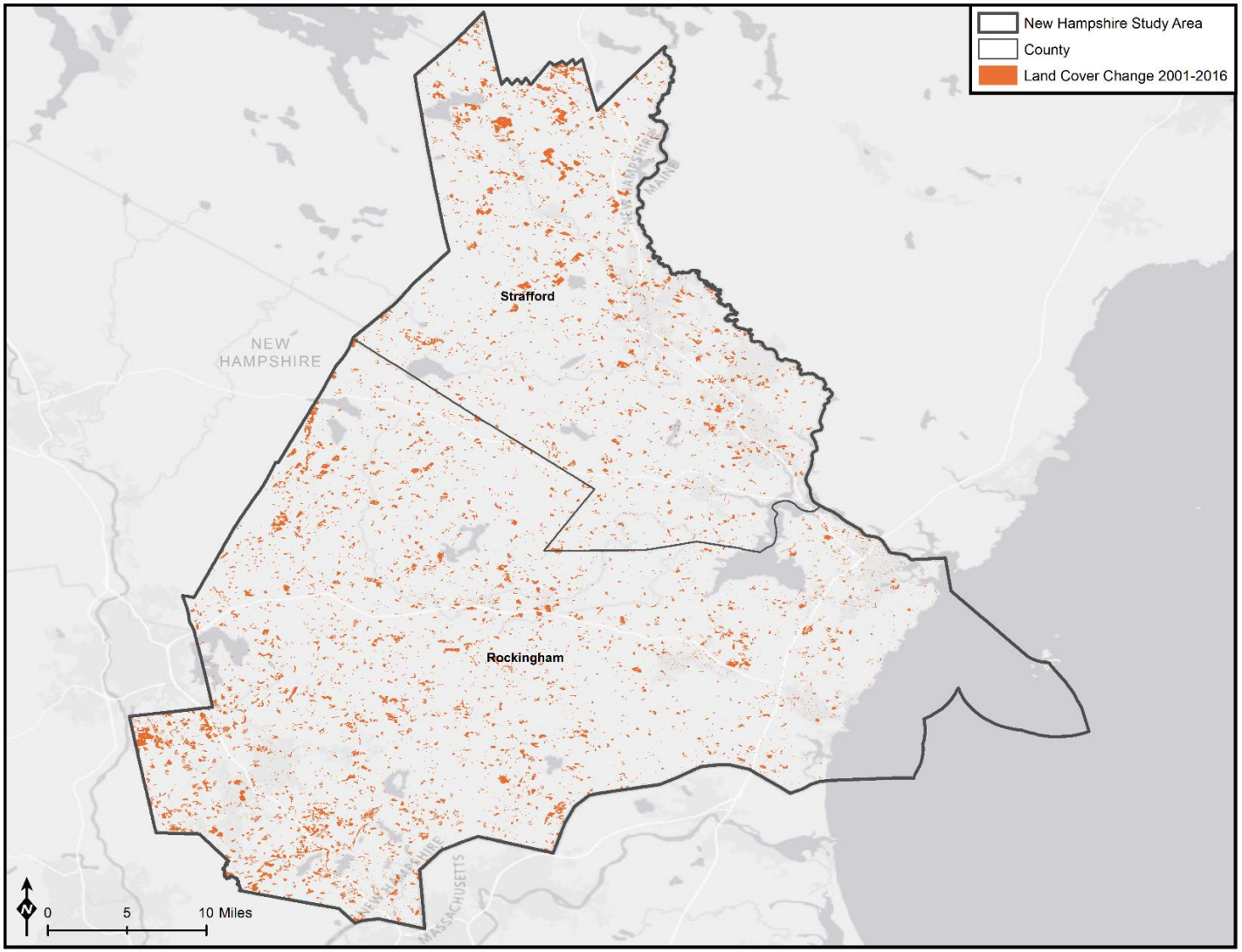
Source: NLCD 2001-2016

It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serve as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of New Hampshire may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of "forest" is very broad.

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.

3.3.2 Land Use

Land use is defined as the way people use and develop land, including undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.



Source: NLCD 2001-2016

Figure 3-10. Land Cover Change in the New Hampshire Study Area

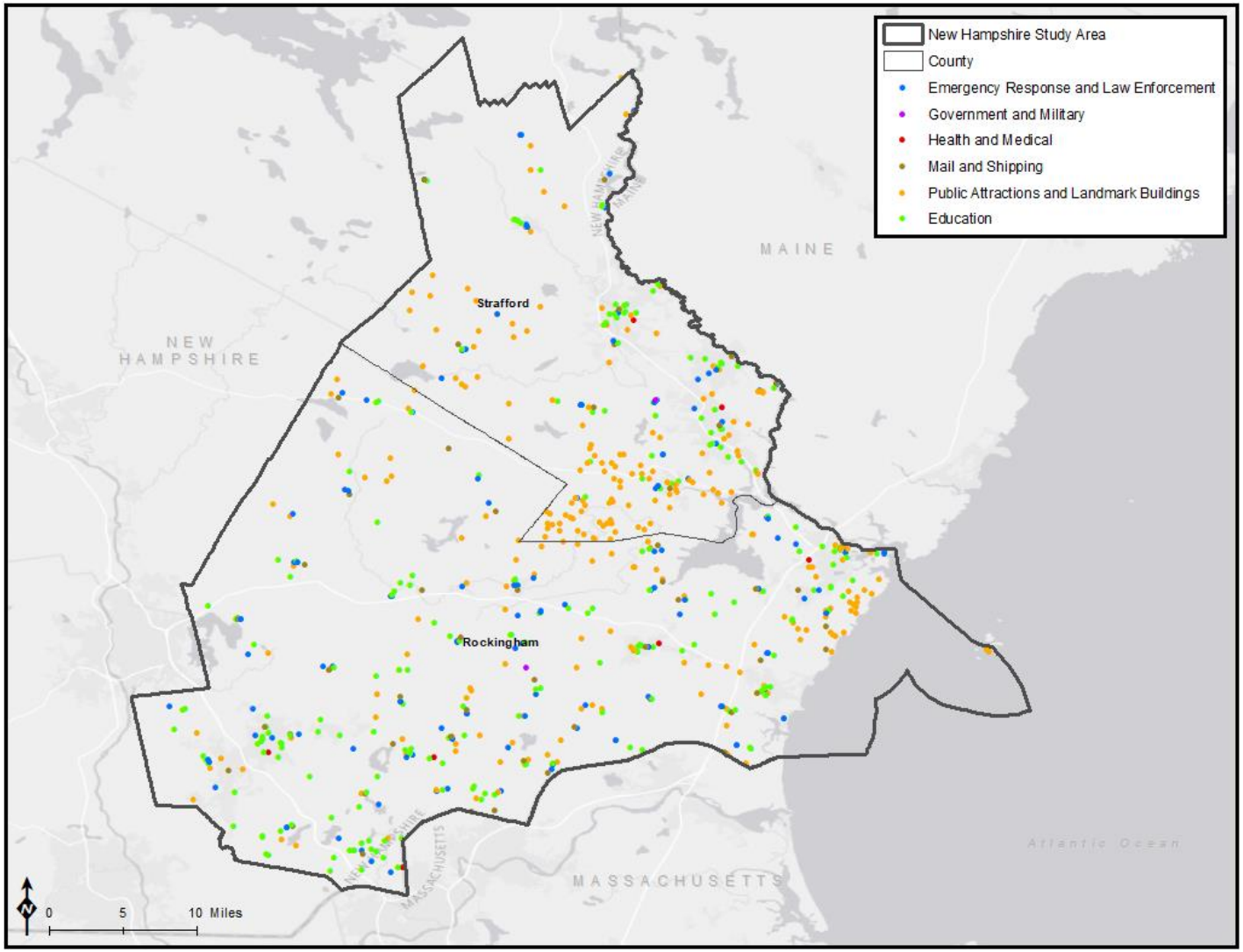
3.3.2.1 Existing and Future Land Use

Land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 3-11 presents locations of infrastructures at the broad scale of the Study Area. Figure 3-12 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 3.3.1, and the specific identified infrastructures and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

Generally speaking, New England States do not have as active of a county government system when compared to the rest of the country. However, municipalities in the Study Area are part of three of the nine regional planning commissions in New Hampshire providing planning assistance to its municipalities (SRPC 2017). The New Hampshire Association of Regional Planning and Commission is comprised of nine regional planning commissions in the State of New Hampshire. Within the two counties that make up the Study Area, there are three regional planning commissions. Strafford County is in the Strafford Regional Planning Commission. Rockingham County is primarily in the Rockingham Regional Planning Commission, but three municipalities are part of the Strafford Regional Planning Commission (Northwood, Nottingham, and Newmarket) and seven municipalities are part of the Southern New Hampshire Regional Planning Commission (Deerfield, Candia, Auburn, Chester, Derry, Windham, and Londonderry) (ESRI 2020b). These regional commissions serve in an advisory role to local governments to promote coordinated planning, orderly growth, efficient land use, transportation access, and environmental protection. Each region and municipality have developed a comprehensive plan, strategic plan, or master plan with regard to future development activities within their specific boundaries (NHOSI 2019).

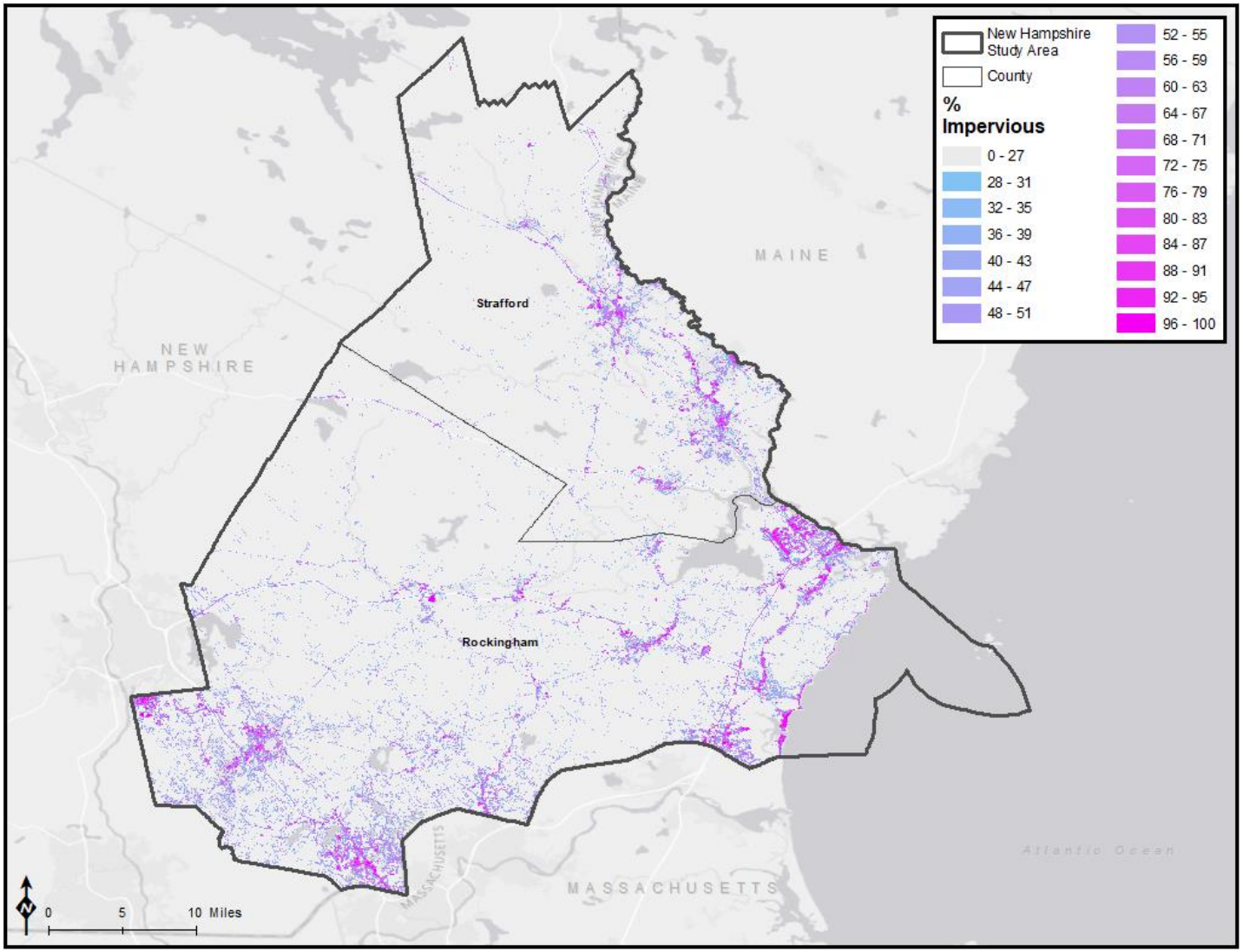
Typically, such planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase future changes in land use. Some, though not all, of these include publicly available GIS data that support the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 3.3.2.2.

Future OCS-related project analysts of onshore components associated with OCS-related activities or projects will wish to consult the comprehensive plan, master plan, or regional plan once site-specific information regarding the location of onshore components of proposed future projects is known. Regions are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.



Source: USGS 2017

Figure 3-11. Select Existing Land Uses within the New Hampshire Study Area



Source: NLCD 2016b

Figure 3-12. Impervious Surfaces within the New Hampshire Study Area

New Hampshire is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New Hampshire's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 27 census tracts identified as Opportunity Zones in the State, several of which are located in the Study Area. An interactive map of opportunity zones is located at https://www.nheconomy.com/grow/opportunity-zones/opportunityzonemaps (NH 2020).

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). Counties and municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time (NH 2020).

As determined in the land cover analysis in Chapter 3.3.2, most of the land cover in the Study Area is forested. The land use maps in Figure 3-11 and Figure 3-12 indicate that (1) a moderate portion of the land in the Study Area is centered around education and public attractions/landmark buildings, (2) impervious surfaces are positively correlated to areas with a larger population density, and (3) public attractions and landmark buildings are mostly clustered in the southern portion of Strafford County, while education is distributed sparsely around the Study Area.

The existing land use maps for the Study Area indicate that impervious surfaces are associated with urban land use and transportation corridors, and public attractions and landmark buildings are associated with urban land use or impervious surfaces. Existing land use data show that the density of public attractions and buildings is mostly clustered in Strafford County.

The land use data show the influence of the regional population density (discussed in Chapter 3.3.2) on the distribution and concentration of various land uses. Regions with higher population densities tend to coincide with the more concentrated land uses, which is consistent with the economic development regions that host larger transportation networks, more industries, and greater recreational resources.

3.3.2.2 Zoning

As described in Chapter 3.3.2.1, within the two counties that make up the Study Area, there are three regional planning commissions. Strafford County is in the Strafford Regional Planning Commission. Rockingham County is primarily in the Rockingham Regional Planning Commission, but three municipalities are part of the Strafford Regional Planning Commission (Northwood, Nottingham, and Newmarket) and seven municipalities are part of the Southern New Hampshire Regional Planning Commission (Deerfield, Candia, Auburn, Chester, Derry, Windham, and Londonderry) (ESRI 2020b). In addition to the comprehensive, strategic, or master plan, all municipalities in the Study Area have a comprehensive, traditional zoning ordinance (NHOSI 2019); however, some ordinances may not have an associated map or the maps may not be available in GIS formats. Thus, zoning information cannot be generalized across the scale of the Study Area. Links to each municipality and their zoning map and/or zoning ordinances are on the regional planning commission websites. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Additional zoning resources at the State level are on New Hampshire's Office of Strategic Initiatives website (NHOSI 2017).

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during potential OCS-related project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

Generally, zoning ordinances are relevant to the activities that take place in a particular zone. However, some counties are stricter about visual aesthetics than others, such as requiring vegetative buffers or requiring architectural structures similar to the structures already existing in the area; others may have more restrictive noise ordinances. Individual plans for Study Area counties reflect the predicted trends of development moving farther inland and the compounding development pressure and associated impacts on existing undeveloped agricultural and natural landscapes; the community plans have been formulated to discourage these trends.

Zoning may or may not apply to pipeline routes. Often, projects attempt to plan the placement of new pipelines within or parallel to existing pipeline rights-of-way to minimize new ground-disturbing impacts to other areas.

3.3.2.3 Industrial Incentives

In an effort to promote new business growth and encourage current businesses, New Hampshire offers several industrial and financial incentives to encourage the State's business climate. The New Hampshire Division of Economic Development provides assistance to help individuals and businesses obtain licenses and permits, and facilitate business growth (NHDED 2020a). The following are examples of business and financial incentives that could potentially benefit a business associated with OCS-related activities. Some economic development programs may have specific requirements or deadlines which should be considered during future OCS-related project analysis.

The New Hampshire Job Training Fund provides a grant of $750 to $100,000 for training of a company's employees. The program is designed to ready New Hampshire employees and employers for company training that is paid through a State operated fund (NHDED 2020a). Additionally, the On-The-Job Training assists businesses with hiring needs and screening qualified applicants (NHDED 2020a).

Businesses that invest and contribute to the economic growth of Opportunity Zones may be able to defer part of their capital gains on earnings that have been reinvested into the zones through specialized funds. The long-term investments within Opportunity Zones do not have to pay additional capital gains taxes on earnings from the original investments (NHDED 2020a).

The New Hampshire Office of International Commerce works with companies to connect with existing opportunities and establish new opportunities in overseas markets (NHDED 2020a). New Hampshire has also applied and been approved by the Foreign Trade Zones Board, which encourages the location of businesses in the U.S. and States that contain Foreign Trade Zones. These zones provide financial benefits where companies are able to defer, reduce, or eliminate duties on imports as well as find and succeed in international markets (NHDED 2020a).

New Hampshire also offers a comprehensive list of available commercial and industrial properties for sale at SelectNH.com to promote business establishment or relocation. The New Hampshire Division of Economic Development offers business consulting and support, and should be consulted when considering business in New Hampshire. The New Hampshire Employment Security is a federally funded State agency that operates to provide free public employment service through job and information centers, and also investigates and reports on labor market information (NHES 2020).

3.3.2.4 Industry

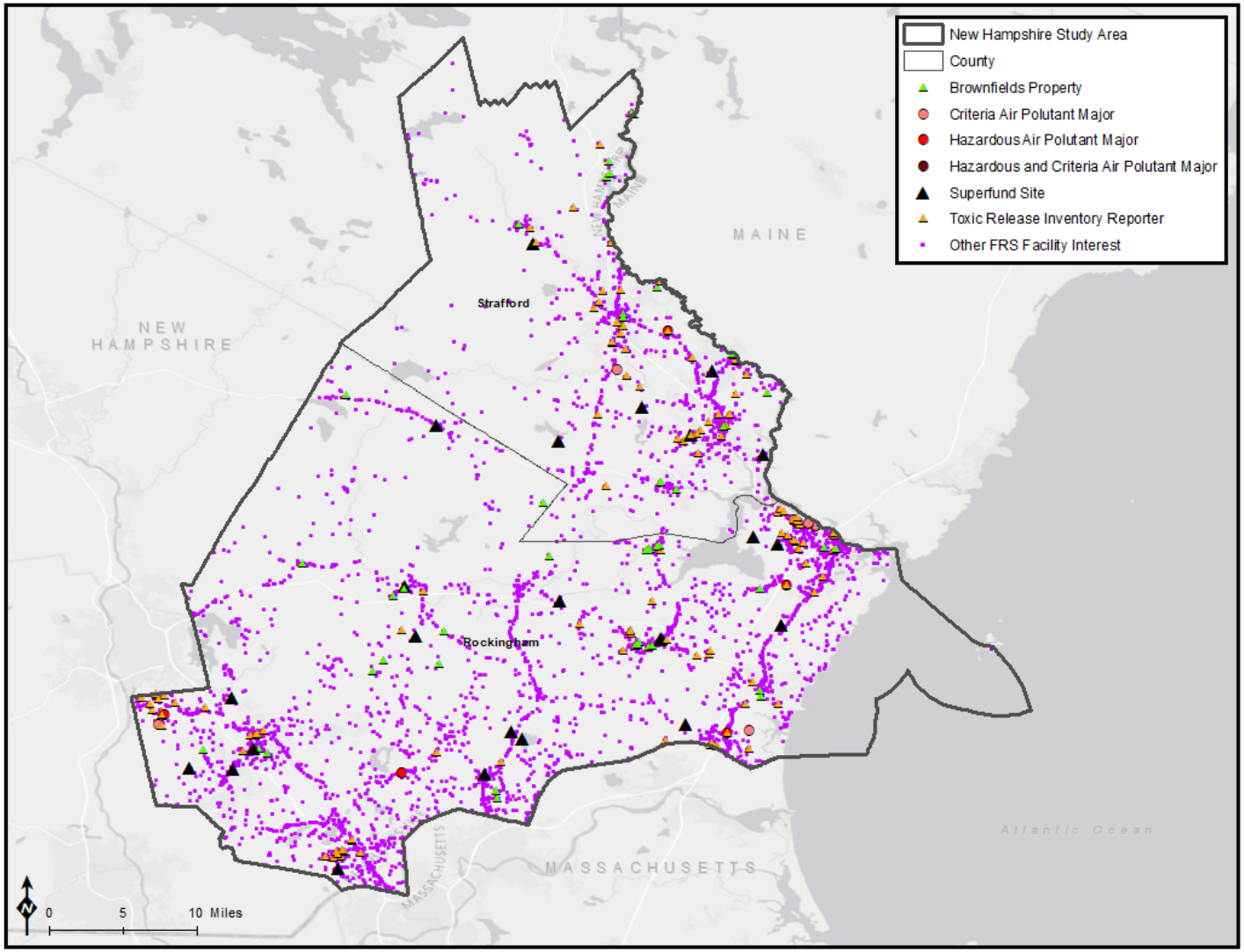
The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 3-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory-listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 3-13, industry is concentrated in northeast Rockingham County and southeast Strafford County. Chapter 3.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

3.3.2.5 Protected Areas

The PAD-US produced by the U.S. Geological Survey is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of fauna and flora within the ecosystem, as well as recreational activities and any other use of the land through “legal or other effective means.” The purpose of the PAD-US database is to aid and inform decision makers in considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands (USGS 2019f). The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time.



Source: USEPA 2018a

Figure 3-13. USEPA Facility Register Service Record for the New Hampshire Study Area

Figure 3-14 shows the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, USFWS, and NPS. Overall, the eastern region of the Study Area has the largest area of protected lands primarily because of the many Federal or State-owned protected areas, along with State Conservation areas on the coast. The Great Bay is a large portion of the eastern region of Rockingham County. All of the protected areas can be viewed via an interactive map with data taken from PAD-US (protectedlands.net 2019). Overall, a large portion of the Study Area is covered in protected lands that could prohibit development. Protected areas and potential impacts to these areas will need to be considered during potential future OCS-related project analysis. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance. Protected lands in the Study Area include those owned and/or managed by the city/local area, Federal or State, USFWS, State conservation, and non-governmental organizations.

3.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

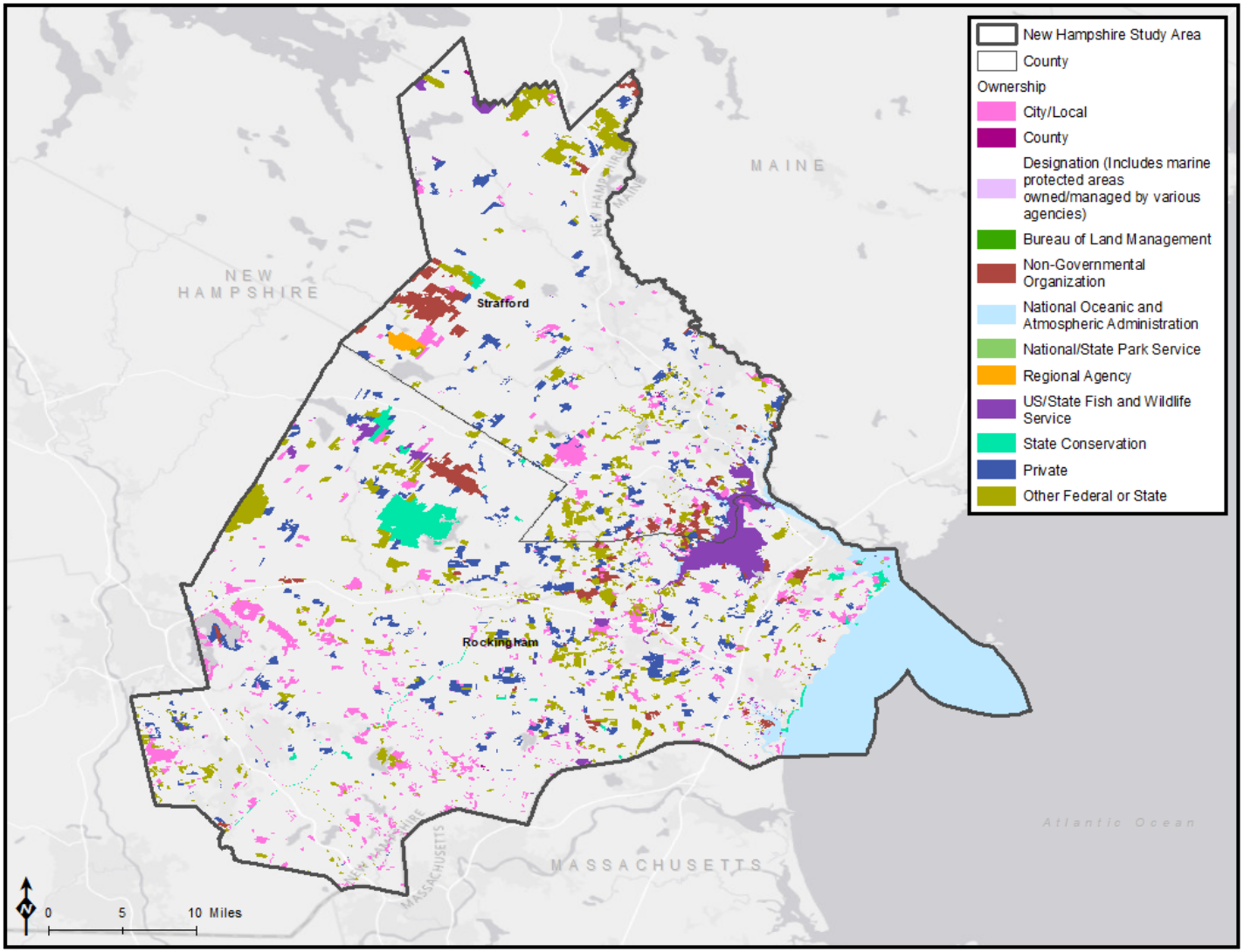
The early inhabitants of the region, now referred to as New Hampshire, resided in the area long before the era of European exploration. These tribes all spoke related dialects of the Abenaki language (NHSCA 2014). The Abenaki were recorded by European explorers in the early 1500's and were believed to set up villages along rivers and lakes where they could hunt, farm, and fish. However, by the mid- to late 1600's diseases brought by the settlers,, war, and forced migration reduced the Abenaki population. (Squires et al. 2020).

The colony New Hampshire was founded as a fishing community in 1623 by Captain John Mason who was granted the land by the King of England. The main settlements of the time were the towns of Dover (Strafford County) and Portsmouth, Exeter, and Hampton (Rockingham County). Control of the New Hampshire colony changed several times, being under the Massachusetts colonial government from 1641-1679 before becoming a separate province in 1679. In January 1776, New Hampshire formed its own state government (Squires et al 2020).

In 1774, prior to the American Revolutionary War (1775-1783), Paul Revere rode to Portsmouth and warned people that the British would be reinforcing Fort William and Mary in New Castle; therefore, colonists seized Fort William and Mary (now Fort Constitution State Historic Site) as resistance to British rule spread (Squires et al. 2020). During the American Revolutionary War, no battles were fought on New Hampshire soil; however, New Hampshire fought with the Continental Army in several battles.

In the years that followed, agriculture, particularly sheep herds, and manufacturing grew in importance throughout the State, especially in Manchester. Shipbuilding became a primary industry in Portsmouth and the surrounding area (Squires et al. 2020).

During the American Civil War, (1861-1865), no battles were fought in New Hampshire, but several men enlisted to fight in the war or, alternatively, to work in industrial communities such as Dover (Strafford County) and Newmarket (Rockingham County). as the industries in these communities were important because the production of blankets, uniforms, shoes, and rifles were needed to aid war efforts. Due to the increase in industrial centers in New Hampshire, after the war there was a general decline in agricultural communities. Because grains, wool, and meat were brought to New Hampshire at a lower cost, farmers were forced to switch to producing perishable items such as dairy and fruits (Squires et al. 2020).



Source: USGS 2019f

Figure 3-14. Protected Areas within the New Hampshire Study Area

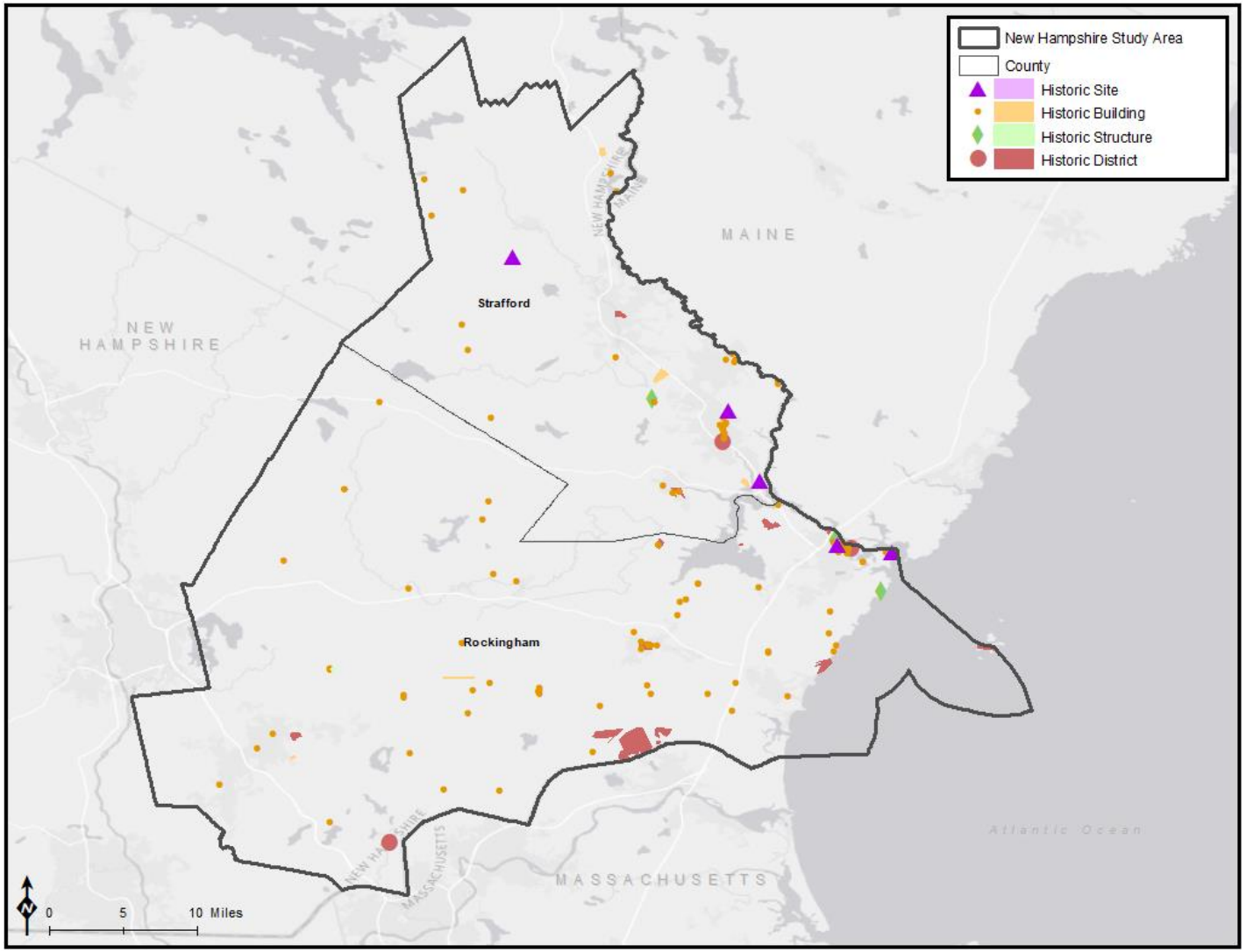
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with American Indians and major turning points in American History such as the Industrial Revolution. There are also sites associated with first settlements of the New World and events leading to the American Revolution. Because of the duration of human presence in New Hampshire, New Hampshire has several historic sites. Figure 3-15 and Figure 3-16 present a summary of many of these locations, including maritime sites and shipwrecks located along the coast.

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including New Hampshire) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are shown in Figure 3-15 and Figure 3-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of New Hampshire's cultural and historical resources, potential future OCS-related projects will need to conduct detailed cultural resource surveys of proposed project sites (and their immediate vicinity) will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

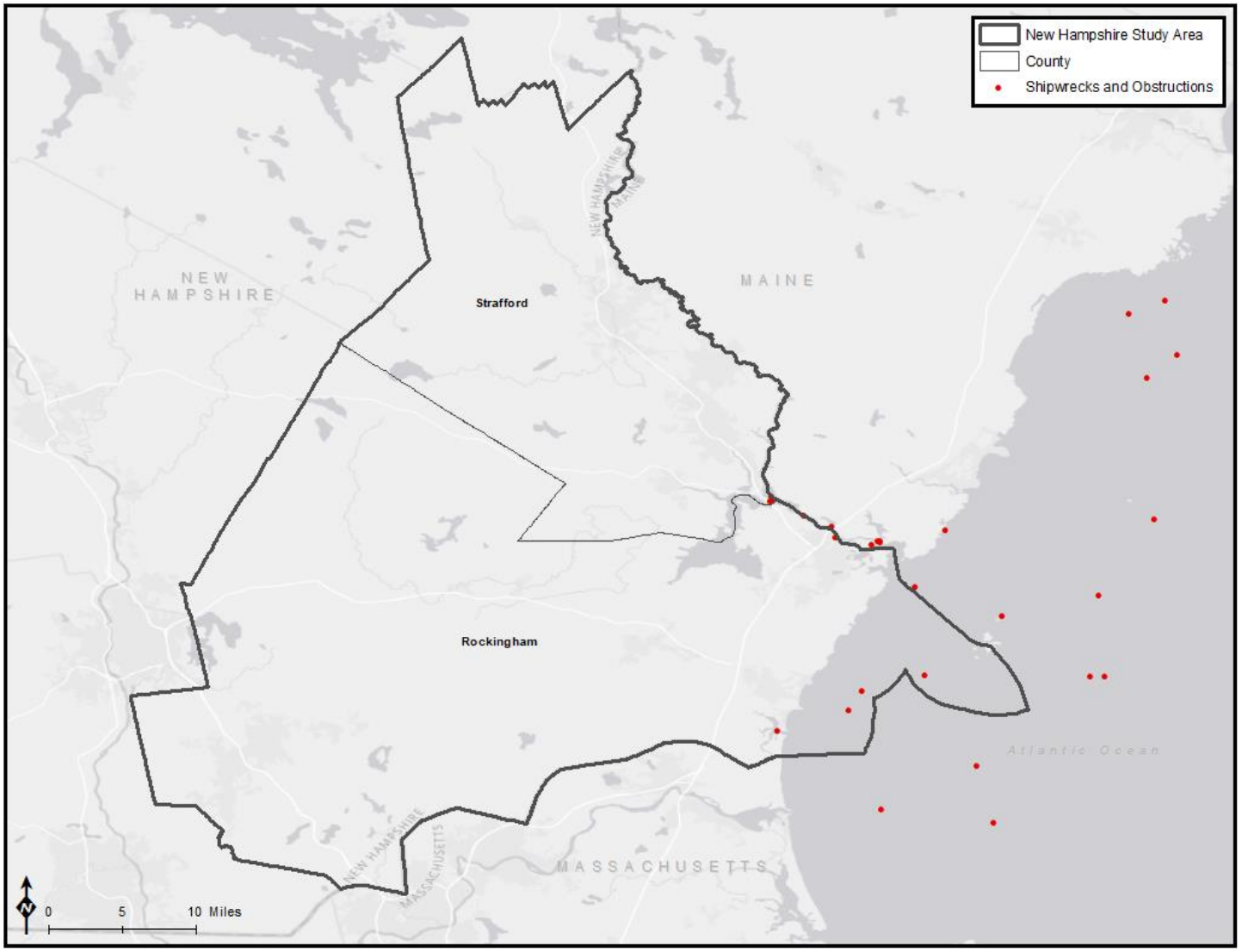
3.3.2.7 Recreation

The Study Area has diverse recreational opportunities including boating, rafting, sailing, camping, whale watching, fishing, hunting, local cruises, and visiting State parks and beaches. A selection of major recreational resources in the Study Area is shown in Figure 3-17. The cultural and historic resources shown in Figure 3-15 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 3-14. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 3.3.2.6), transportation (Chapter 3.3.2.8), tourism employment (included in Chapter 3.4.4), and rental housing (included in Chapter 3.4.3).



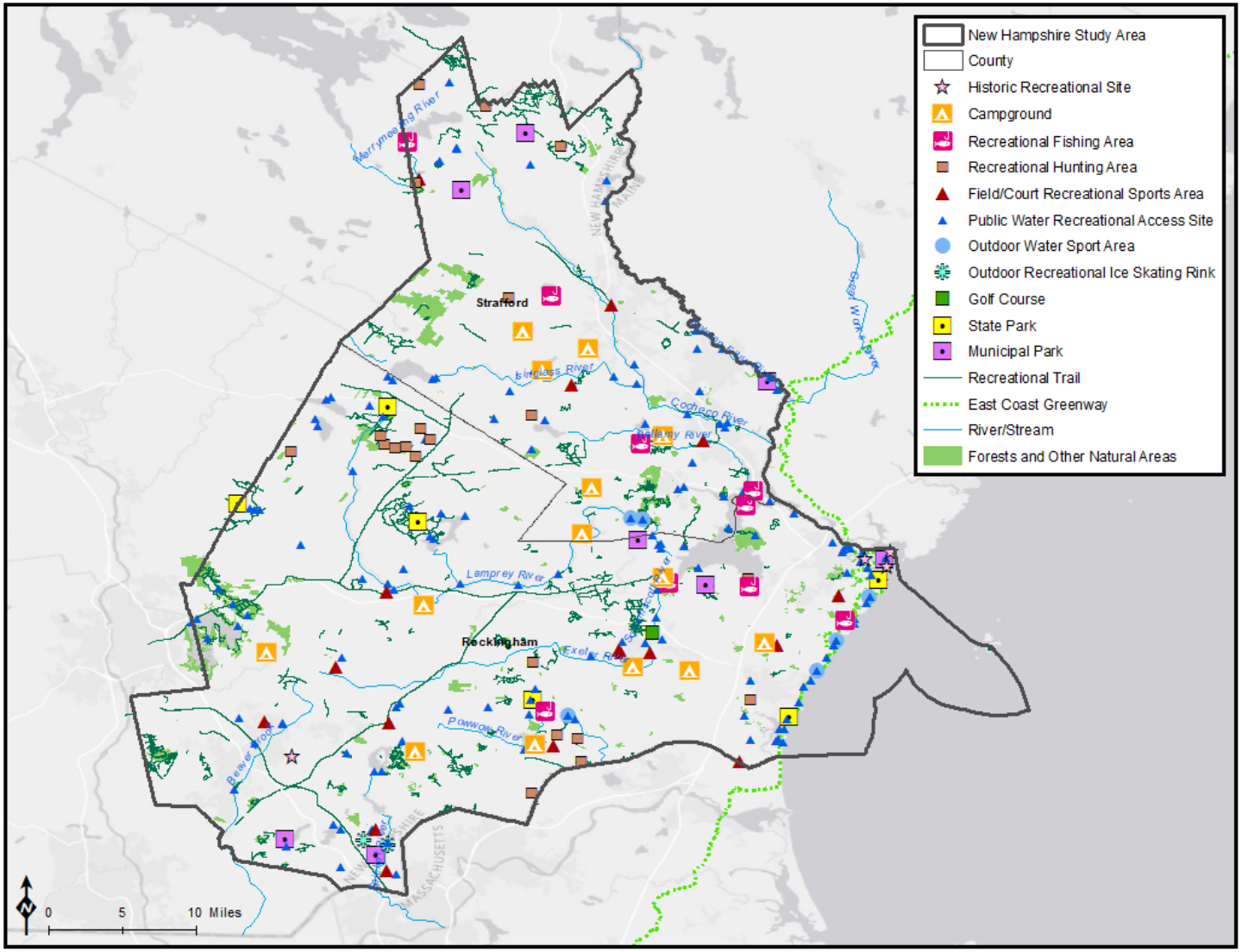
Sources: NPS 2014

Figure 3-15. Cultural and Historic Sites within the New Hampshire Study Area



Source: NOAA 2016a

Figure 3-16. Shipwrecks and Obstructions within the New Hampshire Study Area



Source: NH Geodata Portal 2019a, NH Geodata Portal 2019b, NPS 2014, USFS 2019b

Figure 3-17. Select Recreational Resources within the New Hampshire Study Area

Collectively, Rockingham County and Stafford County are considered the Seacoast Region in New Hampshire. In 2017, total direct travel spending was approximately $1.6 billion in Rockingham County and only $185 million in Stafford County (Dean Runyan Associates 2018). Rockingham County has several State parks and beaches along the 18 miles of coastline, including Hampton Beach State Park, Jenness State Beach North Beach, North Hampton State Beach and Park, Odiorne Point State Park, Rye Harbor State Park, and Wallis Sands State Beach and Park. Inland State parks in Rockingham County include Bear Brook State Park, Kingston State Park, Northwood Meadows State Park, and Pawtuckaway State Park. Visitors to State parks can go camping, fishing, hiking, rock climbing and bouldering, swimming in the lakes or ocean, walking and hiking on trails, and rent paddle boats, canoes and kayaks. Information on each State park and beach can be found on New Hampshire's State Parks website (NHSP 2020). Historic sites in Rockingham County that are tourist destinations include Fort Stark, Fort Constitution, and the White Island Historic Site, all which are on the coast. Portsmouth is a popular destination in Rockingham County because there are cruises, lighthouses, forts, museums, theaters, golf courses, local parks, and shops, as well as the Seacoast Science Center, the Sagamore Golf Center, and the Children's Museum of New Hampshire (NH Seacoast 2020).

Strafford County does not have any State parks or beaches, but there are several lakes, forests, wildlife management areas, and conservation areas that can be used for hiking, hunting, fishing, and/or camping. The New Hampshire Fish and Game's website has a list and interactive map of the Wildlife Management Areas in the State (NHFG 2020). There are no National Park System properties in the Study Area.

There are also several annual festivals held in the Study Area. In Rockingham County, festivals and events include the WOKQ Chowder Festival (June), Hampton Beach Seafood Festival (September), Sheep and Wool Festival (May), Piscataqua Riverfest and Round Island Regatta (August), Hampton Beach Children's Festival (August), Exeter UFO Festival (August-September), Stratham Agricultural Fair (July), and Deerfield Agricultural Fair (September) (NH Magazine 2019). In Strafford County, festivals include the Rochester Agricultural Fair (September) and Somersworth Pumpkin Festival (October).

In summary, there are several recreational activities within the Study Area found in areas along the 18-mile coastline and inland. Activities tend to be related to camping, water sports, and outdoor recreational access sites along the many rivers in the surrounding areas. Most tourism occurs between Memorial Day and Labor Day because of the warmer weather. Therefore, travel costs will be higher during the summer months in the Study Area. Also, there are annual festivals and events that occur in the Study Area. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages. Therefore, future developers should consider the potential impacts on recreation during the planning phase and site-selection process.

3.3.2.8 Transportation Resources

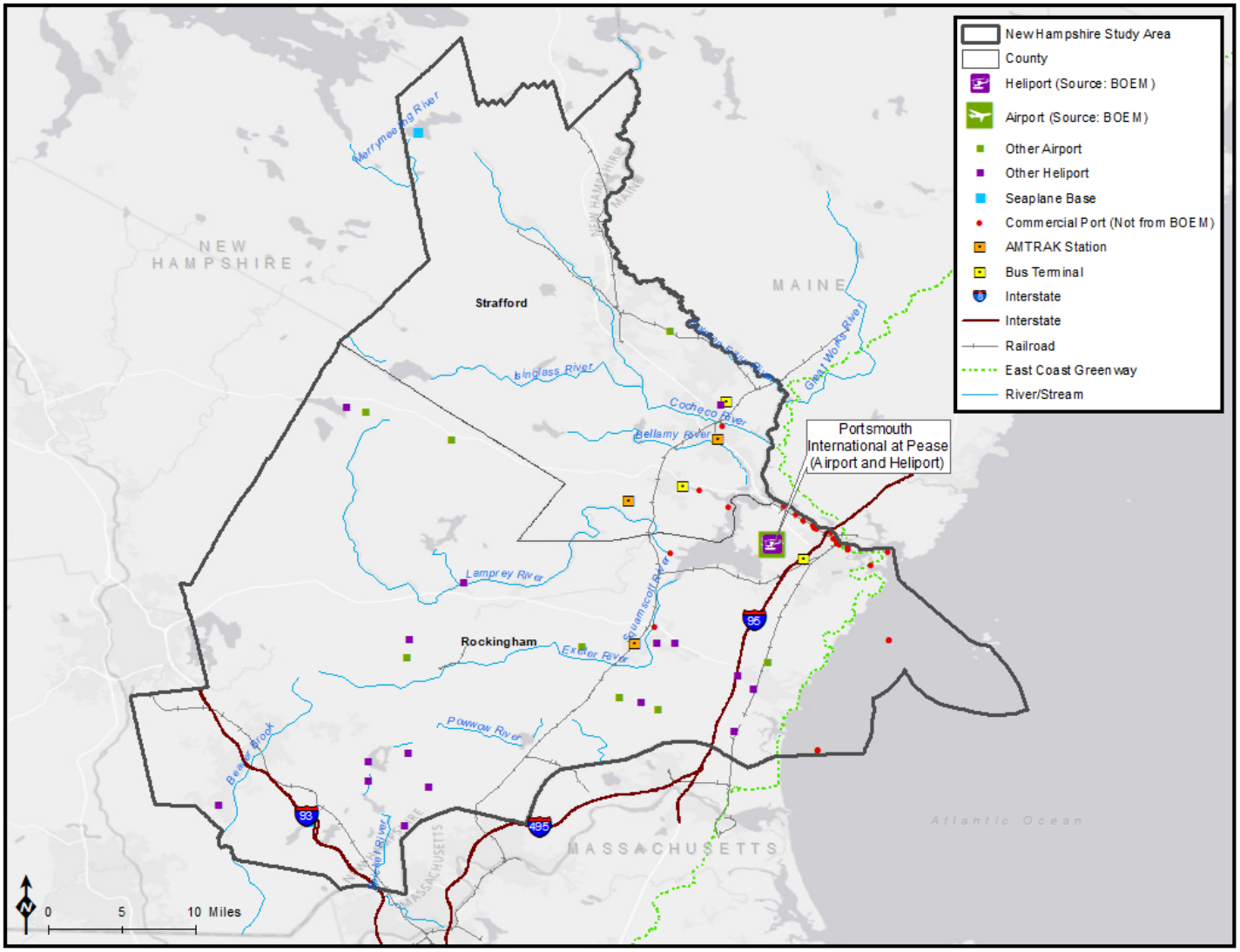
The New Hampshire Department of Transportation (NHDOT) is responsible for planning, designing, construction, maintenance, and operation of the State transportation system. The State transportation system includes multimodal travel options that link rural and urban communities through an interconnected highway network, airport system, transit, rail, and other active transportation systems. The NHDOT's planning and projects to address transportation infrastructure, congestion, and other issues are addressed in various long-range and strategic planning documents. These include the New Hampshire Long Range Transportation Plan (NHDOT 2010), Statewide Transportation Improvement Program (NHDOT 2020a), and the New Hampshire Ten Year Transportation Improvement Plan (NHDOT 2020b).

Figure 3-18 shows the transportation resources throughout the Study Area. The main freight truck corridors in the Study Area include Interstate 93 (I-93), which runs through the western part of Rockingham County and the Blue Star Turnpike (I-95). The Blue Star Turnpike extends from the Massachusetts State line in Seabrook to the Maine State border in Portsmouth. Other major truck corridors in Rockingham County include U.S. Route 1 and State Routes 101, 111, and 125. Truck corridors within the Stafford County portion of the Study Area include U.S. Route 4, U.S. Route 202, and New Hampshire (NH) State Routes 11, 16, 125, 126, and 153. The 33.2-mile-long Spalding Turnpike (New Hampshire State Route 16) extends from Portsmouth to Milton. It is the major north-south artery connecting the three major urban centers on the eastern side of the State.

The New Hampshire Rail System is comprised of five primary owners of the railroad lines, four of which are also railroad operators. Within the Study Area there are two active rail networks. Pan Am Railways is a privately held Class II (Regional) rail carrier with operations in five New England States and New York. New Hampshire Northcoast is owned by Boston Sand and Gravel Co. and was established in 1986 with the purchase of 42 miles of track between Ossipee and Rollingsford, known as the Conway Branch. There are five freight rail lines within the Study Area: Main Line – West, Main Line – East (Hampton Branch), Portsmouth Branch, Newington Branch, and the Conway Branch. The Main Line – West is of regional importance as it provides a through route between Maine and Massachusetts utilized for daily freight service and for the Amtrak Downeaster passenger service (NHDOT 2012).

There are 25 public use airports located throughout the State of New Hampshire. The only airport within the Study Area defined as a Primary Commercial Service Airport is the Portsmouth International Airport at Pease. Portsmouth International Airport also serves as the Pease International Tradeport, a former U.S. Air Force base, opened for civilian use in 1991, and is owned and operated by the Pease Development Authority. The airport is primarily used for general aviation services, but the terminal also serves Allegiant Air and military charters. The airport is also home to a New Hampshire Air National Guard aerial tanker squadron. Two other general aviation local airports are located within the Study Area. Hampton Airfield is located in the Town of North Hampton in Rockingham County. Skyhaven Airport is located in the City of Rochester in Strafford County about 20 miles northwest of Portsmouth International Airport at Pease (NHDOT 2015).

The New Hampshire Division of Ports and Harbors (Pease Development Authority) is responsible for the development and maintenance of the Portsmouth Harbor and Piscataqua River. Portsmouth Harbor, located at the mouth of the Piscataqua River, is the State's only ice-free, deepwater port with year-round service availability. Portsmouth Harbor annually handles more than 3 million tons of shipping along with submarines, lobster fleets, and fishing vessels (PREP 2014, USACE 2020b).The Portsmouth Harbor and the Piscataqua River is host to marine terminals and other marine entities (e.g., commercial offshore lobstering fleet, boat yards, marine laboratory, marine construction company, and aquaculture facility), which are all located on the New Hampshire side of the Piscataqua River. The Market Street Terminal is the only public access, general cargo terminal on the river. Cargo handling capabilities include bulk cargo (scrap, salt, wood chips), break bulk (industrial and machinery part, construction materials), project cargo (power plant components, vacuum tanks), and container cargo (PDA 2020). Truck is the primary intermodal connection at the Port of Portsmouth due to cost efficiency. There is direct rail access using Pan Am Railway's Portsmouth Branch, which connects to their main line at Newfields, New Hampshire and passes through the Market Square Terminal. The New Hampshire Division of Ports and Harbors is designated as a Foreign-Trade Zone (FTZ#81), in which goods entering the zone are considered outside of U.S. commerce regulations; therefore, no duty must be paid while in the zone (NHDOT 2019).



Source: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, USDOT 2019c, East Coast Greenway 2019

Figure 3-18. Transportation Resources within the New Hampshire Study Area

The multimodal transportation network of New Hampshire faces several challenges and constraints, including aging infrastructure and congestion. Vulnerabilities from climate impacts (see Chapter 3.2.2) also contribute to transportation constraints. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., sea level and an increase in the frequency and intensity of large storm systems). In 2014, the NHDOT issued a report designed to help maintain and improve the integrity and function of NHDOT transportation systems (existing infrastructure, operations and maintenance, and design and construction of new facilities) by developing a strategy through which NHDOT could reduce the impact of climate change on their assets and programs (NHDOT 2014).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site-selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Available maritime ports are both large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

3.3.3 Summary – Land Cover and Land Use

The two counties in the Study Area are predominantly forested, which makes up 58.8% of the land cover. Strafford County has the highest percent forest land cover at 64.8%, while Rockingham has a forested land cover of 53.9%. Rockingham County has the most developed areas in the Study Area at 21.0%. There are 36 towns and 1 city in the county. Derry and Salem, two of the bigger towns in Rockingham County with populations around 30,000, are both situated in the western part of Rockingham County, which could contribute to the low-intensity development in that region of the county.

The New Hampshire Association of Regional Planning and Commission is comprised of nine regional planning commissions in the State of New Hampshire. Within the two counties that make up the Study Area, there are three regional planning commissions. Strafford County is in the Strafford Regional Planning Commission. Rockingham County is primarily in the Rockingham Regional Planning Commission, but three municipalities are part of the Strafford Regional Planning Commission (Northwood, Nottingham, and Newmarket) and seven municipalities are part of the Southern New Hampshire Regional Planning Commission (Deerfield, Candia, Auburn, Chester, Derry, Windham and Londonderry) (ESRI 2020b). These regional commissions serve in an advisory role to local governments to promote coordinated planning, orderly growth, efficient land use, transportation access, and environmental protection. Each region and municipality have developed a comprehensive plan, strategic plan, or master plan with regard to future development activities within their specific boundaries. Additionally, all municipalities in the Study Area have a comprehensive, traditional zoning ordinance (NHOSI 2019); however, there may be no maps associated with the ordinance or the maps may not be available in GIS formats. Thus, zoning information cannot be generalized across the scale of the Study Area. Links to each municipality and their zoning map and/or zoning ordinances are on the regional planning commission websites. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Additional zoning resources at the State level are on the New Hampshire's Office of Strategic Initiatives website (NHOSI 2017).

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during potential OCS-related project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Zoning may or may not apply to pipeline routes. Often, projects attempt to plan the placement of new pipelines within or parallel to existing pipeline rights-of-way to minimize new ground-disturbing impacts to other areas.

The New Hampshire Division of Economic Development offers business consulting and various incentives exist to foster business development in the State. The State offers a small array of financial incentives for businesses moving into or creating new jobs in the State. Additionally, New Hampshire has specific corporate tax laws regarding businesses and income that may be unique compared to other States.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. Future analysis will need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

The multimodal transportation network of New Hampshire includes roadways, rail, airports, and ports. The transportation system faces several challenges and constraints, including aging infrastructure and congestion. In 2014, the NHDOT issued a report designed to help maintain and improve the integrity and function of NHDOT transportation systems (existing infrastructure, operations and maintenance, and design and construction of new facilities) by developing a strategy through which NHDOT could reduce the impact of climate change on their assets and programs (NHDOT 2014).

3.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

3.4.1 Population

New Hampshire's population is growing but at a rate slower than the Nation. According to the USCB, New Hampshire's estimated population was 1.3 million in 2017. As shown in Table 3-6, the population of New Hampshire grew 1.1% since the 2010 Census, having added approximately 15,378 people. During the same period, the population of the U.S. grew 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Table 3-6. 2010 and 2017 Total Population and Population Projections Through 2040 in the New Hampshire Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) %	Projected Population Change (2017-2040) (%)
Rockingham	295,223	302,479	307,013	321,441	326,238	2.5	7.9
Strafford	123,143	126,552	128,801	136,472	142,204	2.8	12.4
Study Area	**418,366**	**429,031**	**435,814**	**457,913**	**468,442**	**2.5**	**9.2**
New Hampshire	**1,316,470**	**1,331,848**	**1,349,908**	**1,402,878**	**1,432,730**	**1.2**	**7.6**
United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**373,528,000**[4]	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - NH 2016; 4 - USCB 2018b

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). New Hampshire is affected by the nationwide trend of aging population, as indicated by the declining rate of natural increase. According to USCB 2018 estimates, natural increase declined 90.5% from 2011 (approximately 2,257 people) to 2018 (approximately 214 people). Natural increase accounted for approximately 3% of population increase between 2017 and 2018; the rest of the increase came from positive net migration, both domestic (approximately 59%) and international (approximately 38%). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly (USCB 2019b).

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). However, New Hampshire is not part of this national trend, as domestic in-migration resulted in a population gain of 3,928 people between 2017 and 2018 (USCB 2019b). According to USCB 2018 estimates, the majority of people who relocated to New Hampshire moved from Massachusetts, Maine, Florida, Vermont, and North Carolina (USCB 2019c).

3.4.1.1 Study Area Trends

Two counties (Rockingham and Strafford) comprise the Study Area. Rockingham County contains all the of the State's Atlantic Ocean coastline (NHES 2019a). Strafford County, the smallest of New Hampshire's counties by land area, encompasses three cities (Rochester, Dover, and Somersworth) and has the youngest median age (37) (NHES 2019b).

The counties have not been delineated into regions for this chapter. The Study Area is located in the southeastern part of the State. The State capital (Concord) and its largest city (Manchester) lie outside the Study Area. Regional disparities of population density, age, education, and income exist between the more populous urban coastal Study Area counties and the rural mountainous western counties as described by the whitepaper "The Two New Hampshires." The Study Area has greater population density, is younger, with higher incomes and educational attainment as compared to rural counterparts. These differences are reflective of a nationwide trend toward urbanization (as people move away from rural and non-metropolitan areas toward better jobs in metropolitan areas) and indicate a rural-urban divide (as populations in metropolitan areas increase while rural communities decline) (Gittell 2013).

According to 2017 population estimates, the Study Area represented 32.2% (429,031 residents) of the overall State population of 1.3 million. Table 3-6 shows population growth in the Study Area counties. Between 2010 and 2017, both counties gained population. During the same period, the population of the Study Area grew 2.5%, faster than the State (1.1%) and slower than the Nation (4.0%) (USCB 2017a, USCB 2017d).

Between 2010 and 2017, Rockingham and Strafford Counties grew by 2.5% and 2.8%, respectively. Both counties are close to larger population centers and employment opportunities of nearby States, such as Boston, Massachusetts and Portland, Maine, a geographic feature that drives in-migration. Rockingham County, in particular, had high in-migration rates (RPC 2015). According to the Rockingham Planning Commission, the county experienced rapid population growth for most of the past 50 years, at times growing at a much faster pace than the rest of the State. Between 1950 and 1990 the rate of growth averaged nearly 3% per year. The rate of growth declined between 2000 and 2010 and is now estimated to

be less than 1% per year (RPC 2015). According to the Strafford Planning Commission, the region's population increased 123% (over 80,000 people) between 1960 and 2010. Most of the region's growth occurred in the 1970s and 1980s, with a majority settling in urban areas (SRPC 2015).

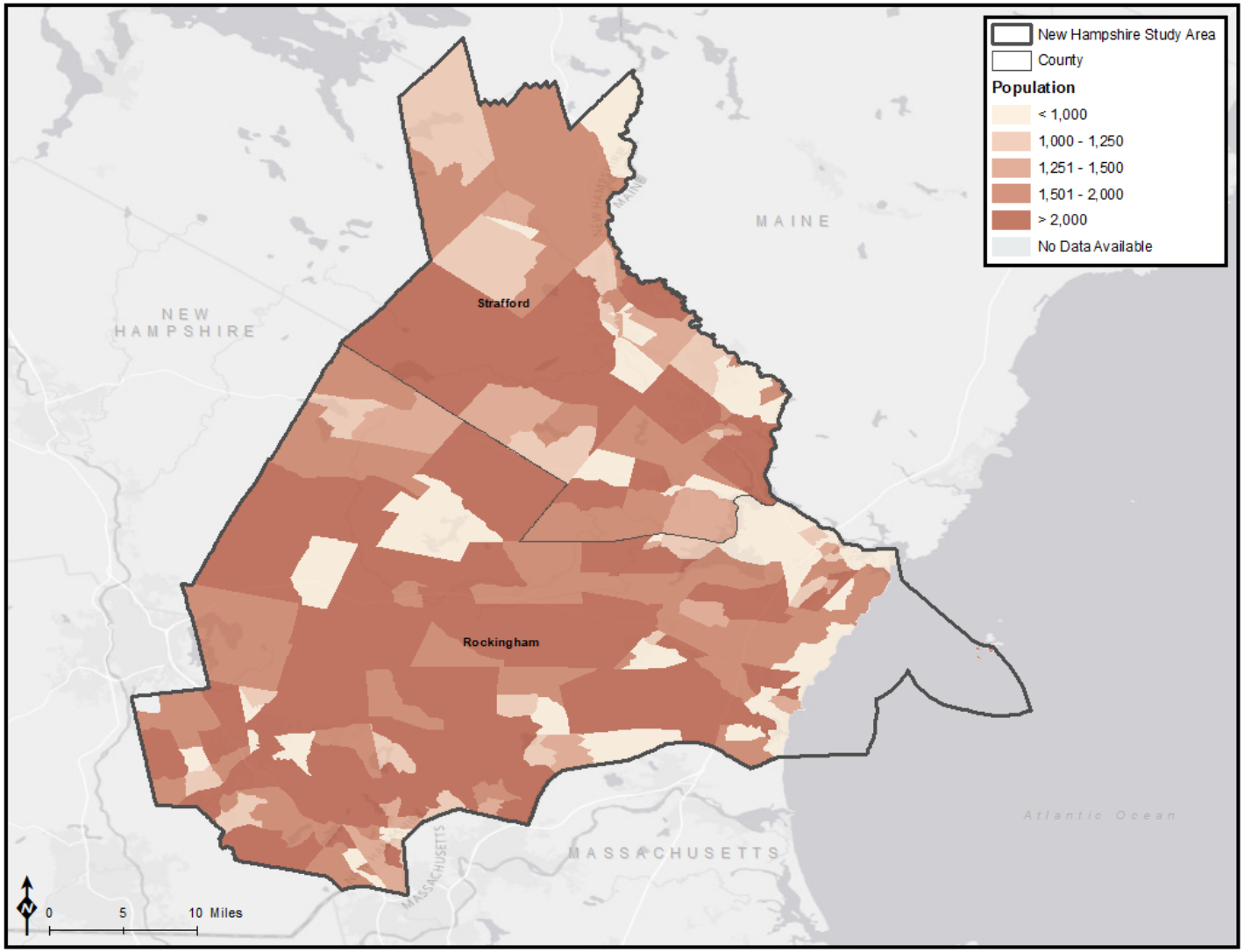
Figure 3-19 shows population counts in census block groups within the two counties located in the Study Area. The figure portrays a population pattern more consistent with a rural-urban continuum, in which the boundaries between urban and rural areas are not clearly defined as opposed to geographic high-density concentrations in major urban areas. According to the Rockingham Planning Commission, residential areas are distributed widely across Rockingham County, indicative of low-density suburban style development that grew up around historic town centers. Industrial development and commercial areas are concentrated along major transportation corridors and urban areas. Within Rockingham County, the densest population centers are the cities of Portsmouth and the towns of Exeter, Hampton, and Salem (RPC 2015). According to the Strafford Planning Commission , between 1990 and 2005, most residential development in Strafford County occurred in the rural areas. However, a majority of the county population resides in three of its municipalities: the cities of Dover and Rochester, and the town of Durham (SRPC 2015). As illustrated in Figure 3-20, both Study Area counties are part of the Boston-Cambridge-Newton, MA-NH metropolitan statistical areas (MSA), defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010, Data.gov 2017).

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is also reflected in New Hampshire. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 3-7, the Study Area is 1,063 square miles, representing 11.9% of the State's total land area of 8,969 square miles. Therefore, approximately one-third (32.2%) of New Hampshire's population resided in 11.9% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c).

Table 3-7. 2017 and 2040 Population Density in the New Hampshire Study Area

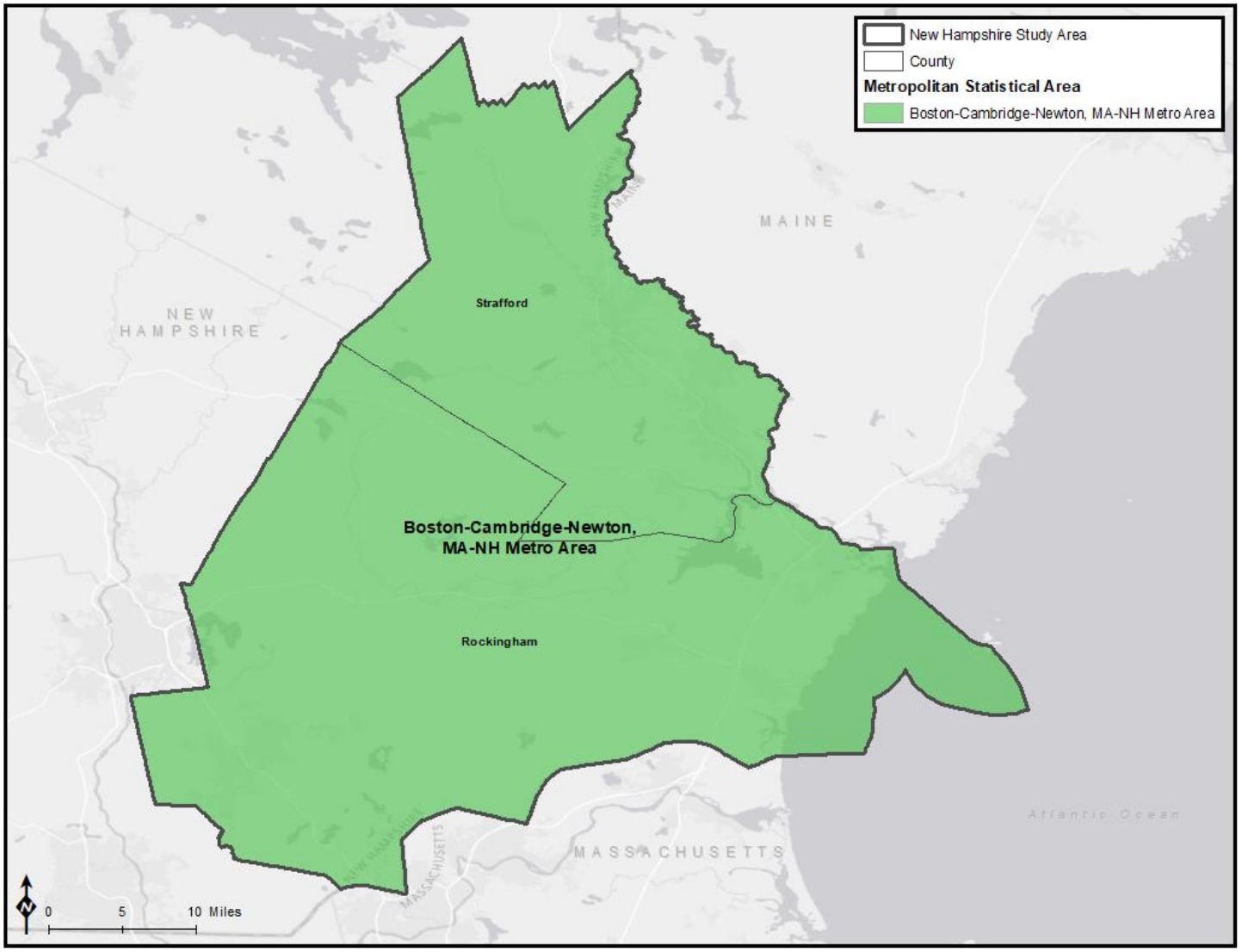
Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Rockingham	302,479	326,238	695	435.0	469.1
Strafford	126,552	142,204	368	344.3	386.9
Study Area	***429,031***	***468,442***	***1,063***	***403.6***	***440.7***
New Hampshire	**1,331,848**	**1,432,730**	**8969**	**148.5**	**159.7**
United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: USCB 2017c, USCB 2017d, USCB 2018b, NH 2016



Source: USCB 2017r

Figure 3-19. Population in the New Hampshire Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 3-20. Metropolitan Statistical Areas Located within the New Hampshire Study Area

Figure 3-21 shows population per square mile in the Study Area. The population density of the Study Area was 404 persons per square mile in 2017, greater than the State (148 persons per square mile) and the Nation (91 persons per square mile). Population densities in the Study Area ranged from 344 persons per square mile in Strafford County to 435 persons per square mile in Rockingham County (USCB 2017d, USCB 2017c).

3.4.1.2 Population Projections

According to the State of New Hampshire, the State's population is projected to grow 7.6% (1.4 million residents) by 2040 (NH 2016). The Study Area is projected to follow a similar pattern to that of the State, growing 9.2% (500,000 residents) by 2040. The Nation's population is projected to grow 16.4% (373.5 million), more than the State and the Study Area. Table 3-6 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040 (USCB 2017d, USCB 2017c, USCB 2018b, NH 2016). Figure 3-22 shows the overall projected percent change in population in each county during the same period.

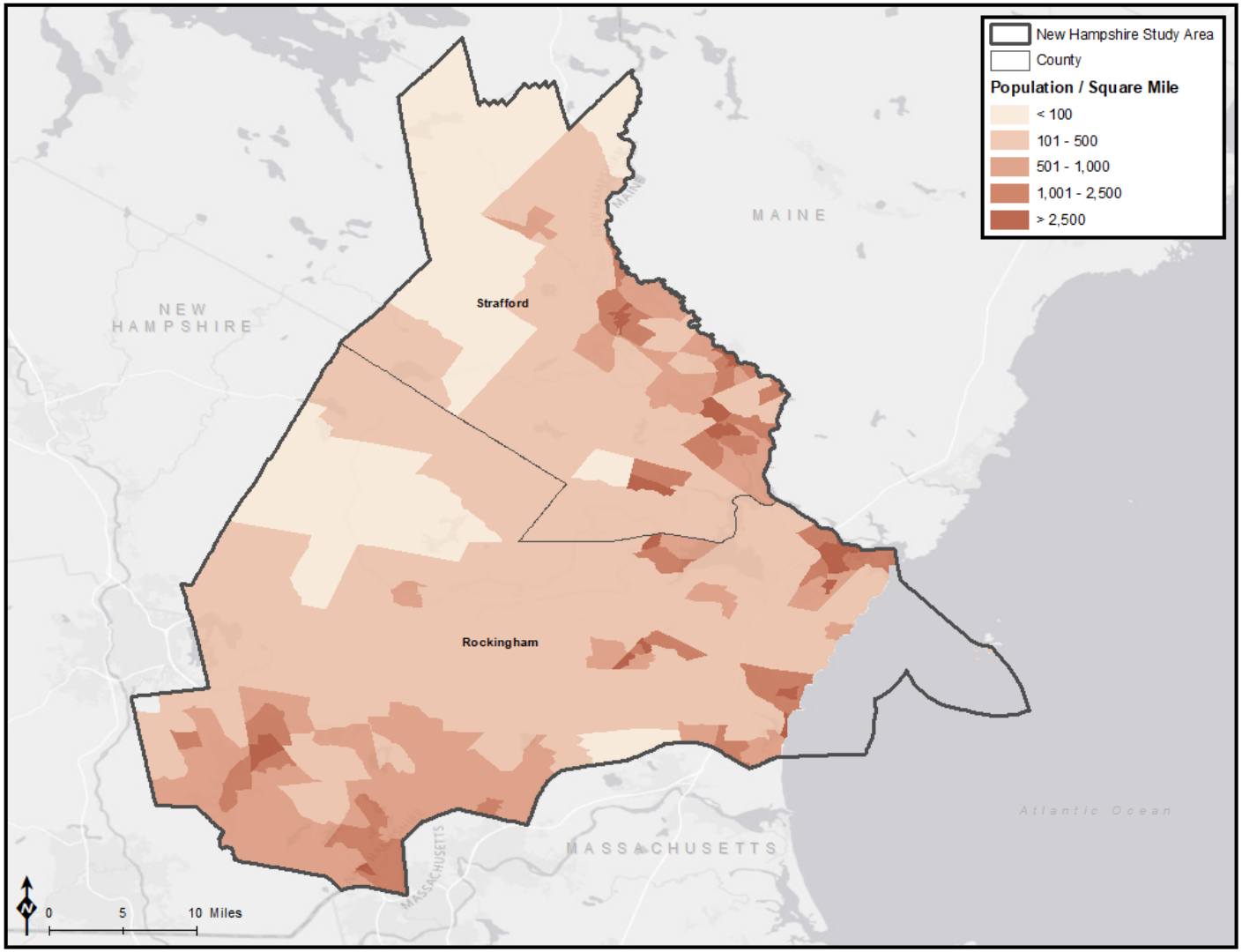
As shown in Table 3-6, projections indicate that 32.7% (500,000 people) of the State's population will reside in the Study Area by 2040 as compared to 32.2% (400,000 people) in 2017. Growth will not be uniform across the Study Area as Strafford County is projected to increase by 12.4% and Rockingham County is projected to increase 7.9% (USCB 2017d, NH 2016).

According to Rockingham Planning Commission, slow projected growth in Rockingham County is due to a number of factors: baby boomers leaving the workforce; a slowdown of in-migration into the region especially from other northeastern States; less availability of undeveloped land; and property taxes that have become so high as to diminish New Hampshire's tax advantage of no State income tax and no tax on retirement income (SRPC 2015, kiplinger.com 2020). Slower growth trends are also projected for Strafford County at a growth rate approximately 75% less than that of the previous three decades (SRPC 2015).

Population density is projected to increase from 404 persons per square mile to 441 persons per square mile in the Study Area between 2017 and 2040 (USCB 2017d, USCB 2017c, NH 2016). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

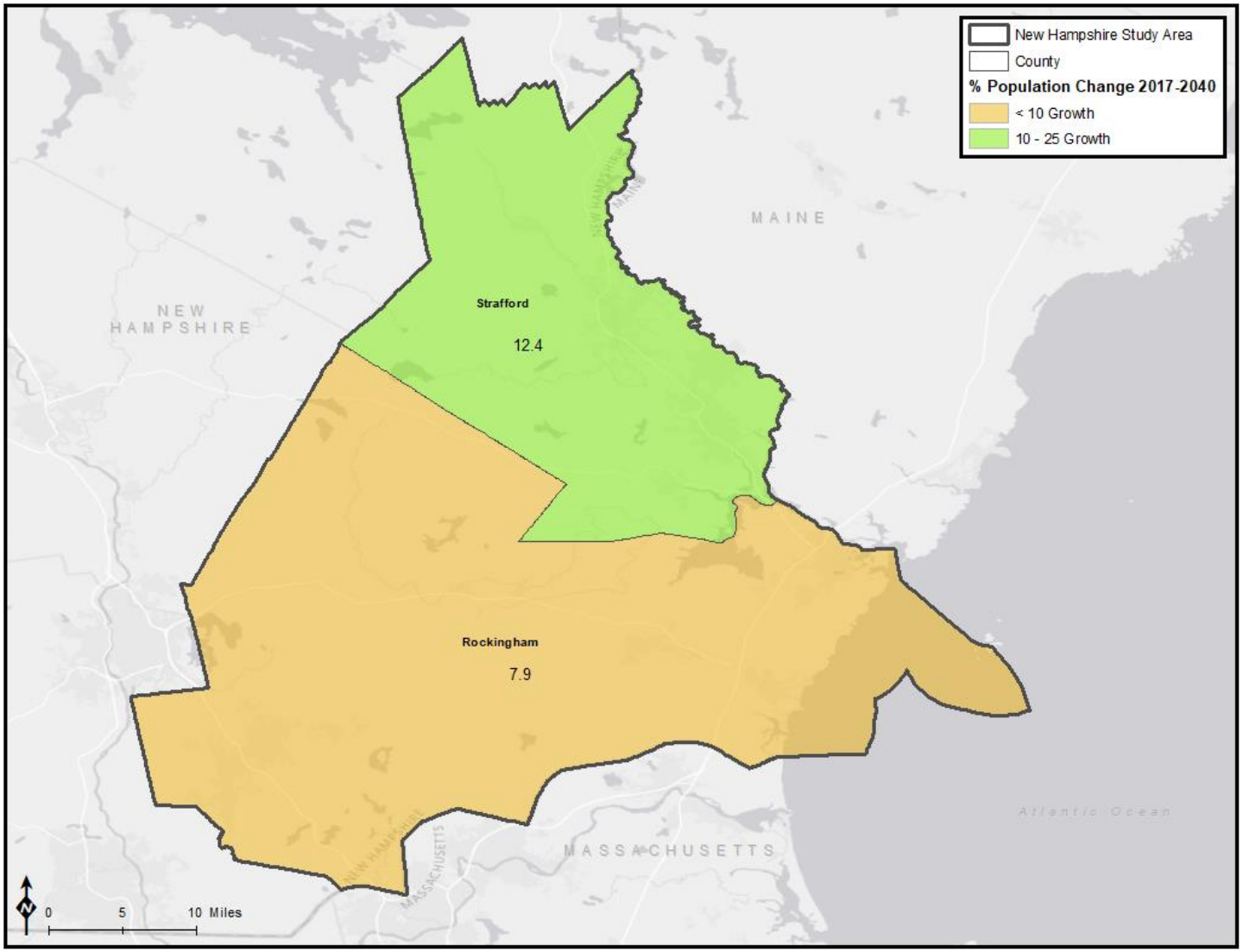
3.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact New Hampshire and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 3-23 and Figure 3-24 show the 2017 estimated population under age 5 and over age 65, respectively. Figure 3-25 and Figure 3-26 show the projected change in these groups by 2040. Table 3-8 shows age distribution by county for these groups for the 2017 estimated population and 2040 projected population in the U.S., New Hampshire, and the Study Area (Brookings Institute 2018, USCB 2017b, NH 2016).



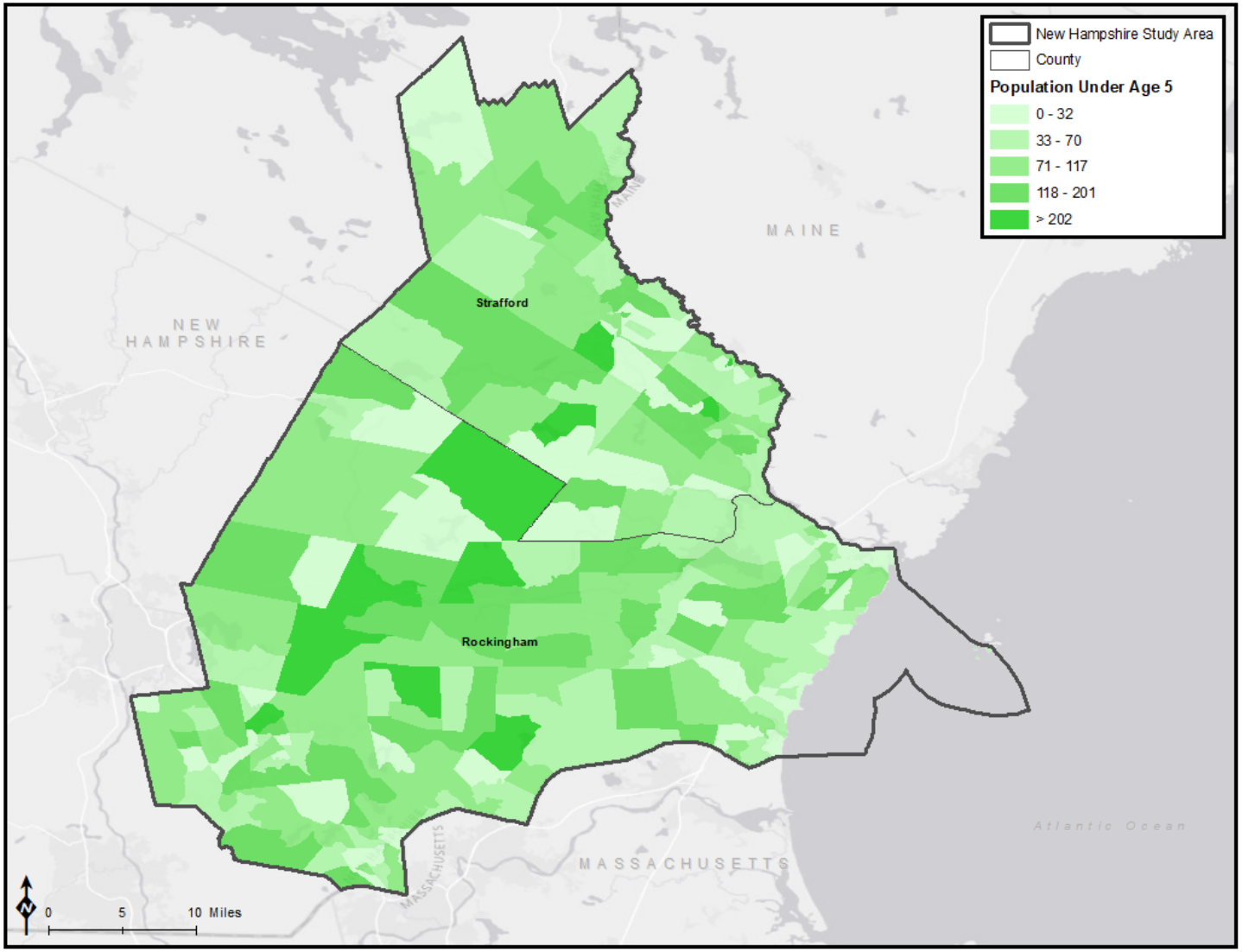
Source: USCB 2017r

Figure 3-21. Population Density in the New Hampshire Study Area by Census Block Group



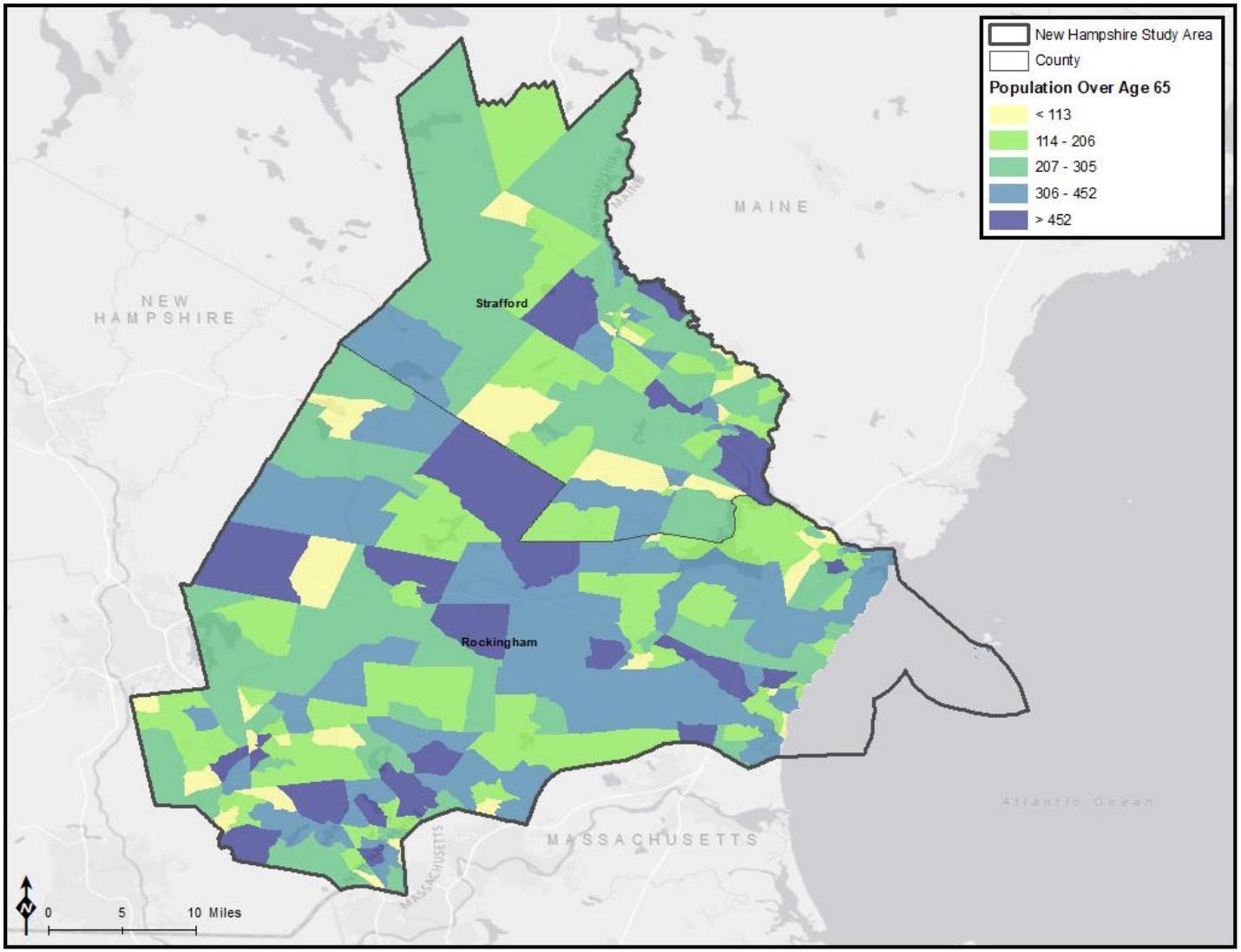
Source: NH 2016

Figure 3-22. Overall Projected Population Change from 2017-2040 in the New Hampshire Study Area by County



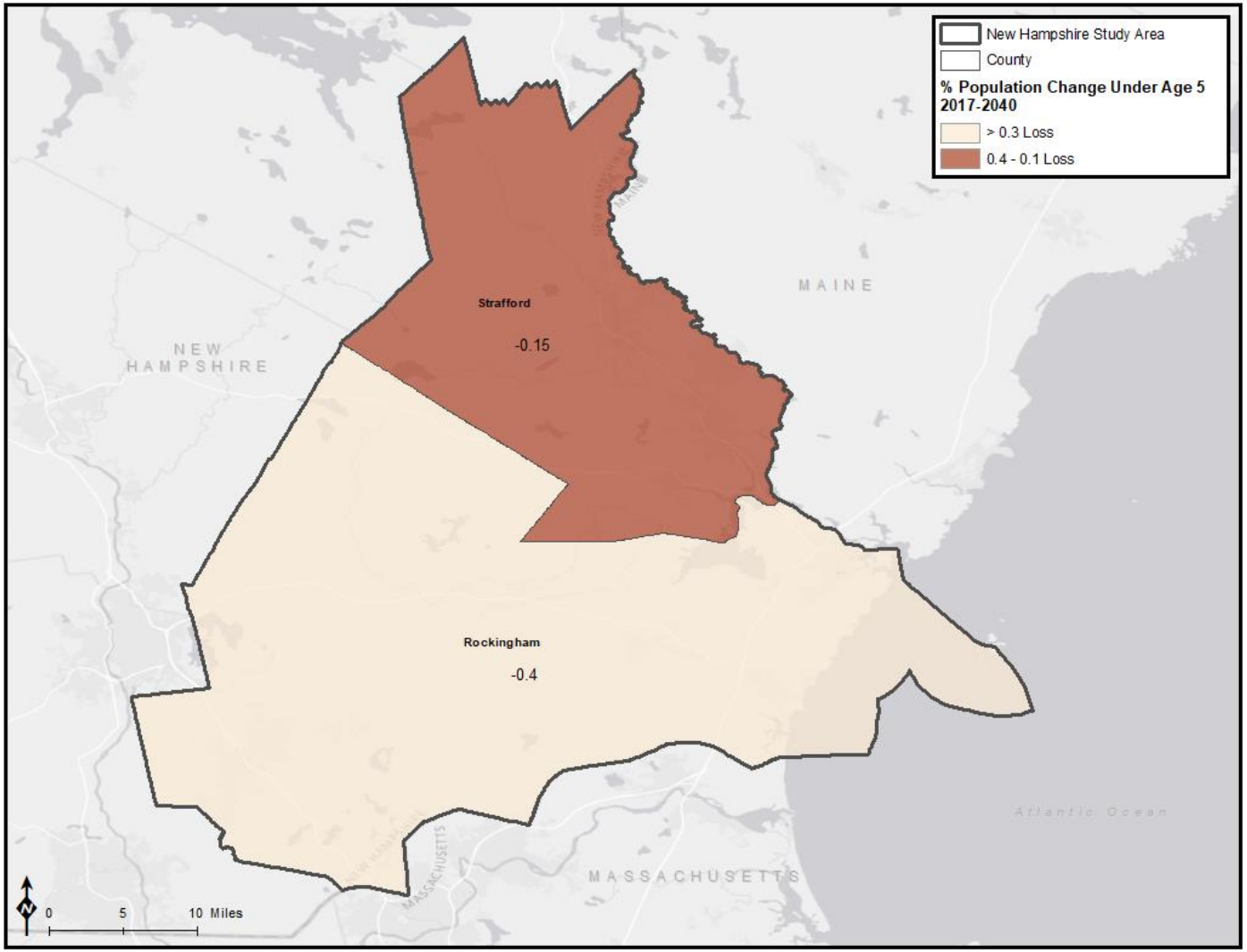
Source: USCB 2017r

Figure 3-23. Population Under Age 5 in the New Hampshire Study Area by Census Block Group



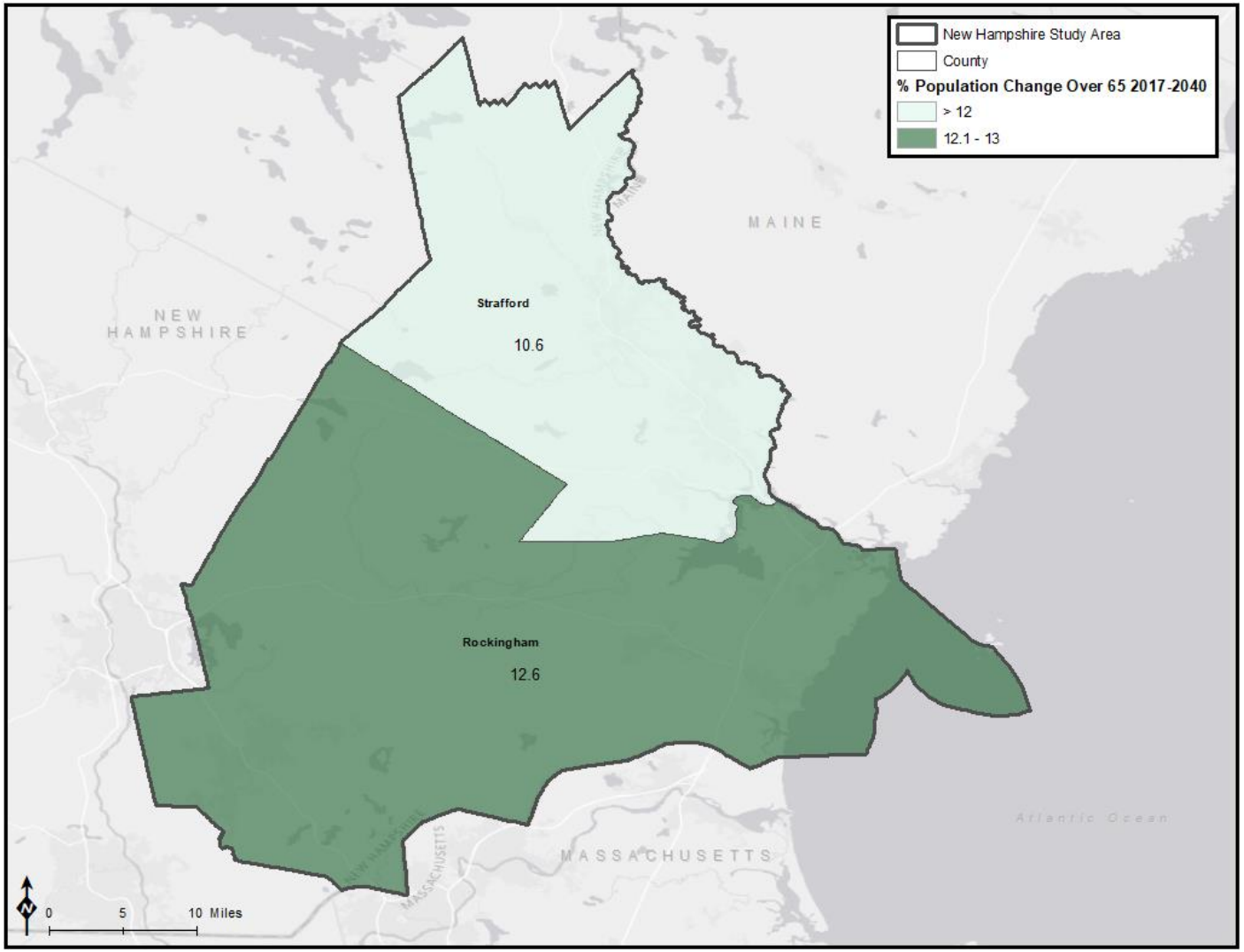
Source: USCB 2017r

Figure 3-24. Population Over Age 65 in the New Hampshire Study Area by Census Block Group



Source: NH 2016

Figure 3-25. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the New Hampshire Study Area by 2040



Source: NH 2016

Figure 3-26. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the New Hampshire Study Area by 2040

Table 3-8. Population Under Age 5 and Over Age 65 in the New Hampshire Study Area

Geographic Unit	2017 Estimates					Projected 2040				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Rockingham	302,479	13,971	4.6	48,446	16.0	326,238	13,798	4.2	93,319	28.6
Strafford	126,552	6,259	4.9	17,596	13.9	142,204	6,824	4.8	34,820	24.5
Study Area	**429,031**	**20,230**	**4.7**	**66,042**	**15.4**	**468,442**	**20,622**	**4.4**	**128,139**	**27.4**
New Hampshire	**1,331,848**	**64,233**	**4.8**	**219,293**	**16.5**	**1,432,730**	**66,466**	**4.6**	**408,522**	**28.5**
United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: NH 2016, USCB 2017b, USCB 2018b

The State and Study Area are currently experiencing a rapid aging of the population, a trend shared by other New England States. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 4.8% in New Hampshire and 4.7% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 3-8 shows the breakdown by county. Both counties had a lower percentage of young children as compared to the Nation. Projections by the year 2040 indicate this group's decline in the Nation (5.7%), the State (4.6%), and the Study Area (4.4%). For the study area, this is an overall decline of 0.3% in the proportion of the population under age 5 from 2017-2040 (USCB 2017b, USCB 2018b, NH 2016).

The State's young adult population (20-29 year olds) contracted by more than 10% in the decade from 2000 to 2010 due to outmigration during the Great Recession (which lasted from 2007 to 2009) (Rich 2013). Despite positive net migration – domestic and international – communities are experiencing an observable decline in families, children, and school enrollment. Enrollment in New Hampshire's public schools (for pre-school through 12th grade) began to trend downward in 2000 and continues to decline. The decline is attributed to children of the baby boomers reaching college age and slow population growth caused by aging population and declining birth rates (NHHFA 2019a). Lower enrollment in school causes lower State funding; thus, declining or stagnant enrollment costs taxpayers more due to fixed infrastructure costs (SRPC 2015).

According to 2017 estimates shown in Table 3-8, the elderly represented 14.9% of the U.S. population; 16.5% in New Hampshire and 15.4% in the Study Area. The number and proportion of elderly as compared to the general population is projected to rise, fueled by aging baby boomers. By 2040, elderly population is projected to increase to 21.6% in the U.S., 28.5% in the State, and 27.4% in the Study Area. In the Study Area counties, the number of elderly is projected to nearly double in size (increasing 92.6% and 97.8% in Rockingham and Strafford counties, respectively). Rockingham County had the largest percentage (16.0%) of elderly in 2017; a further increase to 28.6% is projected by 2040. For the study area, this is an overall increase of 12% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, NH 2016).

3.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area are presented in Table 3-9.

As shown in Table 3-9, in 2017 homeownership in New Hampshire was 70.7%, which was higher than the Nation (63.8%) and lower than the Study Area (73.5%). Renters comprised approximately 29.3% of the State and 26.5% of the Study Area in 2017, less than the Nation (36.2%) (USCB 2017m). According to the New Hampshire Housing Finance Authority, households continue to rent due to the tight supply of affordable homes (NHHFA 2019a).

Table 3-9. Housing Utilization and Vacancy Rates in the New Hampshire Study Area

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Rockingham	130,187	119,955	10,232	7.9	92,025	76.7	27,930	23.3	$295,900	$1,164
Strafford	53,109	48,543	4,566	8.6	31,845	65.6	16,698	34.4	$220,900	$1,018
Study Area	**183,296**	**168,498**	**14,798**	**8.1**	**123,870**	**73.5**	**44,628**	**26.5**	**$258,400**	**$1,091**
New Hampshire	**627,619**	**526,710**	**100,909**	**16.1**	**372,304**	**70.7**	**154,406**	**29.3**	**$244,900**	**$1,052**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m

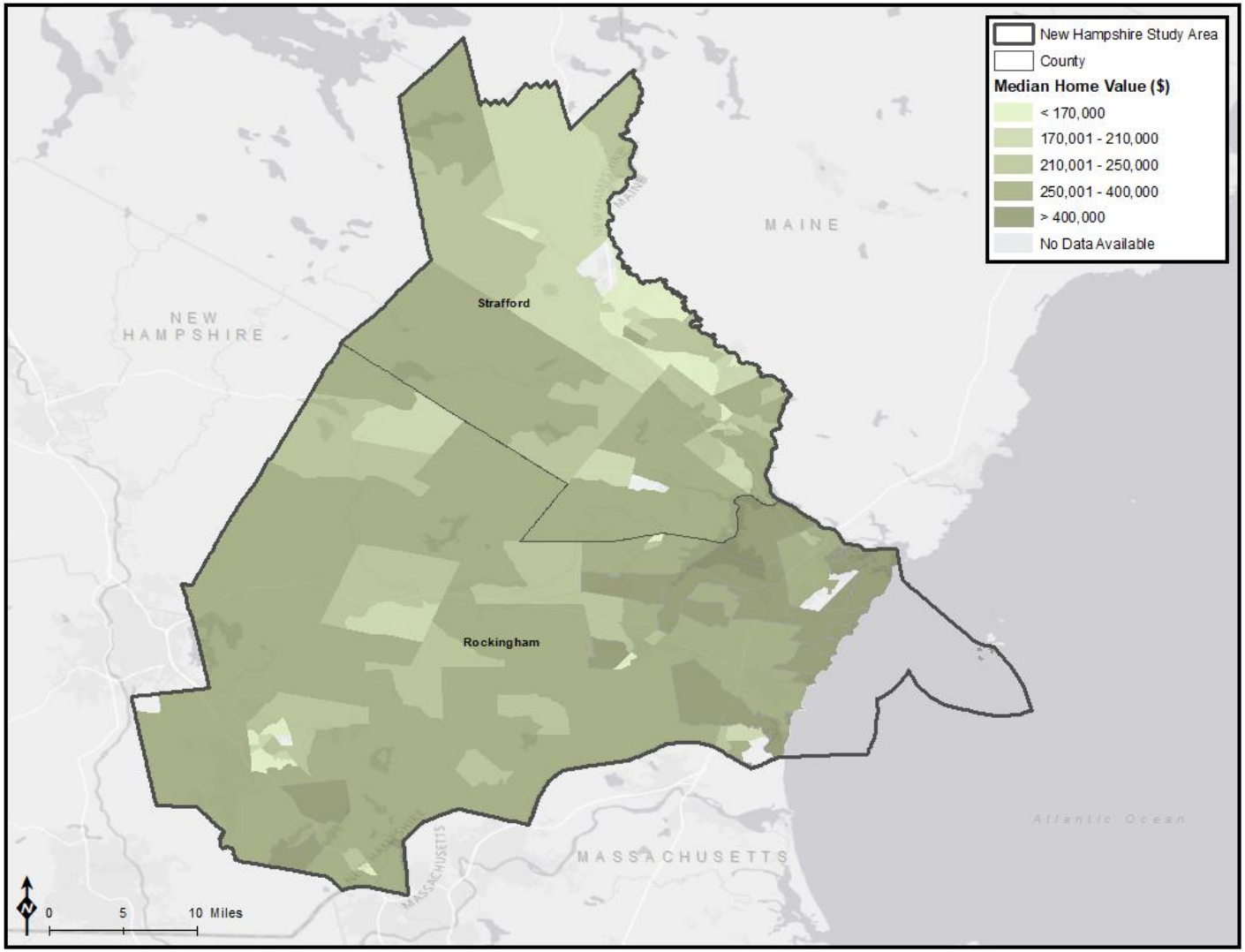
New Hampshire continues to demonstrate a strong housing market. As a result, finding an affordable place to live in the Study Area is a challenge. According to the New Hampshire Housing Finance Authority, the State's housing market favors sellers and continues to be highly competitive due to rising prices, low inventory of houses for sale for entry level buyers, and competition between first time buyers and downsizing empty nesters. High building costs result in new construction available at the higher end of the market (NHHFA 2019b). The State's growing economy increases the need for a range of housing to accommodate workforce and to retain its graduates, young workers, seasonal workers, and families as well as suitable housing for seniors and disabled (NHHFA 2019a). Lack of affordable housing could discourage workers from moving to or remaining in the State.

In 2017, median home values were higher in the Study Area ($258,400) than the State ($244,900) as well as higher than the Nation ($193,500). Rockingham County had the highest median home value ($295,900); Strafford County had the lowest ($220,900) (USCB 2017l). A shortage of workforce housing has been a long-standing problem in Rockingham County due to the close proximity to the Boston housing market, which tends to inflate housing costs – but not wages. Zoning restrictions and lack of municipal sewer and water services constrains development of multifamily housing units that would provide affordable workforce housing (RPC 2015). Figure 3-27 illustrates median home values in the Study Area (USCB 2017r).

Home values in the State increased 3.8% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio; the prevalence of price cuts on home listings; and time-on-market (Zillow.com 2019c). The market temperature of the State is characterized as very hot, which indicates market conditions favorable to sellers (Zillow.com 2019c). In the 12-month period ending November 2019, the Boston-Cambridge-Newton, MA-NH metropolitan area increased 1.6%; its market temperature was hot (Zillow.com 2019d).

The State's current housing supply is not aligned with the current market preferences of baby boomers who will occupy a growing proportion of housing units due to their increasing numbers by 2040. Many seniors prefer to "age in place" with few leaving for warmer climates in the south. In New Hampshire many seniors prefer to "age in place"; only 3% migrate to warmer climates in the south. Proximity to vital healthcare services, located in downtown areas, is an attribute required by seniors, but housing in this area is not senior-friendly. Increasing taxes and the need for home retrofits to accommodate disabilities are additional challenges (SRPC 2015). The Accessory Dwelling Unit law, enacted in 2017, allowing for accommodations for health care needs such as design consideration, room for onsite caregivers, and multi-generational households, may help align current housing stock to meet senior requirements (NHHFA 2019b).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).



Source: USCB 2017r

Figure 3-27. Median Home Value in the New Hampshire Study Area by Census Block Group

Figure 3-28 illustrates median gross rent. According to the National Low Income Housing Coalition, as of 2019, throughout New Hampshire, fair market rent for a two-bedroom rental unit is $1,208. In these conditions, a minimum wage worker would have to work approximately 128 hours a week in order to afford a two-bedroom fair market rate home. New Hampshire has a shortage of approximately 27,347 rental homes affordable and available to extremely low-income households. Approximately 39,856 (25%) of renter households in New Hampshire are considered extremely low income; approximately 27,102 (68%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (32%), single caregivers (32%), and disabled (26%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

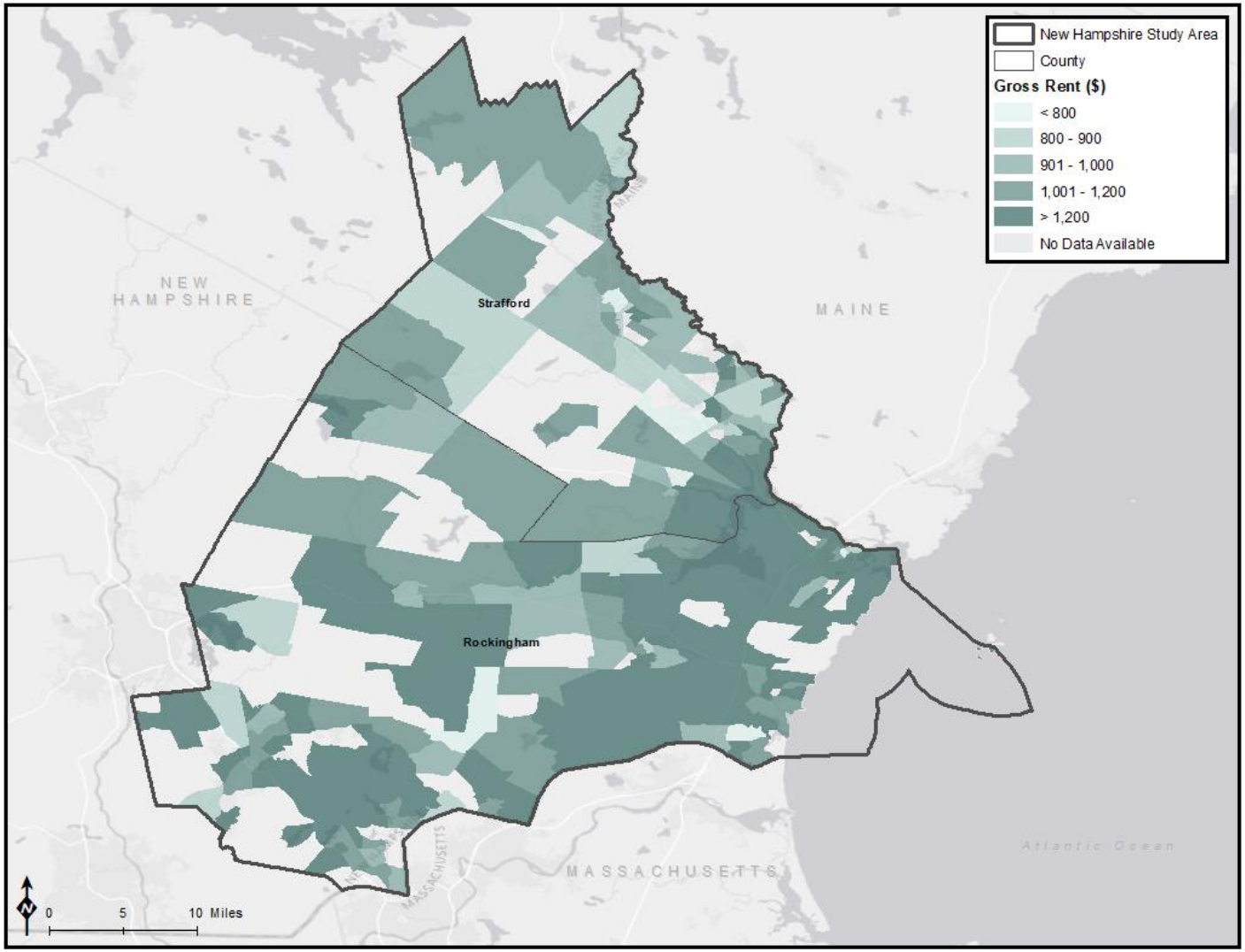
As shown in Table 3-9, vacancy rates in the Study Area were 8.1% in 2017, significantly less than the State (16.1%) and Nation (12.2%), reflecting higher demand in the Study Area. Figure 3-29 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (8.6%) in Strafford County (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals.

3.4.4 Employment

3.4.4.1 Employment Types

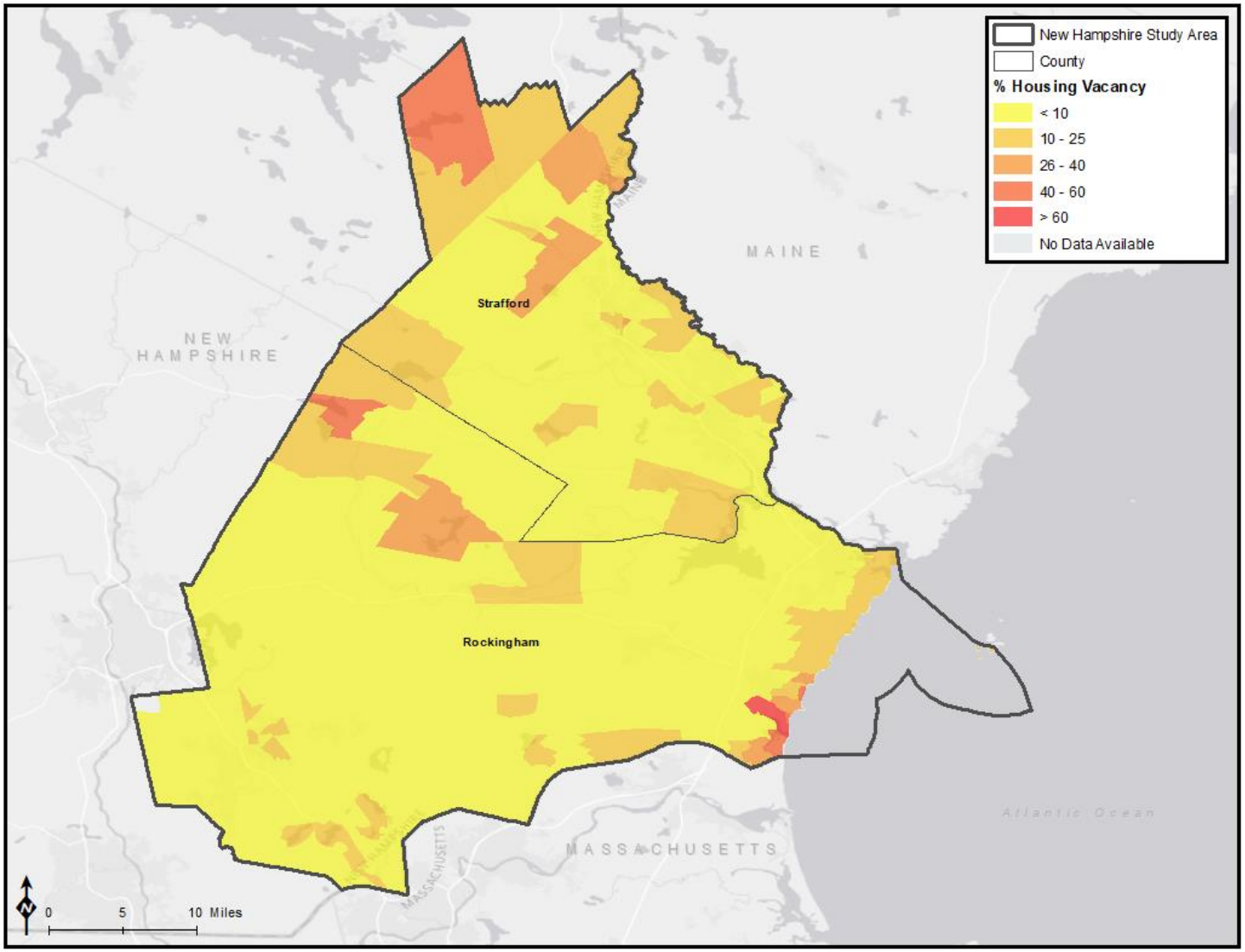
Employment data by industry sector are presented in Table 3-10. In 2017, the Study Area had a total employment of approximately 240,000 jobs, representing approximately 33.6% of the total jobs in New Hampshire.

New Hampshire's 2018 annual gross domestic product was 84.4 billion, which represented 0.4% of the Nation's gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 3-28. Median Gross Rent in the New Hampshire Study Area by Census Block Group



Source: USCB 2017r

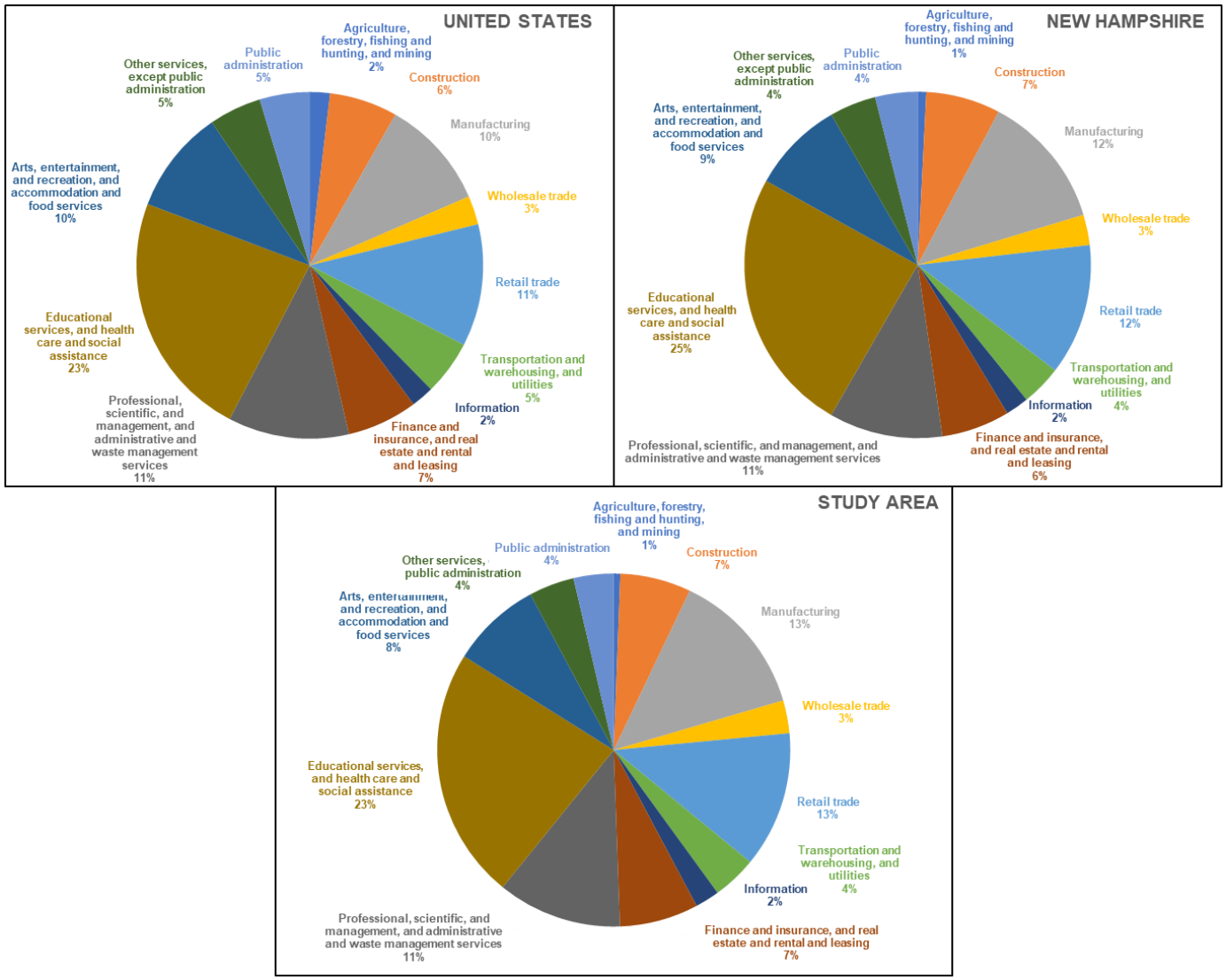
Figure 3-29. Housing Vacancy Rates in the New Hampshire Study Area by Census Block Group

Table 3-10. Census Bureau Labor and Industry Statistics for the U.S., New Hampshire, and the New Hampshire Study Area (number of jobs)

Industry	United States	Percent (%)	New Hampshire	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**713,424**		**239,860**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	5,666	0.8	1,434	0.6
Construction	9,564,541	6.4	49,533	6.9	15,569	6.5
Manufacturing	15,477,389	10.3	89,847	12.6	32,113	13.4
Wholesale trade	4,042,867	2.7	20,216	2.8	7,191	3.0
Retail trade	17,167,000	11.4	87,411	12.3	29,886	12.5
Transportation and warehousing, and utilities	7,681,579	5.1	26,868	3.8	9,738	4.1
Information	3,173,300	2.1	15,443	2.2	5,335	2.2
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	45,437	6.4	17,325	7.2
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	75,676	10.6	27,328	11.4
Educational services, and health care and social assistance	34,781,348	23.1	176,499	24.7	55,345	23.1
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	61,624	8.6	19,826	8.3
Other services, except public administration	7,371,226	4.9	31,010	4.3	9,977	4.2
Public administration	7,025,870	4.7	28,194	4.0	8,793	3.7

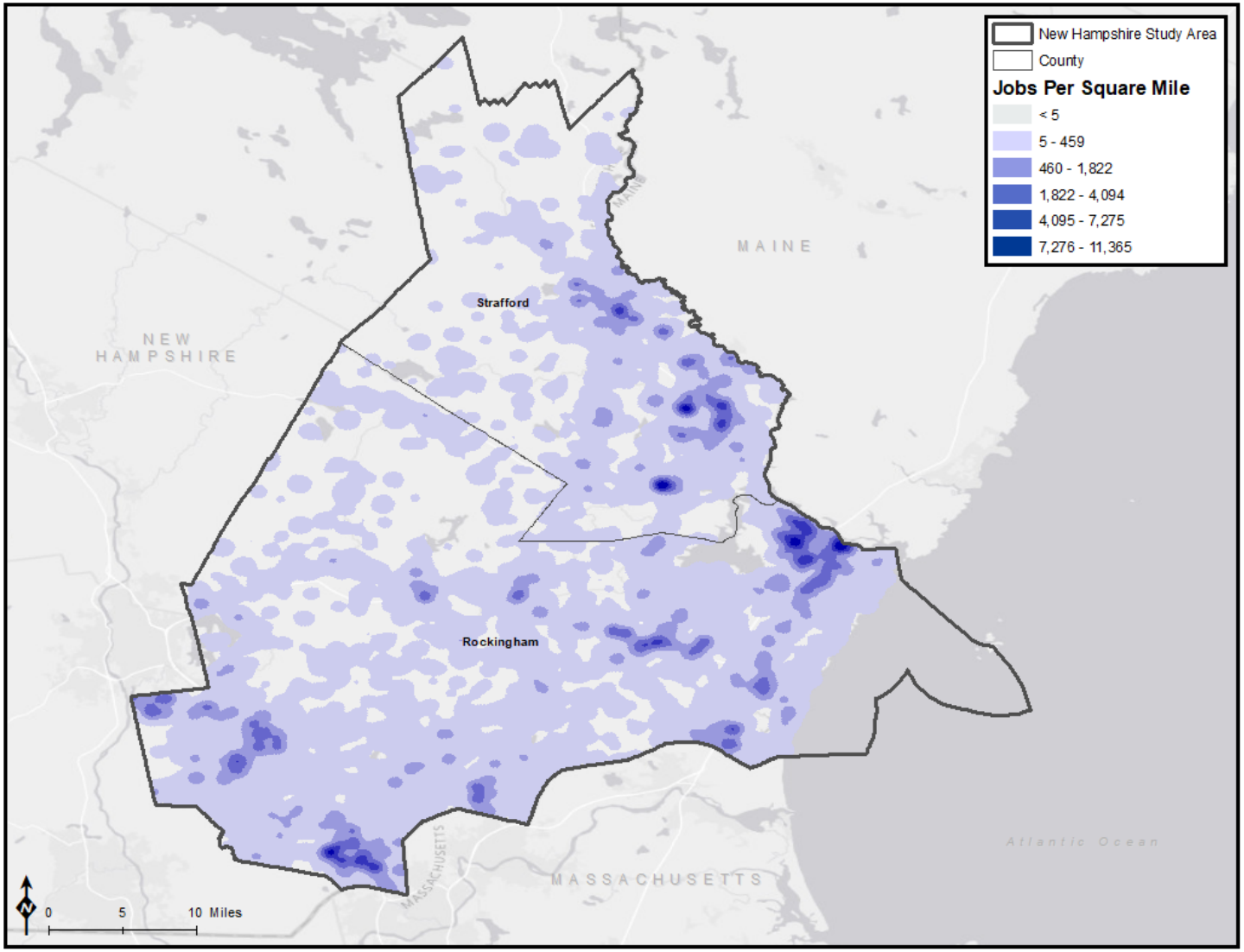
Source: USCB 2019p

Table 3-10 and Figure 3-30 show the number of jobs in each major industry sector for the U.S., the State, and the Study Area. The dominant industry sectors in the Study Area based on USCB data are educational services, and health care and social assistance (23.1%); manufacturing (13.4%), retail trade (12.5%); and professional, scientific, and management, and administrative and waste management (11.4%). Generally, the dominant employment categories in the Study Area are similar to those of the State. In the Study Area, 8.3% of people work in arts, entertainment, and recreation, and accommodation and food services, less than the State (8.6%) and the Nation (9.7%). The Study Area has a greater percentage of manufacturing jobs (13.4%) as compared to the State (12.6%) and the Nation (10.3%) (USCB 2017p). Figure 3-31 shows the location of jobs within the Study Area (USCB 2017r).



Source: USCB 2017p

Figure 3-30. Number of Jobs by Industry Sector for the U.S., New Hampshire, and the New Hampshire Study Area



Source: USCB 2017r

Figure 3-31. Jobs per Square Mile in the New Hampshire Study Area by Census Block Group

These major industries, based on the number of employees out of the entire State workforce per the Bureau of Labor Statistics, include (1) trade, transportation, and utilities; (2) education and health services; (3) professional and business services; (4) leisure and hospitality; and (5) manufacturing (BLS 2019a). Trade, transportation, and utilities account for 20.4% of non-farm employment (BLS 2019a). Government industries and services are also a major industry in New Hampshire; however, government is not usually included in discussions regarding industries. In Rockingham County, employment was highest compared to the rest of the counties in New Hampshire, and the average weekly wage rose 5.0% across the second quarter of 2018 to the second quarter of 2019 (BLS 2019a, BLS 2020a). The average weekly wages for the counties in the Study Area, Rockingham and Strafford, were $1,082 and $992, respectively (BLS 2019a, BLS 2020a). New Hampshire is positioned to reach major markets throughout the northeastern U.S. and Canada (NHDED 2020b).

Study Area counties are close to larger labor markets and major transportation networks and have experienced higher job growth compared to rural parts of the State (NHHFA 2018).

New Hampshire's potential job growth and continued economic expansion is dependent on its ability to attract and retain prime working age adults (ages 25 to 54). Due to slow population growth and aging of the population, the State depends on in-migrating workers to fill jobs. The lack of available and affordable housing options has the potential to hamper migration patterns, which are sensitive to economic conditions, and results in a labor shortage (NHHFA 2018, SRPC 2015).

3.4.4.1.1 New Hampshire's Ocean Economy

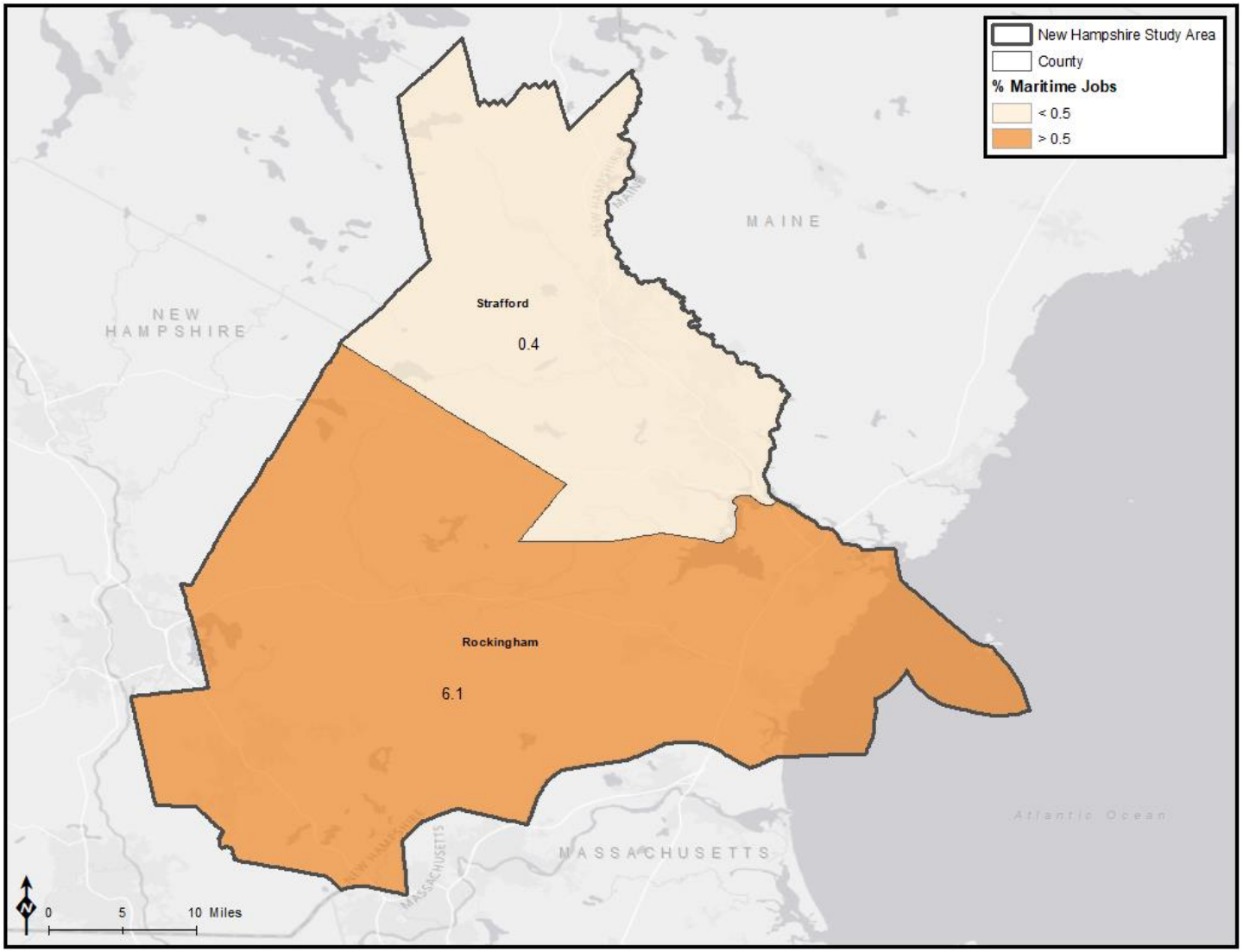
Overall, New Hampshire's ocean economy ranked 28th in employment among the 30 States included in the U.S. ocean and Great Lakes economy (NOAA 2016b). As shown in Table 3-11, New Hampshire's ocean economy accounted for 15,558 maritime jobs in 2016, accounting for 2.4% of New Hampshire's employment (NOAA 2016b, USCB 2017i). Within the State, tourism and recreation was the dominant sector, accounting for 50.3% (7,684) of maritime jobs. The tourism and recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums. The second most dominant sector was marine transportation, accounting for 47.6% (7,269) of maritime jobs. The marine transportation sector includes deep-sea freight, marine passenger transportation, pipeline transportation, marine transportation services, search and navigation equipment, and warehousing (NOAA 2016b).

The Study Area had 9,658 maritime jobs, representing 62.1% of total maritime jobs in the State. Rockingham County had the greatest number of maritime jobs (9,441), representing 97.8% of maritime jobs in the Study Area, reflecting its proximity to the ocean and maritime employment opportunities (USCB 2017i, NOAA 2016b). Figure 3-32 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. The highest percentage of maritime jobs to overall county jobs was also in Rockingham County (6.1%); the low percentage of maritime jobs indicates higher economic diversity in metropolitan areas (NOAA 2017b).

Table 3-11. Employment Data in the New Hampshire Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Rockingham	179,284	178,486	170,757	7,729	4.3	153,577	9,441	6.1	$85,619	$43,474
Strafford	72,695	72,292	69,103	3,189	4.4	49,355	217	0.4	$67,805	$32,540
Study Area	**251,979**	**250,778**	**239,860**	**10,918**	**4.4**	**202,932**	**9,658**	**4.8**	**$76,712**	**$38,007**
New Hampshire	**748,779**	**746,990**	**713,424**	**33,566**	**4.5**	**644,553**	**15,558**	**2.4**	**$71,305**	**$36,914**
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 3-32. Maritime Jobs in the New Hampshire Study Area by County

3.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 3-11, in 2017 New Hampshire had higher median household income and per capita income than the U.S. (Harness 2019). According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, New Hampshire had a median income of $71,305 (23.7% higher than the Nation's median income) and a per capita income of $36,914 (18.4% higher than the Nation's per capita income). Median and per capita income in the Study Area were higher than the State at $76,712 and $38,007, respectively (USCB 2017k, USCB 2017n).

As shown in Table 3-11, in 2017 the median household income in the Study Area ranged from $67,805 (Strafford County) to $85,619 (Rockingham County). In 2017, per capita income ranged from $32,540 (Strafford County) to $43,474 (Rockingham County) (USCB 2017k, USCB 2017n). Figure 3-33 and Figure 3-34 show median household and per capita income in the Study Area (USCB 2017r).

3.4.4.3 Unemployment Rates

Figure 3-35 shows the 2017 unemployment rates in the Study Area counties by census block group. Table 3-11 presents unemployment rates for each county in the Study Area. The average unemployment rate in the Study Area was 4.4%, similar to the State (4.5%) but less than the Nation (6.6%), reflecting the availability of jobs. Within the Study Area, unemployment rates ranged from 4.3% in Rockingham County to 4.4% in Strafford County (USCB 2017h).

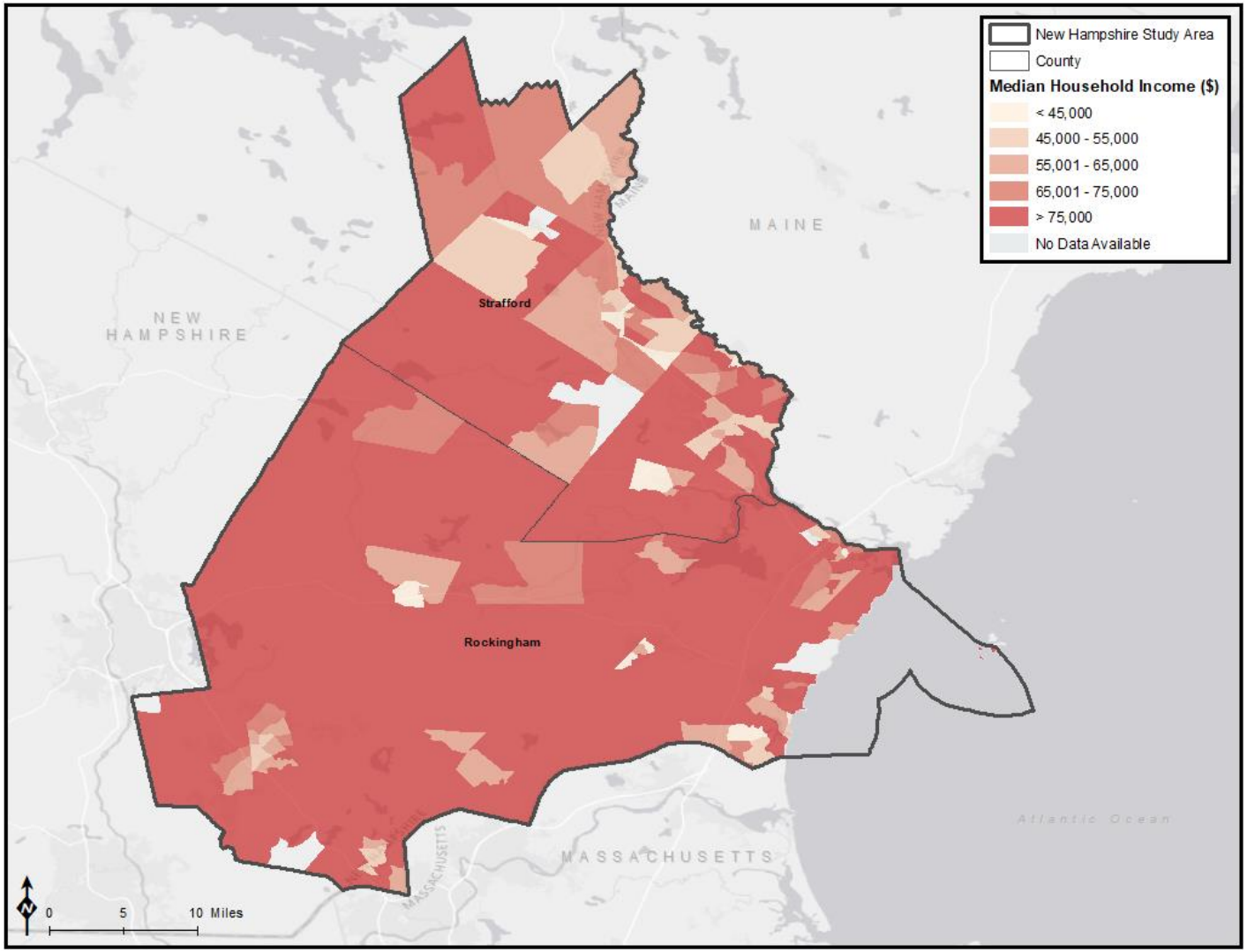
3.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 3-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State, and the Nation (USCB 2017t).

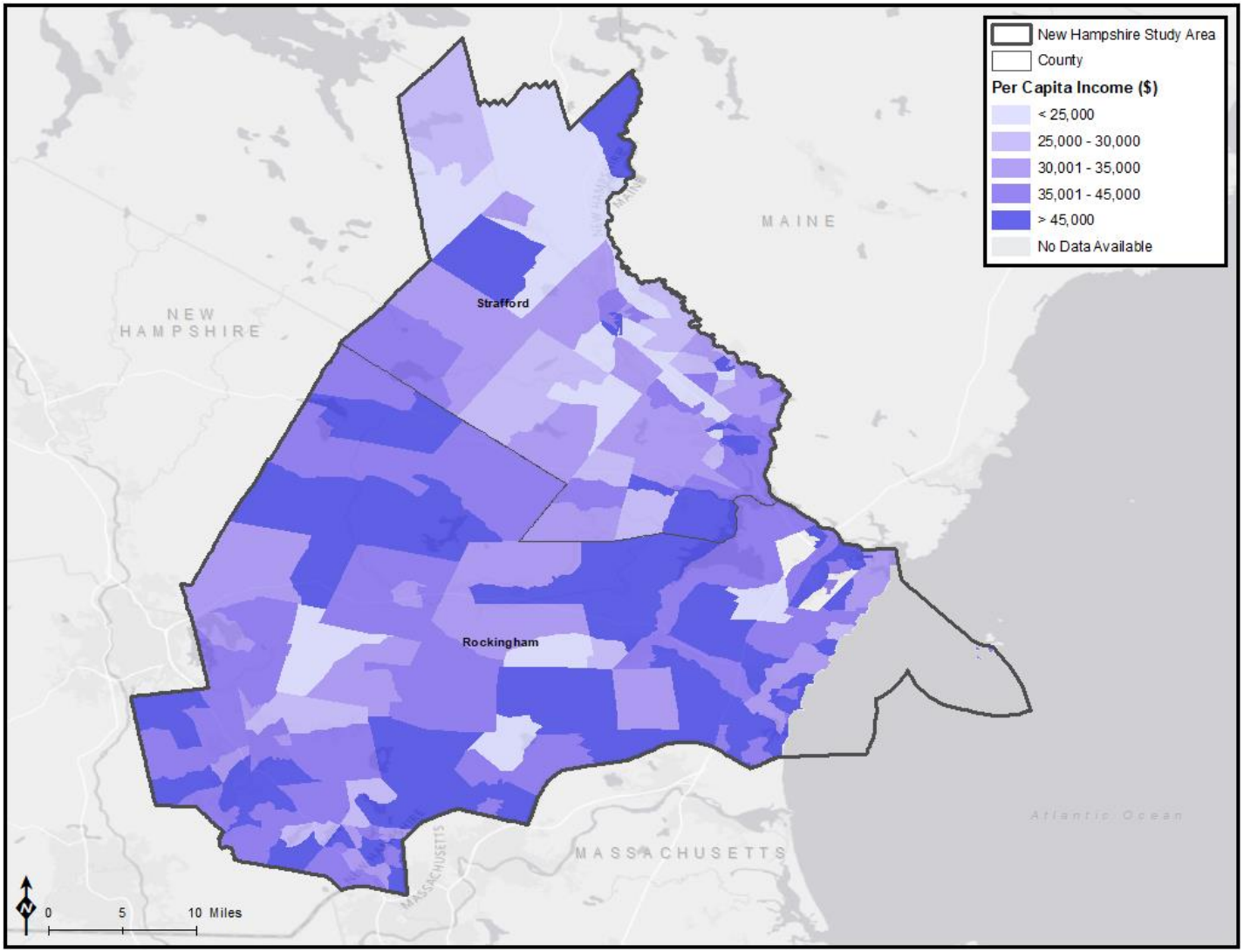
Figure 3-36 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma and 36.9% earned a college or advanced degree.
- In New Hampshire, 28.6% of the working-age population earned only a high school diploma and 43.2% earned a college or advanced degree.
- In the Study Area, 26.3% of the working-age population earned only a high school diploma and 44.9% earned a college or advanced degree (USCB 2017q).



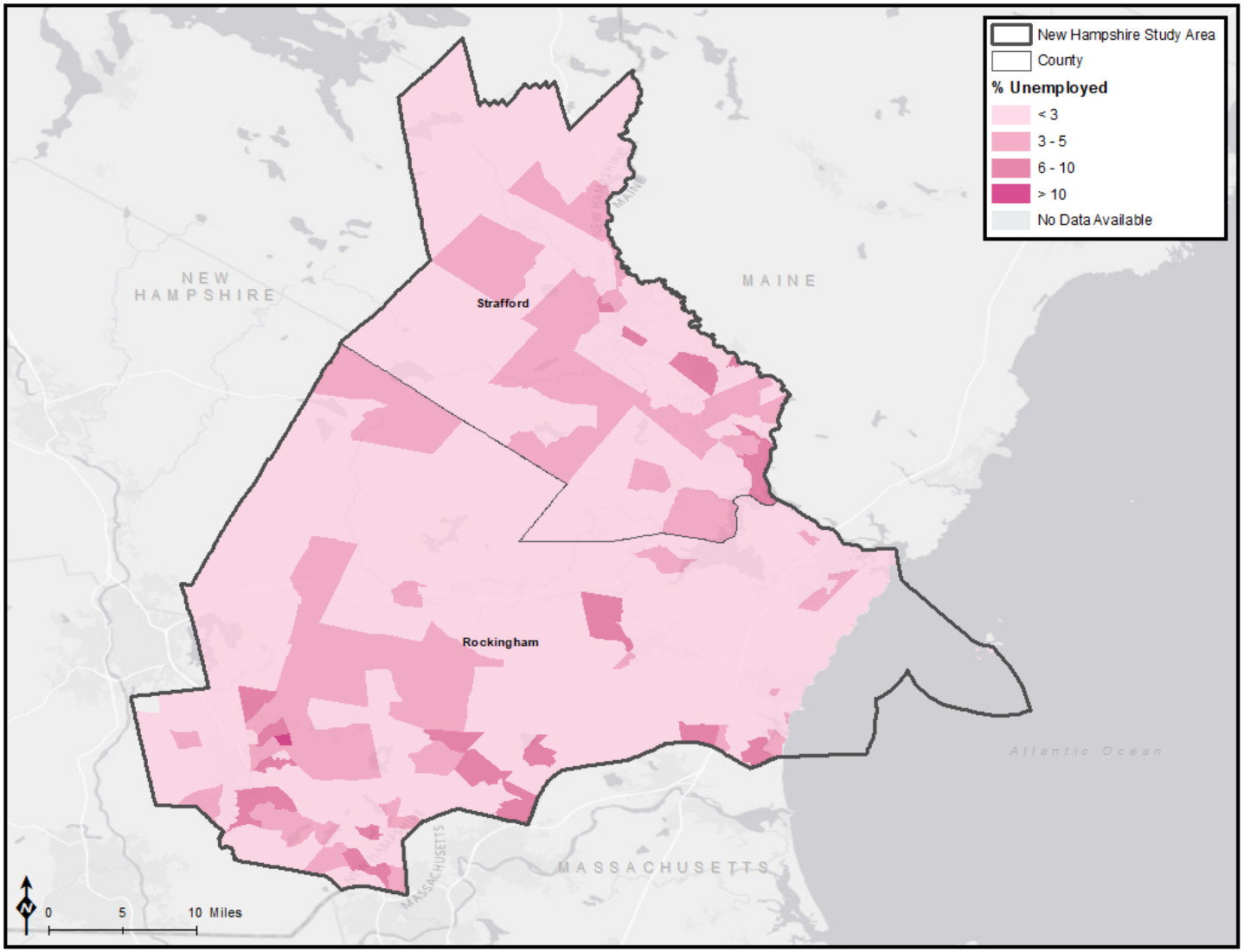
Source: USCB 2017r

Figure 3-33. Median Household Income in the New Hampshire Study Area by Census Block Group



Source: USCB 2017r

Figure 3-34. Per Capita Income in the New Hampshire Study Area by Census Block Group



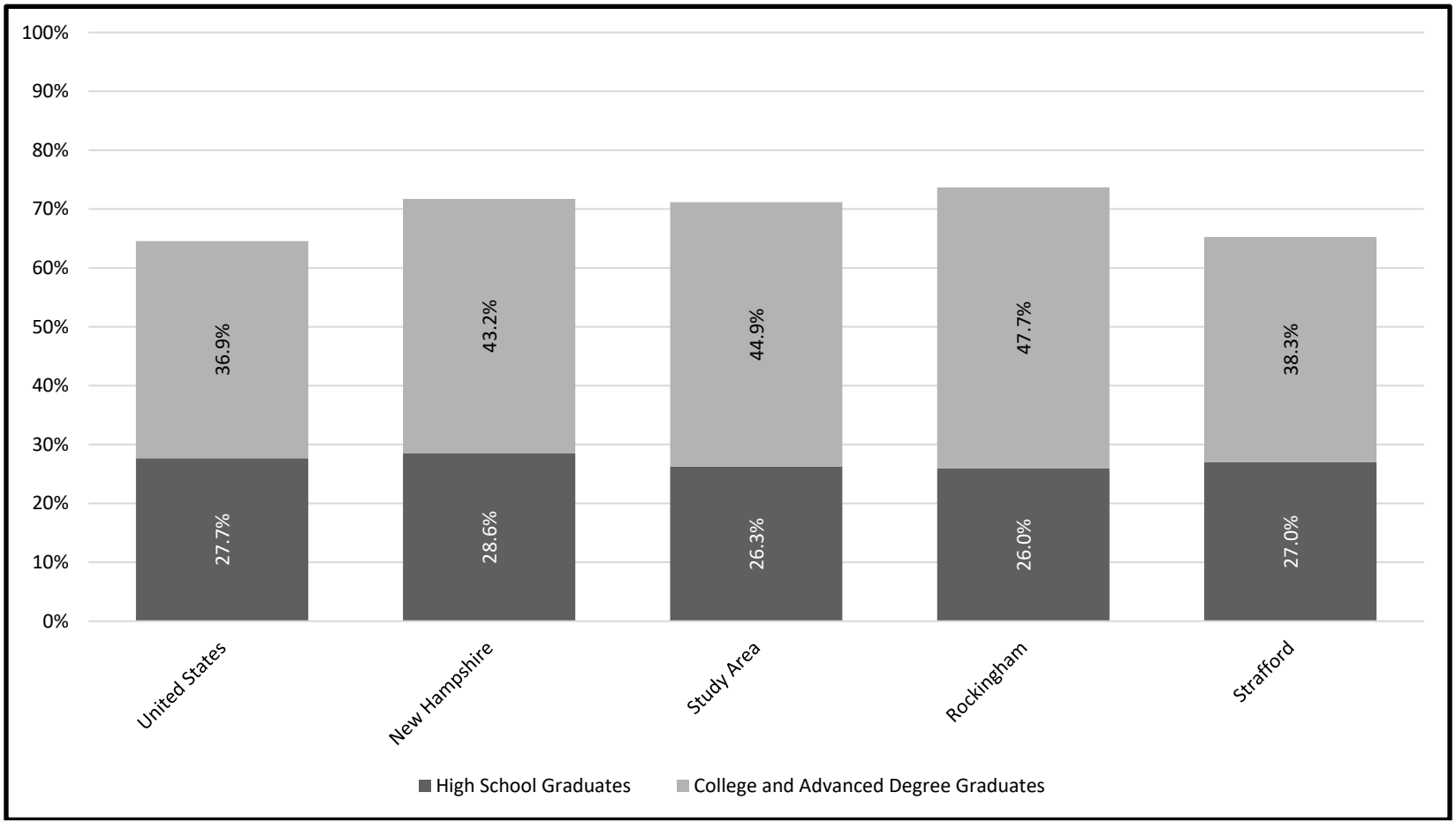
Source: USCB 2017r

Figure 3-35. Unemployment Rates in the New Hampshire Study Area by Census Block Group

Table 3-12. Educational Data for the New Hampshire Study Area

Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Rockingham	3,154	10,679	62,620	49,692	22,140	59,894	33,019	241,198	1.3	4.4	26.0	20.6	9.2	24.8	13.7
Strafford	1,669	5,625	27,570	28,218	7,766	20,332	11,009	102,189	1.6	5.5	27.0	27.6	7.6	19.9	10.8
Study Area Total	**4,823**	**16,304**	**90,190**	**77,910**	**29,906**	**80,226**	**44,028**	**343,387**	**1.4**	**4.7**	**26.3**	**22.7**	**8.7**	**23.4**	**12.8**
New Hampshire	**18,164**	**60,656**	**309,713**	**227,941**	**97,978**	**233,006**	**137,142**	**1,084,600**	**1.7**	**5.6**	**28.6**	**21.0**	**9.0**	**21.5**	**12.6**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 3-36. High School, College, and Advanced Degree Graduate Rates in the New Hampshire Study Area

Figure 3-37 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q). For workers with less than a high school diploma, percentages in each county were less than the State and National percentages. The percentage of workers with only a high school diploma was equivalent between the counties in the Study Area and State and National percentages. The percentages of workers earning an Associate's, Bachelor's, and Graduate or Professional degree were all higher in the Study Area counties than State or National percentages.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

3.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

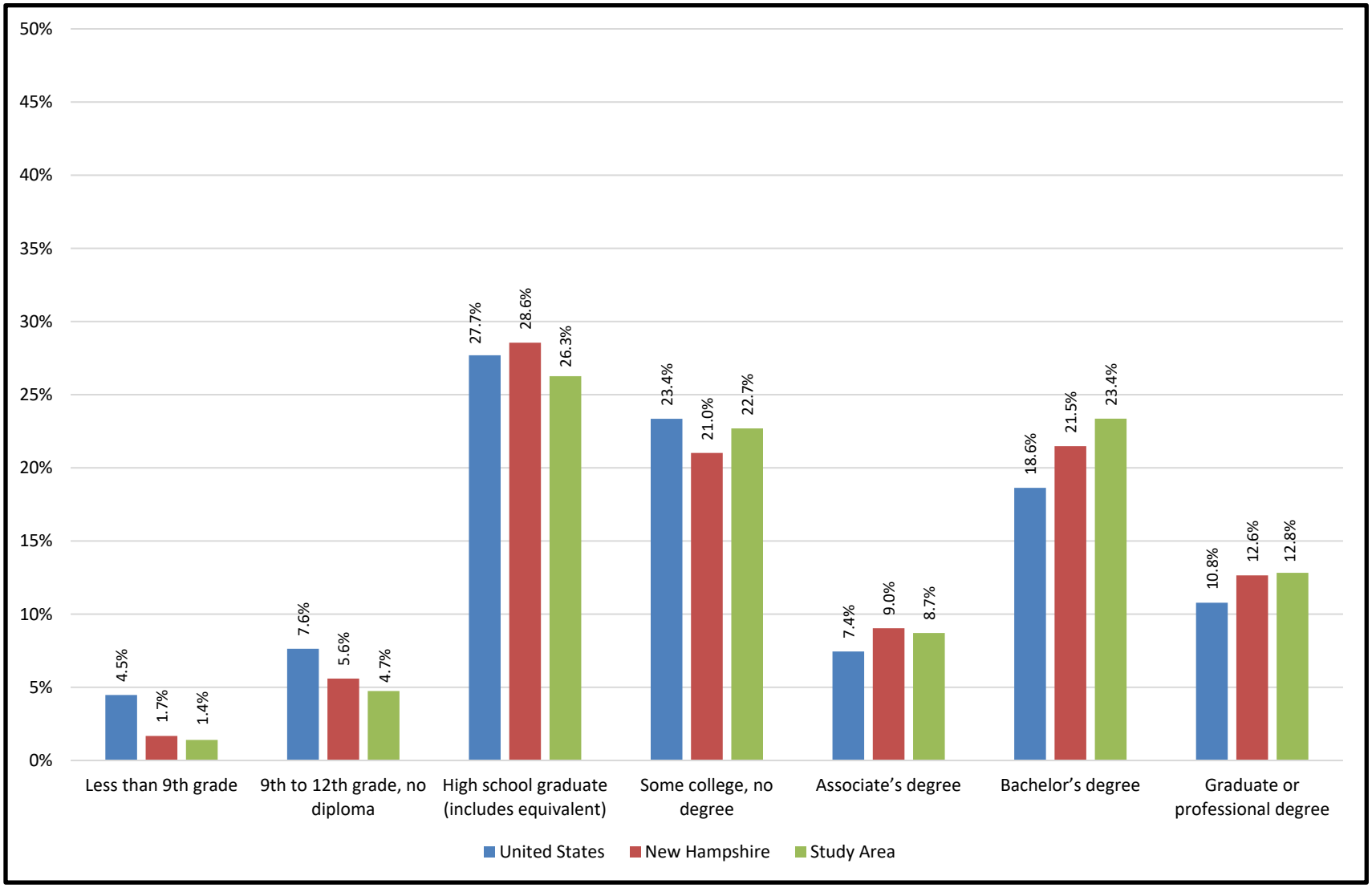
Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities and subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

3.4.5.1 Environmental Justice Communities of Concern

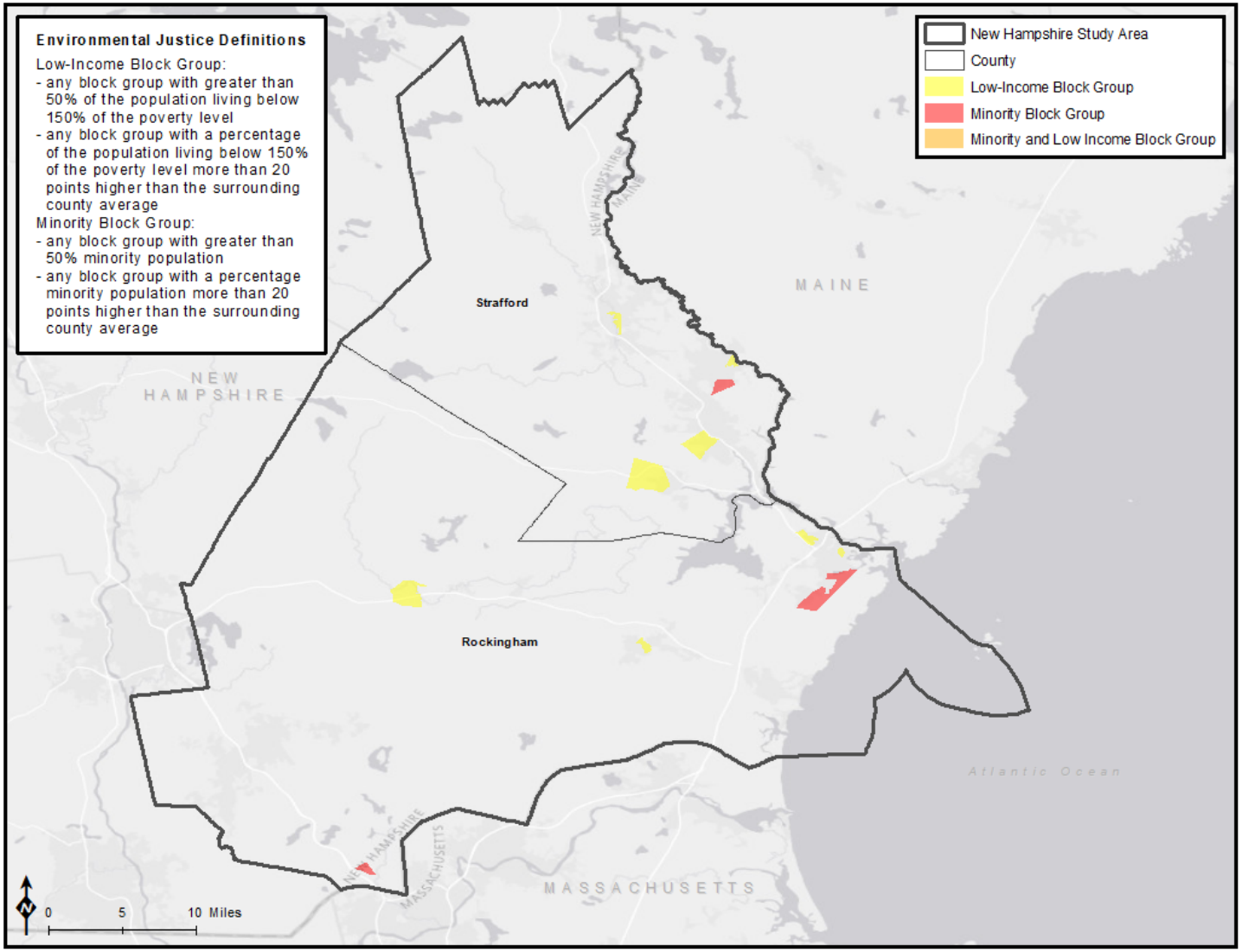
Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 3-38 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.



Source: USCB 2017q

Figure 3-37. Educational Attainment in the New Hampshire Study Area



Source: USCB 2017r

Figure 3-38. Minority and Low-Income Population in the New Hampshire Study Area by Census Block Group

3.4.5.1.1 Minority Populations

As compared to all Study Areas within the 15 coastal states and the District of Columbia comprising the Project Area, the New Hampshire Study Area has strikingly small minority populations. Even though the populations are small in comparison, the New Hampshire Study Area contains minority populations subject to consideration as potential environmental justice communities of concern.

Table 3-13 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 429,031 people living in the Study Area, approximately 31,601 (7.4%) are minority. This is less than the State (9.1%) and significantly less than the Nation (38.5%). The presence of these populations indicates the Study Area contains sensitive populations subject to environmental justice consideration. Of the 258 block groups in the Study Area, approximately 1.2% (3 block groups) are considered minority populations (USCB 2017f).

Each of the counties contain census block groups with minority populations. As shown in Table 3-13, Strafford County had 9.1% minority block groups. Rockingham County had 2.2% minority block groups (USCB 2017f). Within the Study Area the largest minority group is Hispanic or Latino (1.8%) followed by Black or African-American (0.7%) (USCB 2017f).

3.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 3-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 1,289,255 people for whom poverty status is determined living in the Study Area, approximately 46,400 (11.1%) individuals have incomes less than 150% of the poverty level. This is less than both the State (14.0%) and significantly less than the Nation (23.7%). The presence of these communities indicates the Study Area contains sensitive populations subject to environmental justice consideration. Of the 258 census block groups in the Study Area, approximately 4.3% (11 block groups) are considered low-income populations (USCB 2017o).

As shown in Table 3-13, Strafford County had 1.3% of low-income census block groups. Rockingham County had 1.1% of low-income census block groups (USCB 2017o).

3.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this chapter, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Table 3-13. Low-Income and Minority Populations in the New Hampshire Study Area

Geographic Unit	Total Population (2017)	White, Nonhispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less Than 150% of the Poverty Level	Percent Population with Incomes Less Than 150% of the Poverty Level (%)
Rockingham	302,479	281,776	20,703	6.8	181	4	2.2	2	1.1	299,957	26,606	8.9
Strafford	126,552	115,654	10,898	8.6	77	7	9.1	1	1.3	117,505	19,794	16.8
Study Area	**429,031**	**397,430**	**31,601**	**7.4**	**258**	**11**	**4.3**	**3**	**1.2**	**417,462**	**46,400**	**11.1**
New Hampshire	**1,331,848**	**1,211,110**	**120,738**	**9.1**						**1,289,255**	**180,387**	**14.0**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report, we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this report to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and is discussed in detail in "Fishing Communities" (Chapter 3.4.5.3.1).

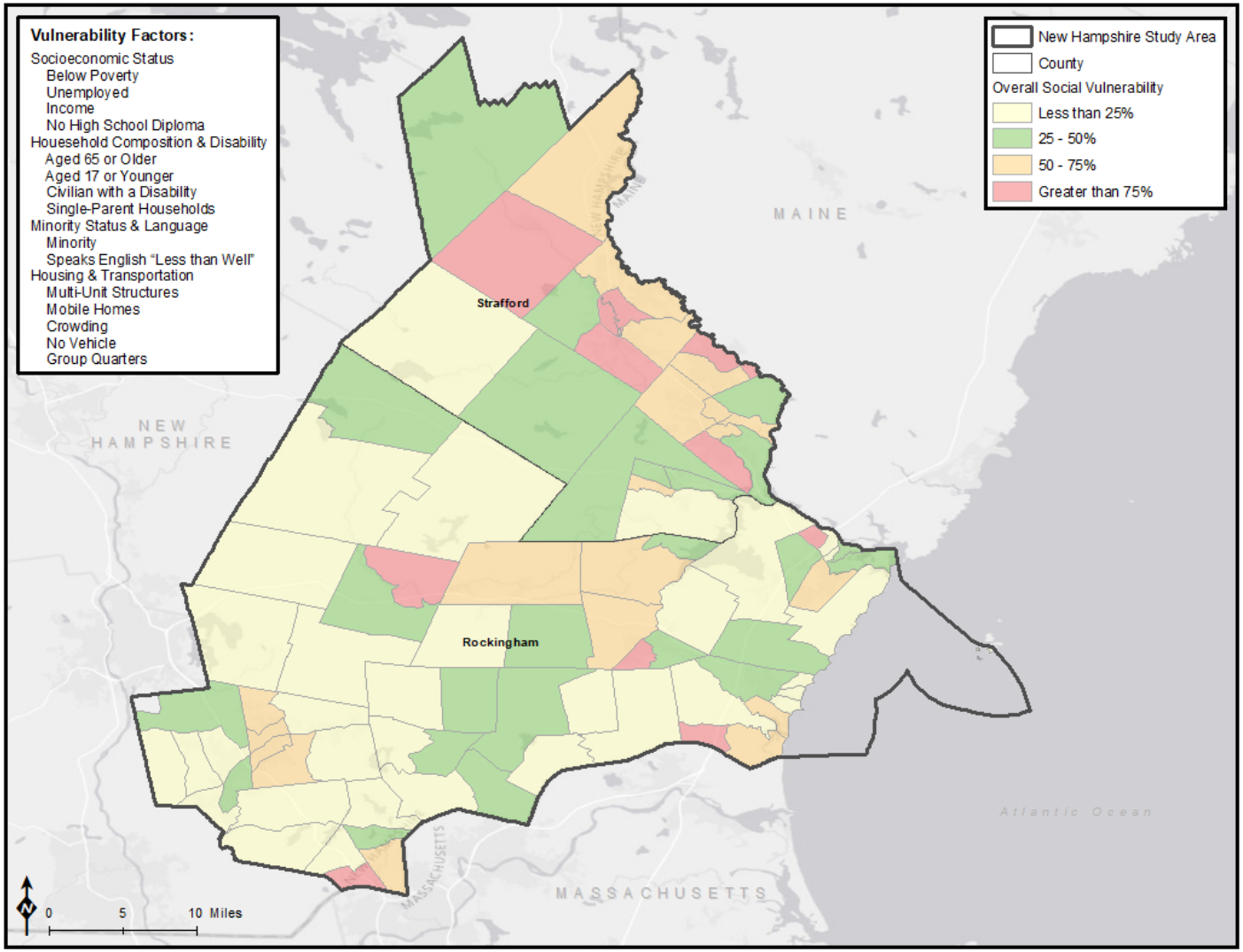
The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 3-39 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 3-39, census blocks near Rochester and Dover (both located in Strafford County) have the highest vulnerability ranking within the Study Area. Both counties have some populations deemed vulnerable to varying degrees (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 3-40 combines the CDC SoVI index (as shown in Figure 3-39) with minority and low-income populations (as shown in Figure 3-38) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC SoVI vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in the Dover area.

Figure 3-41 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 3-41 shows that communities along the coast in Rockingham County are at risk for impacts associated with sea level rise. The figure indicates less impact to Strafford County, as its eastern boundary is inland from the coast. Not shown, but also applicable (as discussed in Chapter 3.2.2.3 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

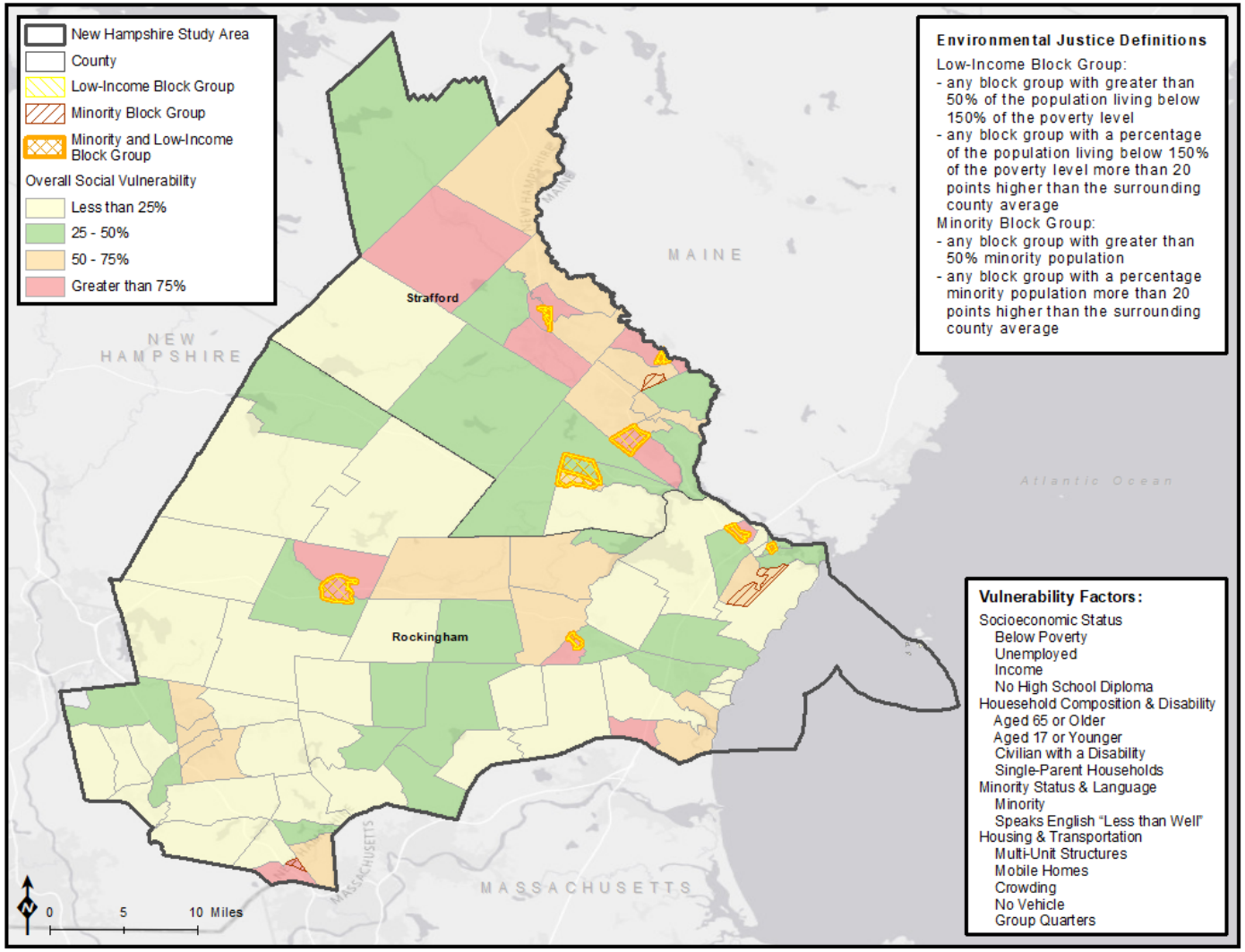
As discussed in Chapter 3.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that the location of socially vulnerable populations be considered when evaluating potential future OCS-related project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the Eastern Shore and coasts of the Study Area (CDC 2016).



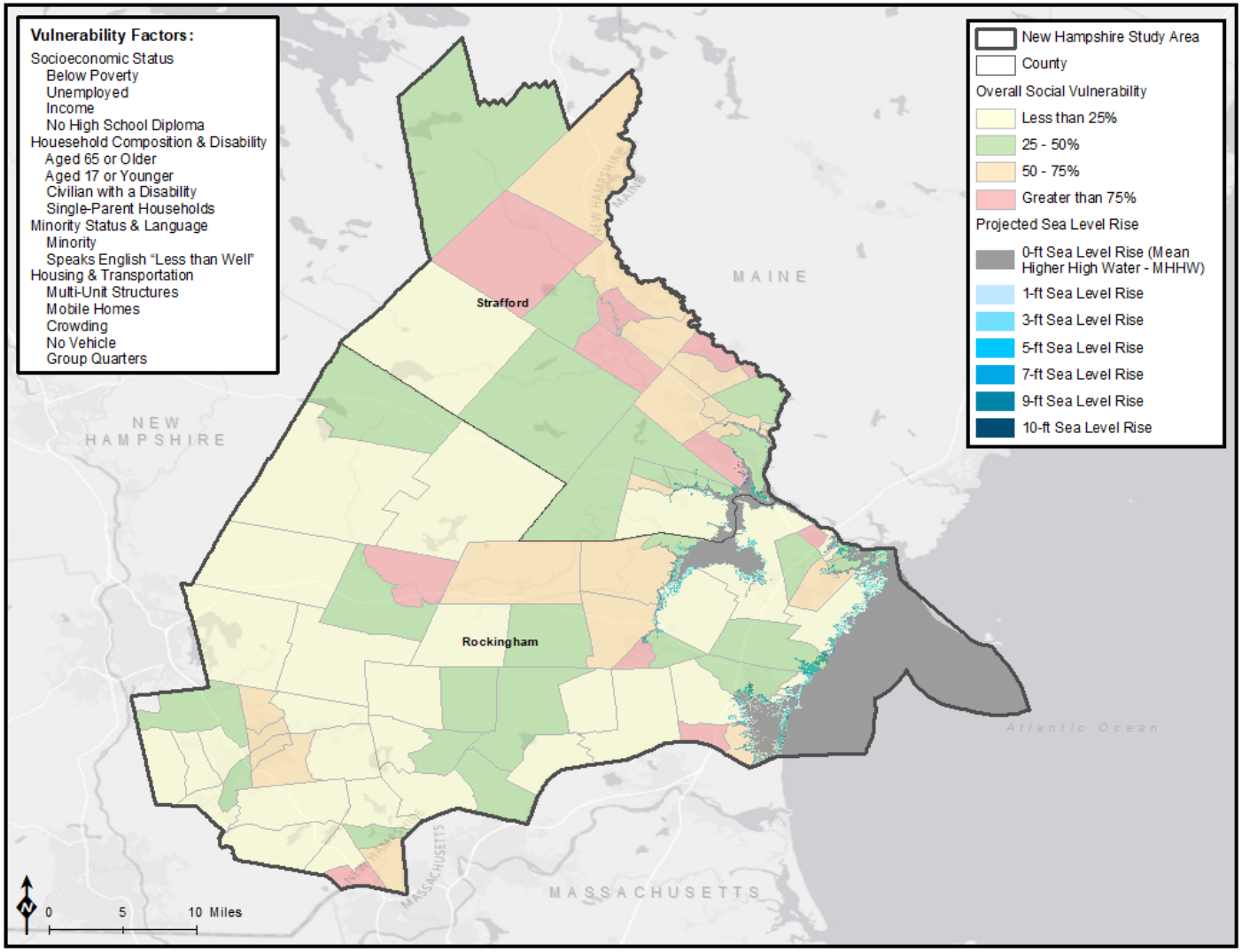
Source: CDC 2016

Figure 3-39. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the New Hampshire Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 3-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the New Hampshire Study Area



Sources: CDC 2016, NOAA 2018a

Figure 3-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the New Hampshire Study Area by Census Tract

3.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.

3.4.5.3.1 Fishing Communities

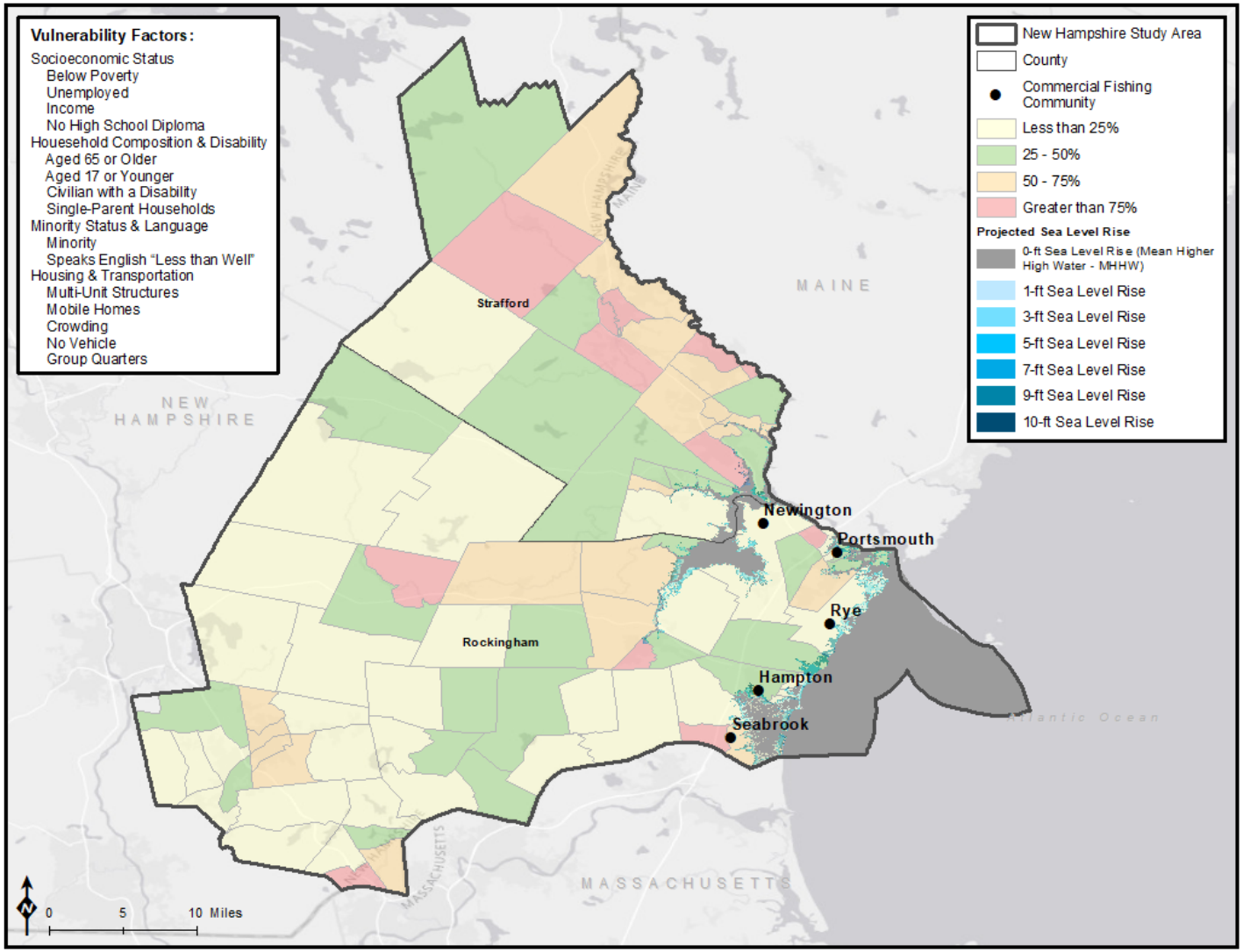
There are five fishing communities in the Study Area, all of which are located in Rockingham County, as illustrated in Figure 3-42.

The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Hampton, Rockingham County
- Nevington, Rockingham County
- Portsmouth, Rockingham County
- Rye, Rockingham County
- Seabrook, Rockingham County

As can be seen in Figure 3-42, four of the five of these fishing communities are located within areas somewhat vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. Newington is located on the Great Bay and has more protection from these effects due to its more inland position. As discussed in Chapter 3.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site-selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 3-42. Potential Vulnerable Communities in the New Hampshire Study Area by Census Tract

3.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, American Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 3-42). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

3.4.5.4 Tribes

There are no federally or State-recognized tribes in New Hampshire. However, there are tribal groups that no longer reside in New Hampshire or are not recognized by either the Federal government or the State who have a tribal history or other tribal associations to land within the State as well as the Study Area.

Historically, the predominant tribes in New Hampshire were the Abenaki and the Pennacook. The Abenacki lived in the northern and central part of the state while the Pennacook lived in the southern part of New Hampshire (including the Study Area). Today, less than 1,000 Abenaki live in New Hampshire (NHSCA 2014, Native Languages of the Americas 2015b). The Pennacook Tribe was closely related to the Abenaki and, in New Hampshire, primarily inhabited the Merrimack River Valley (Native Indian Tribes 2018), which includes the western parts of Rockingham and Strafford Counties in the Study Area. However, although the Pennacook are no longer a distinct tribe, their descendants can be found among the Abenaki people who continue to live in and around New Hampshire (Weiser-Alexander 2018). There are also several non-recognized Abenaki and New England tribal groups that either do not live in the Study

Area or do not live in New Hampshire, but have cultural interests in, and historical ties to the State. A list of these groups can be found on the New Hampshire Division of Historical Resources website at: https://www.nh.gov/nhdhr/review/tribal_list.htm (NHDHR 2015).

Tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

3.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

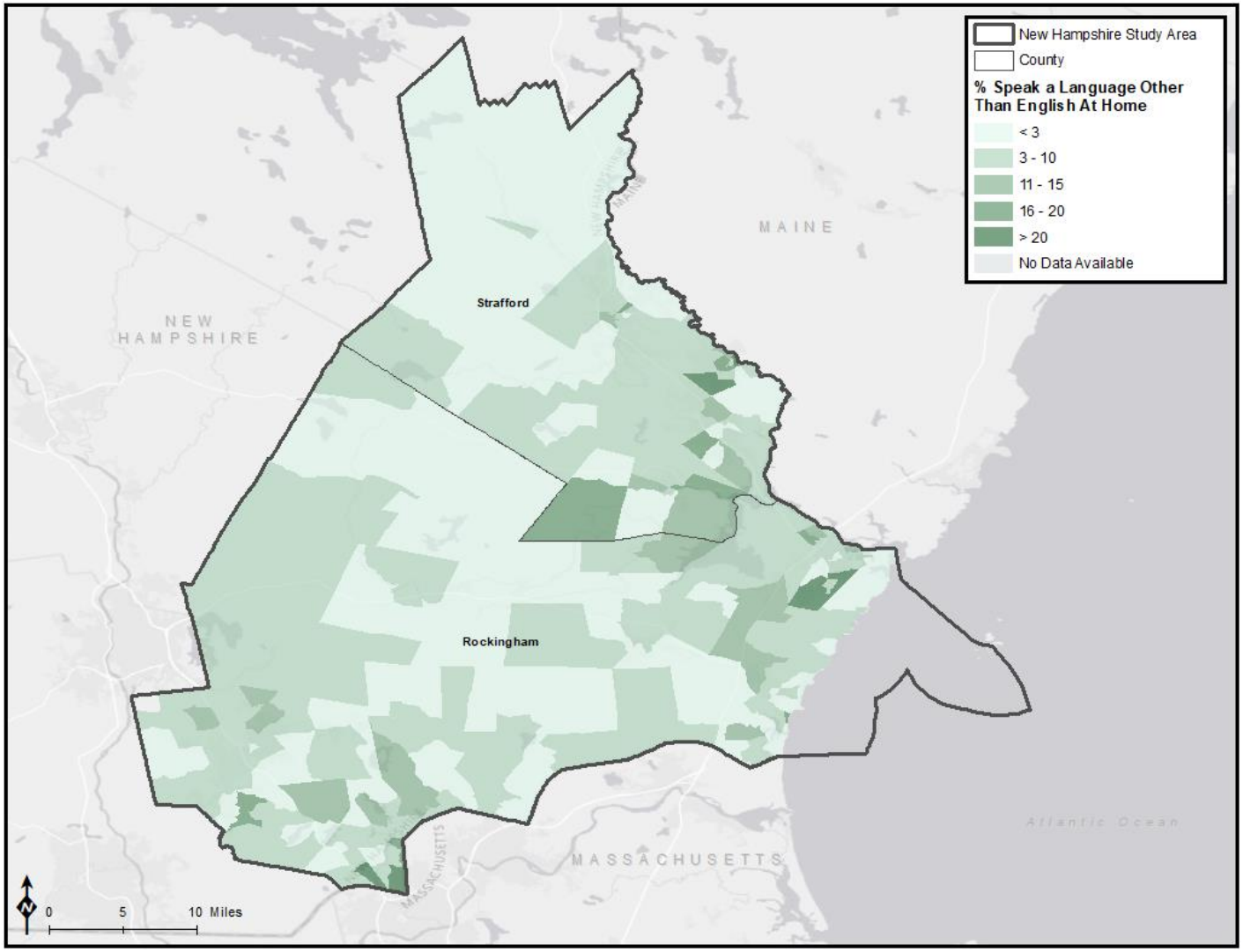
Table 3-14 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 6.4% of the population do not speak English at home. Stafford County had the highest percentage (7.0% of the total population) of this population within the Study Area. Indo-European languages are spoken by the majority (12,066 people or 3.0%) of non-English speakers at home within the Study Area population.

Figure 3-43 illustrates the percent of people who speak a language other than English at home in the Study Area (USCB 2017e). As seen in Figures 3-38 and 3-40, eastern areas of Strafford and Rockingham Counties are ranked as over 75% vulnerable and impacted by rising sea levels.

Table 3-14. People who Speak a Language Other than English at Home in the New Hampshire Study Area by Census Block Group

Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Rockingham	288,508	17,734	6.1	5,323	8,371	3,211	829
Strafford	120,293	8,394	7.0	1,395	3,695	2,902	402
Study Area	**408,801**	**26,128**	**6.4**	**6,718**	**12,066**	**6,113**	**1,231**
New Hampshire	**1,267,615**	**99,496**	**7.8**	**27,171**	**46,976**	**18,825**	**6,524**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017r, USCB 2017e

Figure 3-43. Percent of People Who Speak a Language Other than English at Home in the New Hampshire Study Area by Census Block Group

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

3.4.6 Summary – Demographics and Socioeconomics

New Hampshire's population is growing but at a rate slower than the Nation. The State grew 1.1% between 2010 and 2017 to approximately 1.3 million people. During the same period, the U.S. grew 4%. New Hampshire is affected by the nationwide trend of aging population, as indicated by the declining rate of natural population increase during the same period. However, population continues to grow due to domestic and international migration. Projections indicate the population growth of 9.2% by 2040, significantly less than the national rate (16.4%) during the same period (USCB 2017a, USCB 2017d, NH 2016).

The Study Area is comprised of two counties and represented 32.2% (429,031 residents) of the overall State population of 1.3 million, according to 2017 population estimates. Between 2010 and 2017, the Study Area grew 2.5%, faster than the State (1.1%) and slower than the Nation (4.0%). Both counties gained population during the same period (USCB 2017a, USCB 2017d).

Regional disparities of population density, age, education, and income exist between the Study Area and the rest of the State. These differences are reflective of nationwide trends of urbanization and are indicative of a rural-urban divide. The Study Area counties are part of the Boston-Cambridge-Newton, MA-NH MSA and are connected to Boston's employment opportunities, as well as higher housing costs (Data.gov 2017).

The State and Study Area are currently experiencing a rapid aging of the population, a trend shared by other New England States. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 4.8% in New Hampshire and 4.7% in the Study Area. Projections by the year 2040 indicate this group's decline in the Nation (5.7%), the State (4.6%), and the Study Area (4.4%) (USCB 2017b, USCB 2018b, NH 2016). Despite positive net migration, Study Area communities are experiencing an observable decline in families, children, and school enrollment. The decline is attributed to children of the baby boomers reaching college age and slow population growth caused by aging population and declining birth rates (NHHFA 2019b). A decline in school enrollment may impact State funding for education, which is often based on student enrollment. As a result, local taxpayers may have to contribute more towards the school's budget for fixed costs, such as staffing and maintenance (SRPC 2015).

New Hampshire and the Study Area had a greater percentage of elderly (16.5% and 15.4%, respectively) as compared to the Nation (14.9%) in 2017. The population of elderly is projected to rise in all geographic units, fueled by aging baby boomers. By 2040, the population of elderly Americans is projected to increase to 28.5% and 27.4% in the State and Study Area, respectively, which is more than the Nation (21.6%). In the Study Area counties, the number of elderly is projected to nearly double in size (increasing 92.6% and 97.8% in Rockingham and Strafford Counties, respectively). Rockingham County had the largest percentage (16.0%) of elderly in 2017; a further increase to 28.6% is projected by 2040 (USCB 2017b, USCB 2018b, NH 2016).

The projected shift in the "Under Age 5" and "Over Age 65" age components may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force, in public and private retirement systems, and the allocation of many types of public funds. Population distribution will be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site-selection process for new projects.

In 2017, homeownership in New Hampshire was 70.7%, higher than the Nation (63.8%) and lower than the Study Area (73.5%). Renters comprised approximately 29.3% of the State and 26.5% of the Study Area in 2017, which is less than the Nation (36.2%) (USCB 2017m). Households continue to rent due to the tight supply of affordable homes and competition between baby boomers and entry level buyers for the lower end of the market, resulting in difficulty finding affordable housing (NHHFA 2019a).

In 2017, median home values were higher in the Study Area ($258,400) than in the State ($244,900) and the Nation ($193,500). Rockingham County had the highest median home value ($295,900); Strafford County had the lowest ($220,900) (USCB 2017l). A shortage of workforce housing has been a long-standing problem in Rockingham County due to the close proximity to the Boston housing market, which tends to inflate housing costs – but not wages. Zoning restrictions and lack of municipal sewer and water services constrains development of multifamily housing units that would provide affordable workforce housing (RPC 2015). The State's growing economy increases the need for a range of housing to accommodate workforce and retain its graduates, young workers, seasonal workers, and families as well as suitable housing for seniors and disabled (NHHFA 2019a). Lack of affordable housing could discourage workers from moving to the State or remaining in the State.

Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. Home vacancy rates in the Study Area were 8.1% in 2017, significantly less than the State (16.1%) and Nation (12.2%), reflecting higher demand in the Study Area (USCB 2017g).

The Study Area had a total employment of approximately 240,000 jobs in 2017, representing approximately 33.6% of the total jobs in New Hampshire and 0.2% of the total jobs in the U.S. (USCB 2017p). Study Area counties are close to larger labor markets and major transportation networks and have experienced higher job growth compared to rural parts of the State (NHHFA 2018). New Hampshire's potential job growth and continued economic expansion is dependent on its ability to attract and retain prime working-age adults (ages 25 to 54). Due to slow population growth, aging of the population, the State depends on in-migrating workers to fill jobs. The lack of available and affordable housing options has the potential to hamper migration patterns, which are sensitive to economic conditions, and result in a labor shortage (NHHFA 2018, SRPC 2015).

The Study Area had 9,658 maritime jobs, representing 62.1% of total maritime jobs in the State. Rockingham County had the greatest number of maritime jobs (9,441), representing 97.8% of maritime jobs in the Study Area, reflecting its proximity to the ocean and maritime employment opportunities (USCB 2017i, NOAA 2016b)

Median household and per capita income were higher in the Study Area. Unemployment rates were lower in the Study Area (4.4%) as compared to the State (4.5%) and Nation (6.6%) (USCB 2017k, USCB 2017n).

In the U.S., 27.7% and 36.9% of the working-age population earned only a high school diploma and college degree, respectively. In New Hampshire, 28.6% of the working-age population earned only a high school diploma and 43.2% earned a college or advanced degree. In the Study Area, 26.3% of the working-age population earned only a high school diploma and 44.9% earned a college or advanced degree. Higher educational attainment in the Study Area may be attributed to the high number of workers migrating to New Hampshire for jobs requiring at least a college degree (USCB 2017t). Additionally, the University of New Hampshire is present in Strafford County in the Study Area likely contributing to the educational attainment levels within that county.

The Study Area contains minority and low-income populations subject to consideration as potential environmental justice communities of concern. However, in comparison to all Study Areas within the 15 coastal states and the District of Columbia comprising the Project Area, the New Hampshire Study Area has strikingly small minority populations. Of the 429,031 people living in the Study Area, approximately 31,601 (7.4%) are minority. Of the 258 block groups in the Study Area, approximately 1.2% (3 block groups) are considered minority populations. Strafford County had a higher percentage (9.1%) of minority block groups as compared to Rockingham County (2.2%). Within the Study Area the largest minority group is Hispanic or Latino (1.8%) followed by Black or African-American (0.7%) (USCB 2017f).

In the Study Area, approximately 46,400 (11.1%) individuals have incomes less than 150% of the poverty level. Of the 258 census block groups in the Study Area, approximately 4.3% (11 block groups) are considered low-income populations. Strafford County had a slightly higher percentage (1.3%) of low-income census block groups as compared to Rockingham County (1.1%) (USCB 2017o).

Minority and low-income status are two of several factors that the CDC and NOAA use to calculate potentially vulnerable populations. The output of the CDC SoVI indicates that the cities of Rochester and Dover (both located in Strafford County) have the highest vulnerability rankings within the Study Area. Rockingham County communities along the coast are deemed vulnerable to varying degrees for impacts associated with sea level rise, storm surge, and nuisance tidal flooding. Less impact is projected for Strafford County, as its eastern boundary lies inland from the coast (CDC 2016).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. In the Study Area, these groups include fishing communities, American Indians, limited-English populations, and subsistence populations. There are five fishing communities located in the Study Area. These communities are particularly susceptible to projected sea level rise and storm surge changes and correlate closely with the CDC vulnerability rankings and minority and low-income populations, particularly in Suffolk County. While there are no federally or State-recognized tribes in New Hampshire, individual American Indians and members of non-recognized groups do live in the Study Area.

Limited-English populations are present throughout the Study Area; 6.4% of the population do not speak English at home. Stafford County had the highest percentage (7.0%) of this population within the Study Area. Indo-European languages are spoken by the majority (12,066 people or 3.0%) of non-English speakers at home within the Study Area population. These are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public (USCB 2017e). Eastern areas of Strafford and Rockingham Counties are ranked as over 75% vulnerable and impacted by rising sea levels.

3.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

3.5.1 Regional Observations

Based on the results of the analysis of coastal land use and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

Two counties are included in the Study Area, and these two counties have 13 miles of coastline along the Atlantic Ocean. This New Hampshire coastline is liberally covered with estuaries and wetlands. In addition to the Great Bay and Hampton-Seabrook Estuaries, unique estuary systems in New Hampshire include the bays, harbors, and river outlets. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of pollution and nitrogen reduction as well as salt marsh restoration and fish passage restoration (NHDES 2010, PREP 2014, PREP 2015a, PREP 2015b). As such, estuaries and wetlands are an important natural and cultural resource within the Study Area.

Rates of sea level rise have been increasing in the Study Area, mostly due to subsidence, which makes New Hampshire particularly vulnerable to an increased rate of sea level rise in the future (SeaLevelRise.org 2019). Subsidence in New England is primarily due to the Earth's crust rebounding from the last Ice Age, although it not as pronounced as in the Mid-Atlantic States. Rising groundwater is another consequence of sea level rise. Raised groundwater levels are projected to extend up to 2.5 to 3 miles inland from the coast in coastal New Hampshire as a result of sea level rise, which is approximately three to four times farther inland than current tidal-water inundation. Rising groundwater is a concern in coastal New Hampshire because it contributes to the degradation of coastal road infrastructure and underground utilities (Wake et al. 2019).

Sea level rise is already impacting coastal communities in New Hampshire, including over 2,544 properties (SeaLevelRise.org 2019). Impacts of concern include nuisance flooding and rising groundwater, both of which contribute to the degradation of community property, public infrastructure, and natural resources. These impacts occur from sea level rise but also from storms increasing in magnitude and frequency. Impacts will be felt throughout the New Hampshire coast but especially in the areas surrounding the Hampton-Seabrook Estuary of the Atlantic Coast, the Great Bay Estuary, and the community of Rye because of the extensive low-lying areas around the marshes along Berry's Brook.

The two counties in the Study Area are predominantly forested while Rockingham County also has a significant area of developed land cover that is largely attributable to Derry and Salem, two of the bigger towns in the county with populations around 30,000.

The New Hampshire Association of Regional Planning and Commission is comprised of nine regional planning commissions in the State of New Hampshire. Within the two counties that make up the Study Area, there are three regional planning commissions. Strafford County is in the Strafford Regional Planning Commission. Rockingham County is primarily in the Rockingham Regional Planning Commission, but three municipalities are part of the Strafford Regional Planning Commission (Northwood, Nottingham, and Newmarket) and seven municipalities are part of the Southern New Hampshire Regional Planning Commission (Deerfield, Candia, Auburn, Chester, Derry, Windham and Londonderry) (ESRI 2020b). These regional commissions serve in an advisory role to local governments

to promote coordinated planning, orderly growth, efficient land use, transportation access, and environmental protection. Each region and municipality have developed a comprehensive plan, strategic plan, or master plan with regard to future development activities within their specific boundaries. Additionally, all municipalities in the Study Area have a comprehensive, traditional zoning ordinance (NHOSI 2019); however, there may be no maps associated with the ordinance or the maps may not be available in GIS formats. Thus, zoning information cannot be generalized across the scale of the Study Area. Links to each municipality and their zoning map and/or zoning ordinances are on the regional planning commission websites. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Additional zoning resources at the State level are on the New Hampshire's Office of Strategic Initiatives website (NHOSI 2017).

New Hampshire's population is projected to continue to increase over the next 20 years. The population is also aging, experiencing a similar trend as seen nationwide. Furthermore, the State's young adult population (20-29 year olds) contracted by more than 10% in the decade from 2000 to 2010 due to outmigration during the Great Recession (which lasted from 2007 to 2009) (Rich 2013). Despite positive net migration – domestic and international – communities are experiencing an observable decline in families, children, and school enrollment. Enrollment in New Hampshire's public schools (for pre-school through 12th grade) began to trend downward in 2000 and continues to decline. The decline is attributed to children of the baby boomers reaching college age and to the slow population growth caused by aging population and declining birth rates (NHHFA 2019b). Lower enrollment in school causes lower State funding; thus, declining or stagnant enrollment costs taxpayers more due to fixed infrastructure costs (SRPC 2015).

Regional disparities of population density, age, education, and income exist between the Study Area and the rest of the State. These differences are reflective of nationwide trends of urbanization and are indicative of a rural-urban divide. The Study Area counties are part of the Boston-Cambridge-Newton, MA-NH MSA and are connected to Boston's employment opportunities, as well as higher housing costs (Data.gov 2017).

Nearly three-quarters of residents own homes in the Study Area. This results in competition for affordable housing. The State's growing economy increases the need for a range of housing to accommodate workforce and retain its graduates, young workers, seasonal workers, and families as well as suitable housing for seniors and disabled (NHHFA 2019a). Lack of affordable housing could discourage workers from moving to or remaining in the State. New Hampshire in general has a shortage of approximately 27,347 rental homes affordable and available to extremely low-income households (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b). A shortage of workforce housing has been a long-standing problem in Rockingham County due to the close proximity to the Boston housing market, which tends to inflate housing costs – but not wages. Zoning restrictions and lack of municipal sewer and water services constrain development of multifamily housing units that would provide affordable workforce housing (RPC 2015).

New Hampshire's potential job growth and continued economic expansion is dependent on its ability to attract and retain prime working age adults (ages 25 to 54). Due to slow population growth and aging of the population, the State depends on in-migrating workers to fill jobs. The lack of available and affordable housing options has the potential to hamper migration patterns, which are sensitive to economic conditions, and result in a labor shortage (NHHFA 2018, SRPC 2015).

3.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses.

- New Hampshire's coastline spans only 13 miles, and significant portions of the coast are wetlands or estuaries. Potential projects that would adversely impact these areas may experience resistance.
- The New Hampshire Coastal Risk and Hazards Commission's scientific advisory panel suggests building to different specifications depending on the life of a project, based on different sea level scenarios for different time periods, before or after 2050. Up to 2050, leaders should expect 1.3 feet of sea level rise but be prepared to adapt to 2 feet if necessary. If the design or desired time period is after 2050, leaders should expect 3.9 feet of sea level rise but be prepared to adapt to 6.6 feet if necessary. The Commission's panel further encourages project leaders to be aware that the projected sea level rise ranges may change and to prepare to adjust design considerations if necessary (NHCRHC 2016).
- Projects that are consistent with the comprehensive, strategic, or master plans of the regional planning commissions, as well as the comprehensive, traditional zoning ordinances of the municipalities, will likely be better received within the Study Area communities.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Projects that attract and retain skilled workers to New Hampshire could be attractive to the State due to the slow population growth and aging workforce.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 4

MASSACHUSETTS

4 Massachusetts

4.1 Introduction

This chapter presents the coastal land use baseline analysis for the Commonwealth of Massachusetts to support development of future BOEM environmental impact assessments related to prospective OCS development in the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Massachusetts is located near the North Atlantic Planning Area. A total of nine counties are located within the Massachusetts Study Area (Study Area) along the Massachusetts coastline. Counties range in population size from around 10,912 in Nantucket County to 1,582,857 in Middlesex County. There are three cities in the Study Area with a population over 100,000; they are Boston with a population of 661,977, Cambridge with a population of 114,866, and Lowell with a population of 111,666 (ESRI 2019a). Massachusetts cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Massachusetts has unique characteristics on the Atlantic Coast, extending out into the Atlantic Ocean with a series of peninsulas and islands and the bays between them. The Massachusetts coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes nine counties located within the Commonwealth of Massachusetts. The Study Area is shown in Figure 4-1 and Figure 4-2 and includes the following counties:

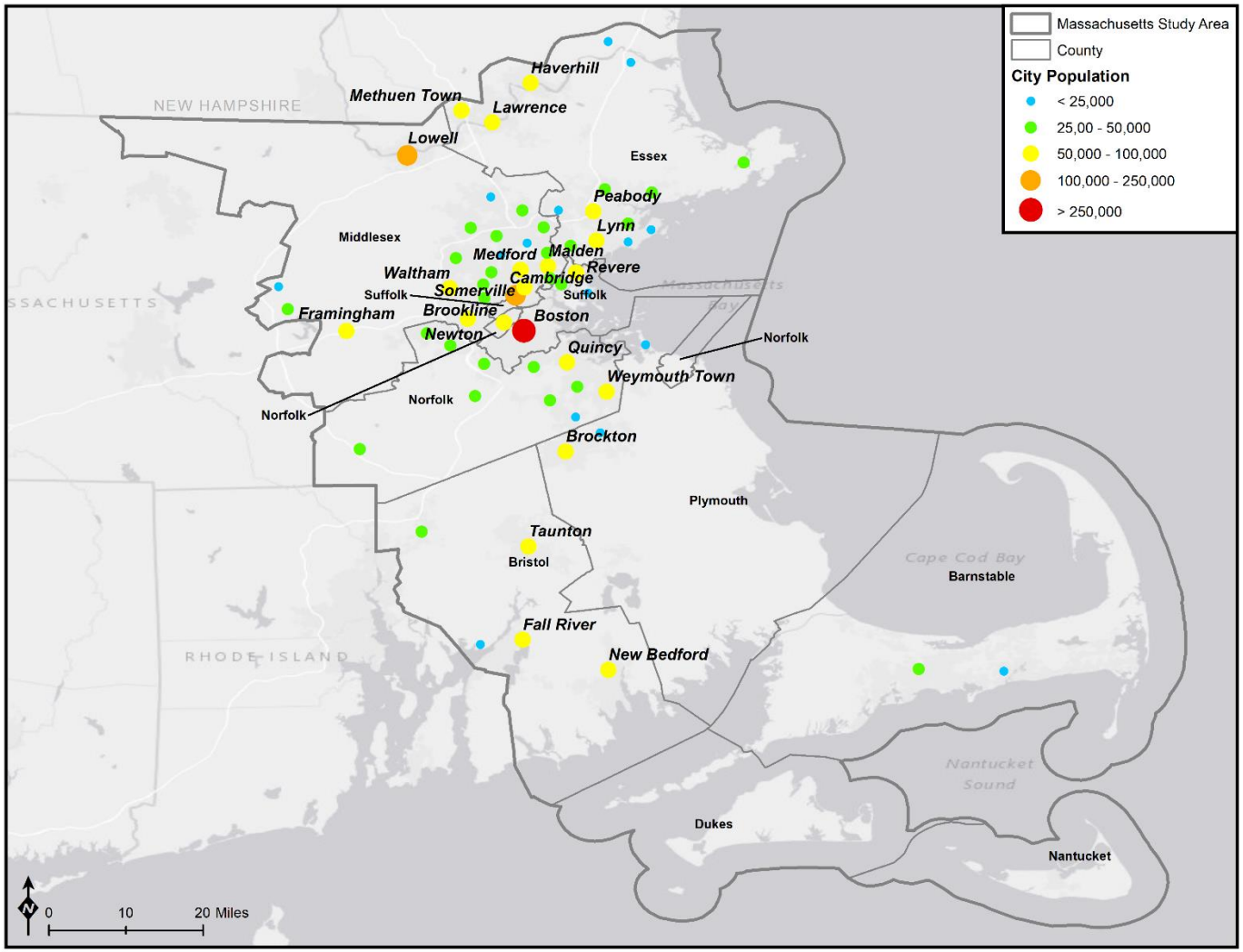
- Barnstable
- Dukes
- Plymouth
- Middlesex
- Suffolk
- Bristol
- Nantucket
- Essex
- Norfolk

4.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the Commonwealth of Massachusetts are described below.

Source: ESRI 2019a

Figure 4-1. Commonwealth of Massachusetts Study Area



Source: ESRI 2019a

Figure 4-2. Cities in the Massachusetts Study Area

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- Massachusetts Bureau of Geographic Information
- Massachusetts Department of Transportation
- Massachusetts Secretary of the Commonwealth/University of Massachusetts Donahue Institute
- Massachusetts Department of Conservation and Recreation
- Massachusetts Department of Fish and Game/Office of Fishing and Boating Access

The metadata database for Massachusetts' specific State, county, and local data sources is included in Appendix A.

4.2 Physical Characteristics

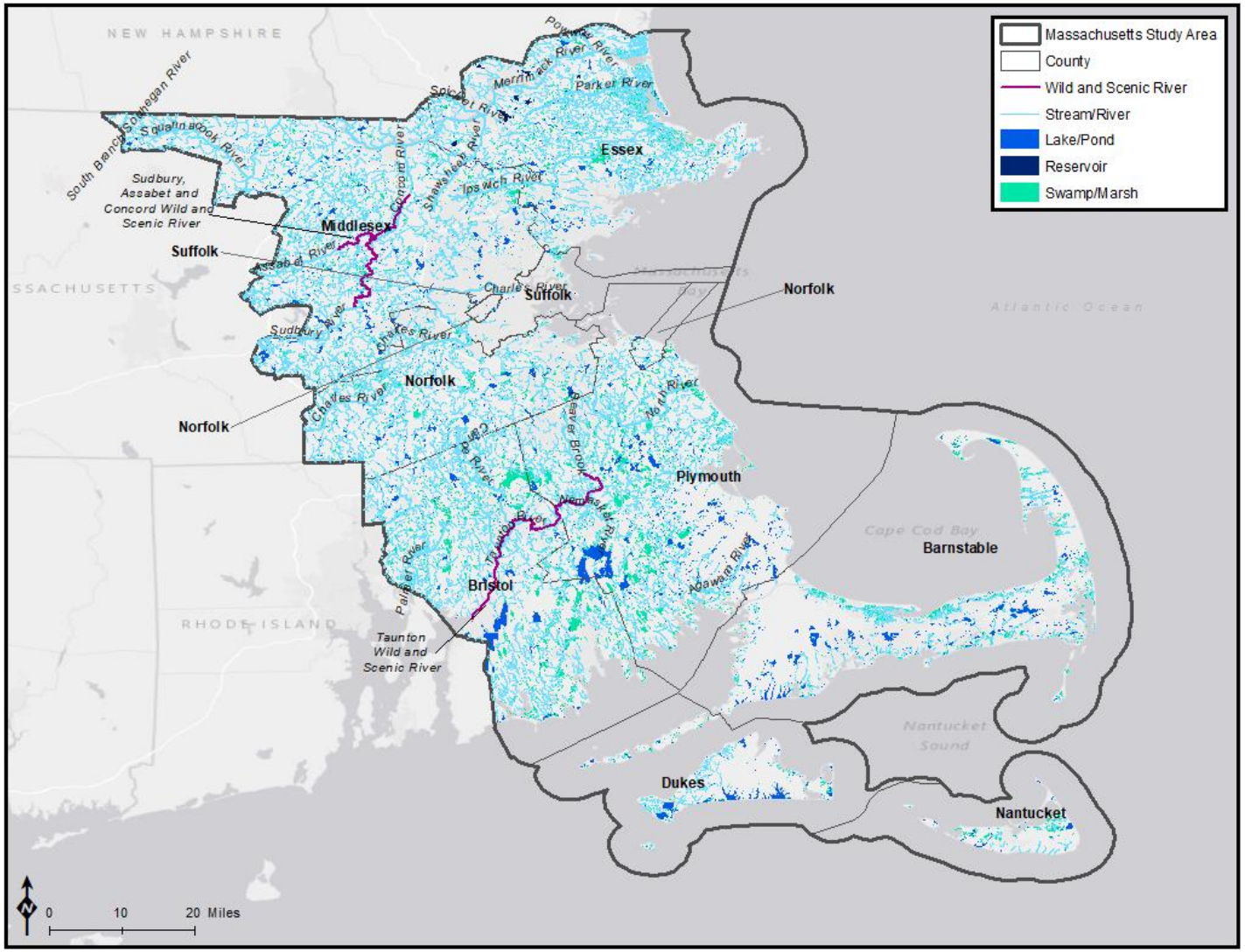
This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

4.2.1 Water Resources

Massachusetts' water resources include Massachusetts Bay, Cape Cod Bay, Nantucket Sound, Narragansett Bay, rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

4.2.1.1 Bays

Defined by shallow waters at Georges Bank on the south and Browns Bank on the east, the Gulf of Maine, shown in Figure 4-3, is bounded by Massachusetts, New Hampshire, and Maine in the U.S. and by New Brunswick and Nova Scotia in Canada. The Gulf of Maine is a semi-enclosed sea spanning 36,000 square miles with dynamic tides mixing freshwater from 60 rivers in a productive marine ecosystem supporting over 3,000 marine species, including habitat for the endangered Atlantic right whale. With geology similar to coastal New England, igneous and metamorphic rocks are scoured bare in some high points while in other, less energetic locations, end moraines stretch into the till-covered Gulf of Maine underlain with igneous and metamorphic rocks. Twice-daily tides average 9 feet in southern Maine to over 20 feet in northern Maine (DACF 2009, Kelley et al. 1998, Slovinsky 2005, GOM 2019).



Source: USGS 2019e

Figure 4-3. Hydrography in the Massachusetts Study Area

In 1987, Congress established the National Estuary Program under Section 320 of the Clean Water Act. The purpose of the program is to create comprehensive management plans for estuaries that have national significance and are threatened by pollution, development, or overuse. In 1990, the Massachusetts Bay National Estuary Partnership, from Salisbury on the north to Provincetown at the tip of Cape Cod, was named an "estuary of national significance." The Massachusetts Bay National Estuary Partnership encompasses 1,100 miles of coastline including Ipswich, Massachusetts, and Cape Cod Bays. The purpose of the partnership is to ensure the health and resilience of estuaries and maintain sustainable ecosystems throughout the area. The highest priority concerns were to address wastewater treatment and sewer overflow issues to improve water quality. More recent concerns include climate change impacts associated with stormwater volumes, sea level rise, temperature driven changes in biodiversity, and shifts in land-based population and development which affect the estuary. In 2019, the Massachusetts Bay National Estuary Partnership completed the Draft Comprehensive Conservation and Management Plan and submitted it to the USEPA for review. The Massachusetts Bay National Estuary Partnership is currently responding to the comments on the Draft prior to finalizing this 10-year management plan. This management plan should be reviewed in greater detail when conducting future OCS-related project analysis (Mass.gov 2020a, Mass.gov 2020b).

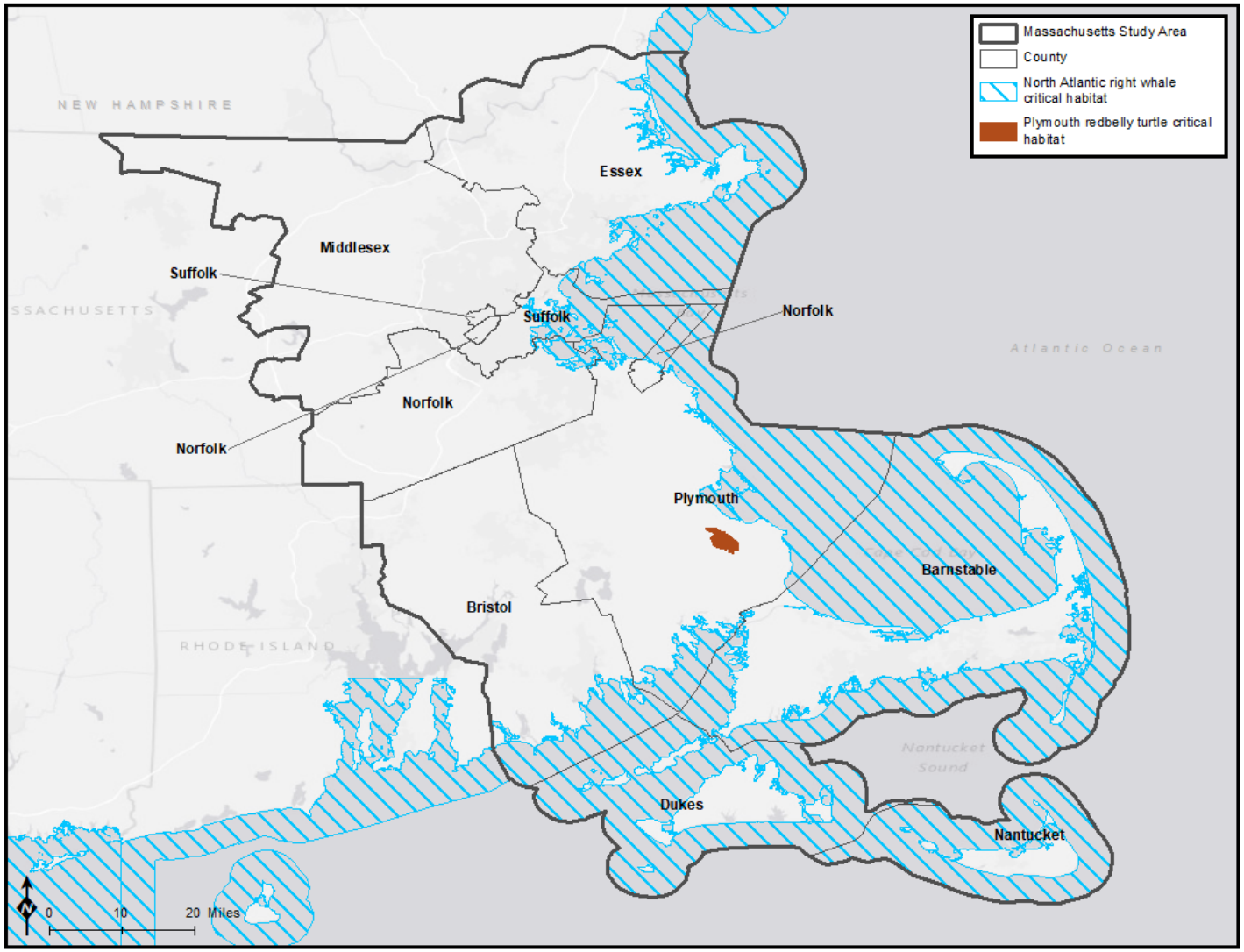
Cape Cod Bay, shown in Figure 4-3, is the southernmost section of the Gulf of Maine, one of the world's most productive bodies of waters (CCS 2020). Designated a State Ocean Sanctuary in 1970, the 604-square mile, 200-feet deep embayment exhibits counter-clockwise circulation with strong tides regularly exchanging 9.3% of the total bay volume. These nutrient-rich waters stratify with the higher ambient temperatures of spring, summer, and fall, with maximum productivity in spring.

As shown in Figure 4-4, the coastal area of Massachusetts within the Study Area includes designated critical habitat for the North Atlantic right whale, Gulf of Maine distinct population segment of the Atlantic sturgeon, and the Plymouth redbelly turtle (CCS 2020, USFWS 2019i, USFWS 2019j). Critical habitat provides essential features for the conservation of the species.

One of the most endangered whale species, the North Atlantic right whale, occurs primarily close to the continental shelf, though may also be found in deeper waters. The North Atlantic right whale is typically found in New England or Canadian waters in the spring, summer, and fall. The right whale typically winters in shallow waters from Cape Fear, North Carolina to southern Florida; calves are generally born in the winter in these waters (NOAA Fisheries 2020e).

The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to fresh water to spawn. It forages on the bottom for amphipods, worms, and other invertebrates. Atlantic sturgeon can live up to 60 years, growing up to 14 feet and 800 pounds. In Massachusetts, its designated critical habitat is in the Merrimack River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

The Plymouth redbelly turtle is a freshwater species that prefers deep coastal plain ponds, either natural or constructed. The preferred ponds are generally located on oak-pine barrens. The turtle requires good water quality and an area free from disturbance for basking, nesting, and overwintering (USFWS 2001).



Sources: USFWS 2019i, USFWS 2019j

Figure 4-4. Critical Habitat within the Massachusetts Study Area

Cradled by dune- and bluff-backed beaches on three sides, the bay nourishes a wealth of estuarine ecosystems where fresh and salt water mix. Cape Cod Bay is part of the Massachusetts Bays National Estuary Program, providing rich, diverse habitats along with pollution mitigation and erosion control. Concerns for the health of these systems include pollution along with loss and degradation of habitat (APCC 2020, CCS 2020, MOCZM 2005).

Nantucket Sound occupies 750 square miles between the Cape Cod peninsula and the islands of Nantucket and Martha's Vineyard. The sound is a unique coastal habitat and ecosystem because of its location at the confluence of the warm Gulf Stream and the colder Labrador Currents. Species from both southern and northern habitats can be found within the sound resulting in a rich and diverse ecosystem. Habitats around the sound include tidal flats, salt marshes, estuaries, and the open sea. Several federally protected species may be found within the sound. It is also a rich source for commercial and recreational fishing. The waters of the sound are state managed out to three miles from the shore. The center of the sound is federally managed. This shared management of the sound has created some tensions and conflict about management practices. In 2001, Cape Wind Associates, LLC proposed construction of a 25-square mile wind farm consisting of 130, 440-foot tall wind turbines and a 1-story electrical service platform in the center of Nantucket Sound. Opponents maintained the project would damage the health of the ecosystem and species therein, impact sacred Tribal lands, be a threat to safe air and sea travel around the sound, disrupt commercial and recreation fishing, pose an unacceptable risk of oil leaks (from the service platform), increase electrical rates, and decrease property values. Despite receiving the first commercial offshore renewable energy lease in the U.S., after years of litigation, the company relinquished its lease and the project was never completed (Save Our Sound 2020a, Save Our Sound 2020b).

Narragansett Bay, shown in Figure 4-3, is one of New England's largest estuaries (NBEP 2020). Located in both Massachusetts and Rhode Island, about 60% of the Narragansett Bay watershed is in Massachusetts, while more than 90% of the bay waters are in Rhode Island. Designated an estuary of national significance in 1987, the 196-square mile embayment averages 26 feet in depth overall with the west passage averaging almost 30 feet in depth and the east passage averaging almost 50 feet in depth. The greater depth of the east passage extends to 194 feet near Newport. The third prong of the bay, the tidal Sakonnet River to the east, averages about 26 feet. This bay of drowned rivers exhibits strong diurnal tides averaging 3.6 feet at the mouth to the Atlantic and 4.6 feet at the head. These waters are considered well-mixed with freshwater flow into the bay, averaging 3.9 inches per second and tidal currents reaching up to 30.3 inches per second. Average refresh time is 26 days.

The 560-mile shoreline of Narragansett Bay National Estuary Research Reserve is primarily narrow cobble beaches with only a few sandy beaches. Protected by land on three sides, the bay nourishes a wealth of estuarine ecosystems that provide rich, diverse habitats along with pollution mitigation and erosion control. Salt marshes are one of the prominent estuarine features in the bay. Salt marsh pools and tidal creeks cover 2,800 acres in Narragansett Bay. Concerns for the health of these systems include pollution along with loss and degradation of habitat (NBEP 2017, NBEP 2020, NBNERR 2009, RIDEM 2016).

In all of these bays and sounds, nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Dead zones may result from a confluence of tides and currents along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. The dead zone in Massachusetts bays and sounds occurs in the stratified, nutrient rich bottom waters from mid-July through September. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (APCC 2020).

In addition to reducing nitrogen added to the ecosystem through waste treatment, tidal flushing, and wetland attenuation, remediation of nitrogen in the marine environment is also being explored through use of bivalves, especially commercially important oysters and Quahog clams. In 2014, Woods Hole Oceanographic Institution determined that as these shellfish filter feed, they grow and incorporate nitrogen from the water into their tissues and their biodeposits. This waste can be incorporated into the sediment or cycled through sediment microorganisms into atmospheric nitrogen, thus removing it from marine waters. In addition, harvest of these shellfish directly removes nitrogen incorporated in tissues. While the nearshore population of shellfish is in decline with a global estimate of 85% of oyster reefs lost, programs seeding oysters and Quahog are developing to help propagate and restore this resource while helping to remediate this nitrogen problem (Chesapeake Bay Foundation 2019, VIMS 2019).

4.2.1.2 Rivers

Within the Study Area, major drainage basins ultimately flow into the Atlantic Ocean and include the Merrimack River and the Ipswich River emptying into Ipswich Bay, the Charles River emptying into Massachusetts Bay, and myriad Plymouth County and Barnstable County rivers emptying into Cape Cod Bay, along with rivers emptying into Nantucket Sound, Buzzards Bay, and Mount Hope Bay. Figure 4-3 shows the major surface water bodies within the Study Area. Major rivers in the Study Area include the Merrimack, Ipswich, Charles, and Taunton Rivers. Another important waterway is the Cape Cod Canal (Massachusetts 2017, USGS 2019e).

At the northern edge of the Study Area, the Merrimack River flows south from Franklin New Hampshire, being joined by several rivers in New Hampshire, including the Nashua River flowing northward from Massachusetts, before entering Massachusetts in Middlesex County. The Assabet and Sudbury Rivers flow north and join to form the Concord River, which empties into the Merrimack at Lowell. The Merrimack flows roughly northeast through Lawrence, Haverhill, Merrimac, and Amesbury, widening into an estuary at Newburyport and the Atlantic Ocean. The Merrimack provides critical habitat for the Gulf of Maine distinct population segment of the Atlantic sturgeon (NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

South of the Merrimack, the Ipswich River originates in the town of Burlington in Middlesex County, flowing southeasterly, briefly transcribing the border between Middlesex and Essex Counties, before widening into an estuary at the town of Ipswich and Ipswich Bay. A named tributary of the Ipswich is the Skug River.

South of the Ipswich, the Charles River flows from Hopkinton, Massachusetts to Boston Harbor and the Atlantic Ocean. Along the way, the Charles is joined by the Muddy, Stop, Mill, and West Branch Charles Rivers. A prominent urban river, the Charles flows 80 miles through densely populated areas including Watertown, Cambridge, and Boston. Because of the surrounding urban density, industrial pollution was originally an issue on the Charles. Current pollution concerns include sewage contamination and excess nutrients. The excess nutrients cause toxic algal blooms on the Charles in the summer months (USEPA 2018b).

Halfway between Boston and Plymouth, the North River enters the Atlantic at Scituate, Massachusetts. Originating from marshes near Pembroke, Massachusetts, this designated scenic river is a 12-mile tidal river nourishing 3,300 acres of marshland. Joined by the Third Herring Brooks in Hanover and Norwell, the second Herring Brook in Norwell, and the First Herring Brook in Scituate, the North River merges with the 15-mile long South River before entering Massachusetts Bay (NSWRA 2020).

South of the Charles, the Taunton River flows southwest to Mount Hope Bay, part of the larger Narragansett Bay in eastern Rhode Island. Arising from the confluence of the Matfield and Town Rivers in Bridgewater, Massachusetts, the Taunton meanders through Bristol County, being joined by the

Winnetuxet River at Halifax and then in Middleborough by the Nemasket River flowing from the Assawompset Pond. The Taunton is then joined by the Mill River in Taunton before flowing through Berkley and then being joined by the Three Mile River in Dighton and the Assonet River in Freetown before slowing to Fall River where it enters the Atlantic at Mount Hope Bay, an arm of the Narragansett Bay off southwest Massachusetts.

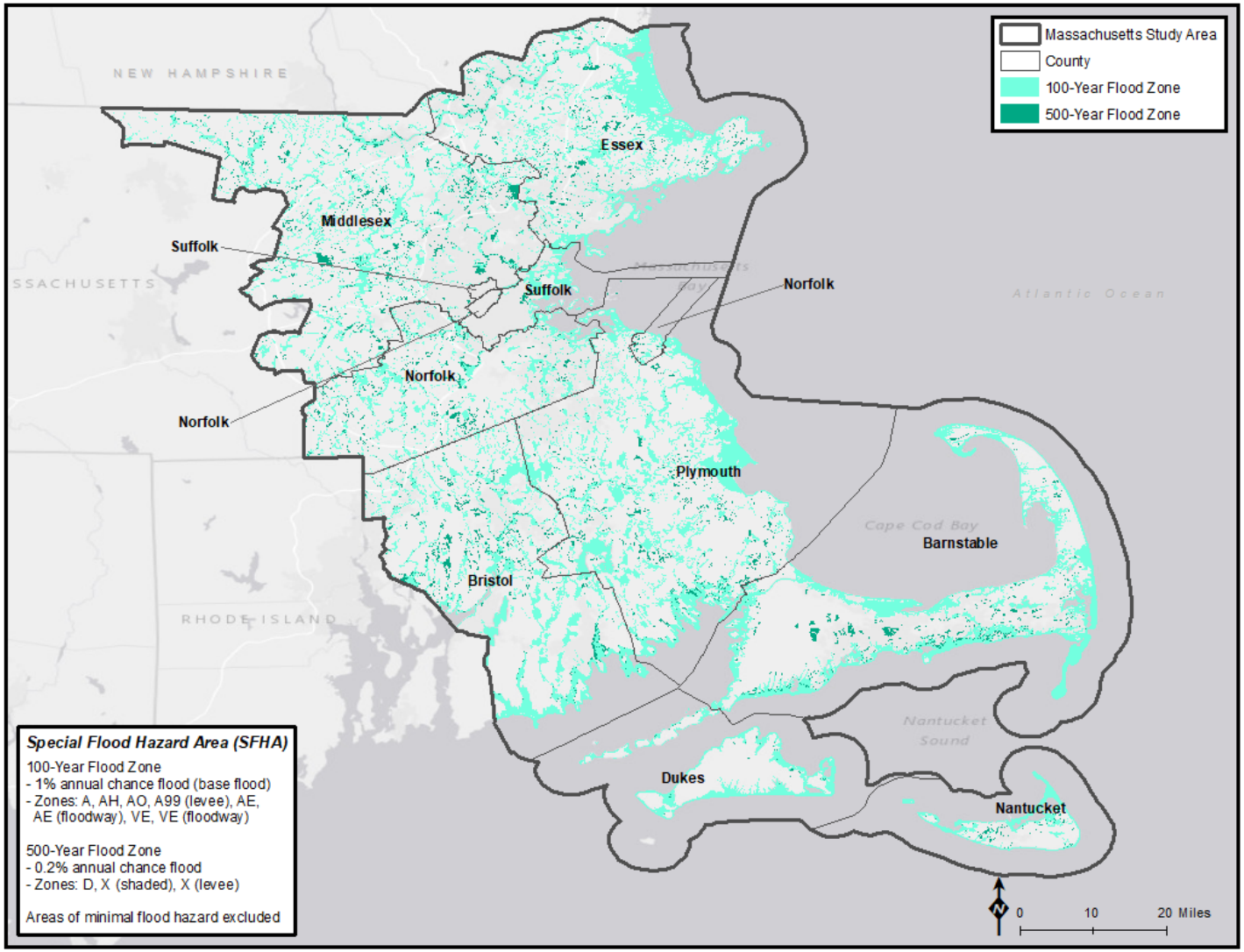
South of the Plymouth and Barnstable County line, Cape Cod was separated from the mainland in 1914 by completion of the Cape Cod Canal. Constructed across the narrow isthmus, this 17.4-mile long canal provides safe passage between Buzzards Bay and Cape Cod Bay, saving more than 65-miles travel and avoiding the treacherous shoals on the outer Cape. Maintained by USACE, this 500-foot wide, 17.4-mile long, 32-foot deep channel provides free, two-way passage for a major shipping route between New York and Boston. Further improvements to the Canal include mooring basins at the head of each entrance and a vertical clearance of 135 feet. The movement of all vessels in this waterway is constantly managed by the U.S. Army Corps of Engineers (USACE 2020a).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Massachusetts has approximately 8,229 miles of river, only 147.1 miles are designated wild and scenic rivers. In the Study Area, 40 miles of the Taunton River are designated wild and scenic river. In 2009, the main stem of the Taunton, from its headwaters in the town of Bridgewater to the Route 195 Bridge in Fall River City, was designated as having exceptional scenic and recreational value (USFWS 2019a).

4.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

Floodplains within the Study Area are shown in Figure 4-5; floodplains are present within every county in the Study Area. Table 4-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.



Source: FEMA 2019b

Figure 4-5. Floodplains of the Massachusetts Study Area

Table 4-1. Floodplains in the Massachusetts Study Area (acres)

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Barnstable	85,792	34.0	10,823	4.3
Bristol	73,391	20.7	11,030	3.1
Dukes	24,784	37.5	494	0.7
Essex	84,264	26.7	10,976	3.5
Middlesex	63,691	12.2	20,860	4.0
Nantucket	13,678	46.3	1,293	4.4
Norfolk	36,768	14.5	9,555	3.8
Plymouth	112,623	26.7	11,825	2.8
Suffolk	11,419	30.6	779	2.1
Study Area Total	**506,410**	**22.5**	**77,635**	**3.4**

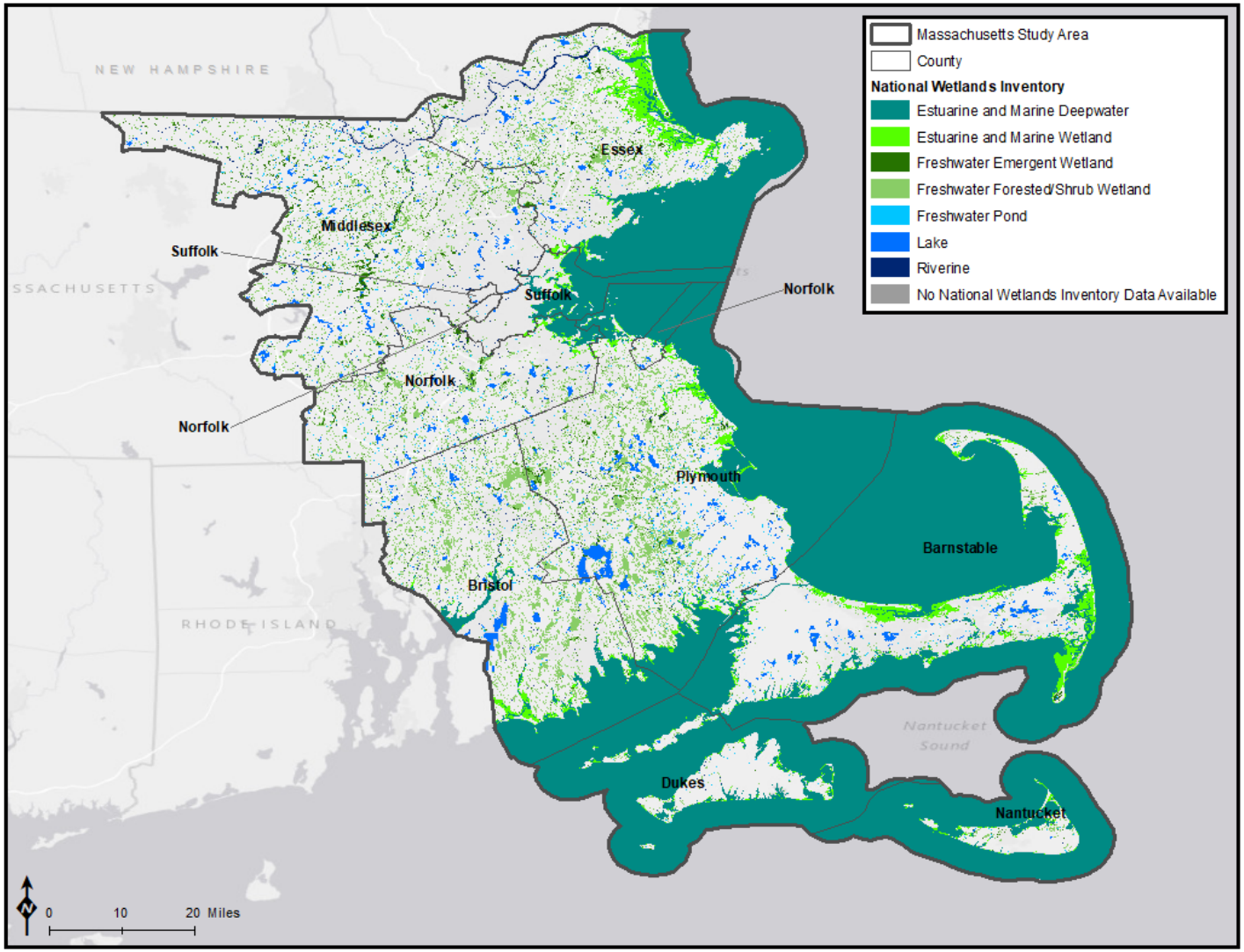
Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean

4.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 4-6, wetlands are a large part of the land area in many of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 4-2 details the wetland acreage in the Study Area along with other water resources. Wetlands comprise about 50% of the Study Area with more inland counties like Middlesex, Norfolk, and Bristol having fewer wetland areas (15%, 22%, and 34%, respectively) while peninsula and island counties like Barnstable, Nantucket, and Dukes are filled with wetland areas (73%, 86%, and 81%, respectively). The remainder of the Study Area has about 50% wetland areas (FGDC 2013, USFWS 2019c).

Providing a rich mix of fresh and salt water, Massachusetts estuaries include a wealth of wetlands. In addition to estuaries along Cape Cod Bay, unique estuary systems in Massachusetts include the bays, harbors, and river outlets along Ipswich Bay, Massachusetts Bay, Buzzards Bay, and Nantucket Sound. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. In addition to the Buzzards Bay National Estuary Program, the Bay State also includes 1,000 miles of coastline known as the Massachusetts Bays National Estuary Program. Massachusetts Bays National Estuary Program encompasses Ipswich Bay through Boston Harbor through South Shore to the tip of Cape Cod. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as salt marsh restoration and fish passage restoration (APCC 2020, Buzzards Bay 2020, USEPA 2020, MOCZM 2005, MassDEP 2019, Giese et al. 2015). As such, this is an important natural and cultural resource within the Study Area.



Source: USFWS 2018a

Figure 4-6. Wetlands in the Massachusetts Study Area

Table 4-2. Wetlands in Massachusetts Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Barnstable	611,679	30,785	1,424	7,567	561,208	8,019	2,339	337
Bristol	150,827	6,961	3,410	52,275	74,285	8,706	2,390	2,800
Dukes	252,945	3,713	180	1,507	247,014	65	317	149
Essex	265,452	26,044	6,652	28,401	191,516	6,388	1,985	4,466
Middlesex	79,147	8	15,115	40,938	110	12,001	4,285	6,691
Nantucket	166,880	2,254	265	1,454	162,622	79	156	50
Norfolk	63,043	2,367	4,171	24,760	21,561	4,839	2,718	2,627
Plymouth	365,471	11,930	6,679	67,755	254,161	17,461	5,291	2,194
Suffolk	40,901	2,488	230	175	37,285	415	101	206
Study Area Total	**1,996,345**	**86,550**	**38,126**	**224,832**	**1,549,762**	**57,973**	**19,583**	**19,519**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

4.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to assist with planning and future decision making.

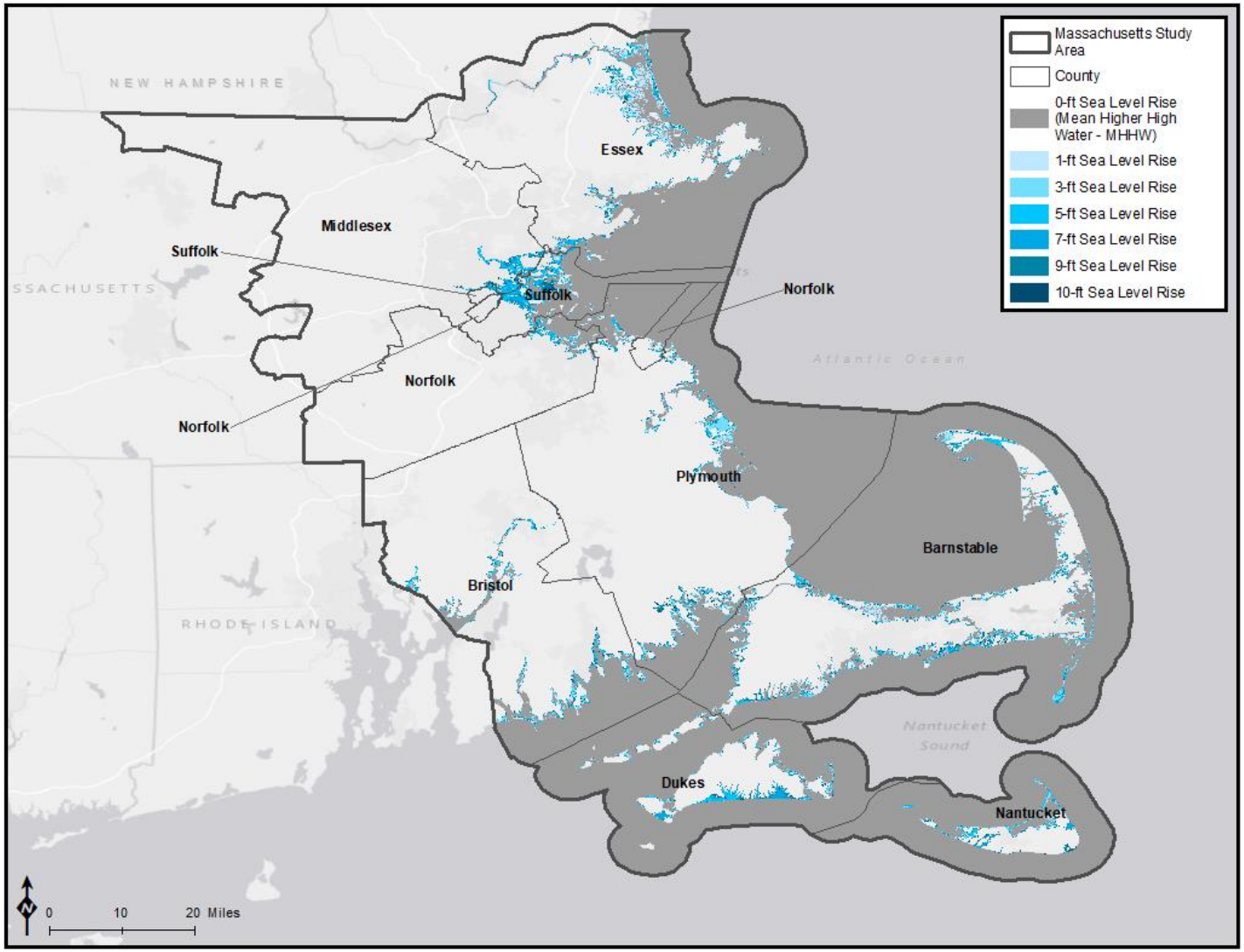
Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods, because higher seas raise the launch pad for storm surge (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in Massachusetts coastal areas reflects the national trend for increasing population growth in the coastal areas. The socioeconomic impacts of this relationship are discussed in Chapter 4.4. Further, land subsidence increases the rate of relative sea level rise in areas with certain geological characteristics (Eggleston and Pope 2013).

4.2.2.1 Sea Level Rise

Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Massachusetts Study Area is 0.13 inches/year (NOAA 2019b).

Figure 4-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in Massachusetts primarily at seaward edges of the shoreline, along peninsulas, and islands. There will also be significant impacts from sea level rise near Plum Island and the Merrimack River, around Salem, throughout Boston, at Cape Cod Bay, and at the Long Point Wildlife Refuge Beach at Martha's Vineyard (NOAA 2018a). These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels.

According to SeaLeveRise.org, the sea level off the coast of Massachusetts has been rising at an average rate of 0.116 inches a year since 1950, as compared to global rates of 0.125 inch/year. Forces for sea level rise in the Study Area include changes in ocean circulation and ice melt. There are already over 27,564 properties at risk from tidal flooding in Massachusetts. The USGS predicts a likely rise of 1.6 feet by 2100 (average rate of 0.226 inches/year) possible rise of 6.6 feet (average rate of 0.932 inches/year). The Cape Cod Region is predicted to experience even higher rates of sea level rise as a result of land subsidence (Giese et al. 2015).



Source: NOAA 2018a

Figure 4-7. Projected Sea Level Rise throughout the Massachusetts Study Area

Boston is particularly susceptible to the effects of sea level rise because many areas were developed in the 1800s when industrious residents began filling in tidal flats and marshland with rocks, dirt, and trash to create more buildable space. By the early 1900s, the city had tripled in geographic land area (Morton 2019). Boston's official elevation is around 46 feet above sea level, but its lowest areas sit at sea level. As a result, Boston is the fifth most vulnerable coastal city to flooding from sea level rise in the U.S. — after Miami, New York City, New Orleans, and Tampa (Morton 2019). Between 1921 and 2014, sea levels have risen in Boston, Massachusetts by 0.11 inches per year for a total of 11.04 inches in 100 years (UMA 2017a). The rate of sea level rise in Boston has accelerated over the last ten years and current rates are measured at about 1 inch every 8 years (0.125 inches/year), which is comparable to the global rate (SeaLevelRise.org 2019). Conservative projections for Boston place sea level almost 6 inches higher by 2030 (~0.4 inches/year) and almost 5 feet higher by 2100 (>5 inches/year) (Morton 2019).

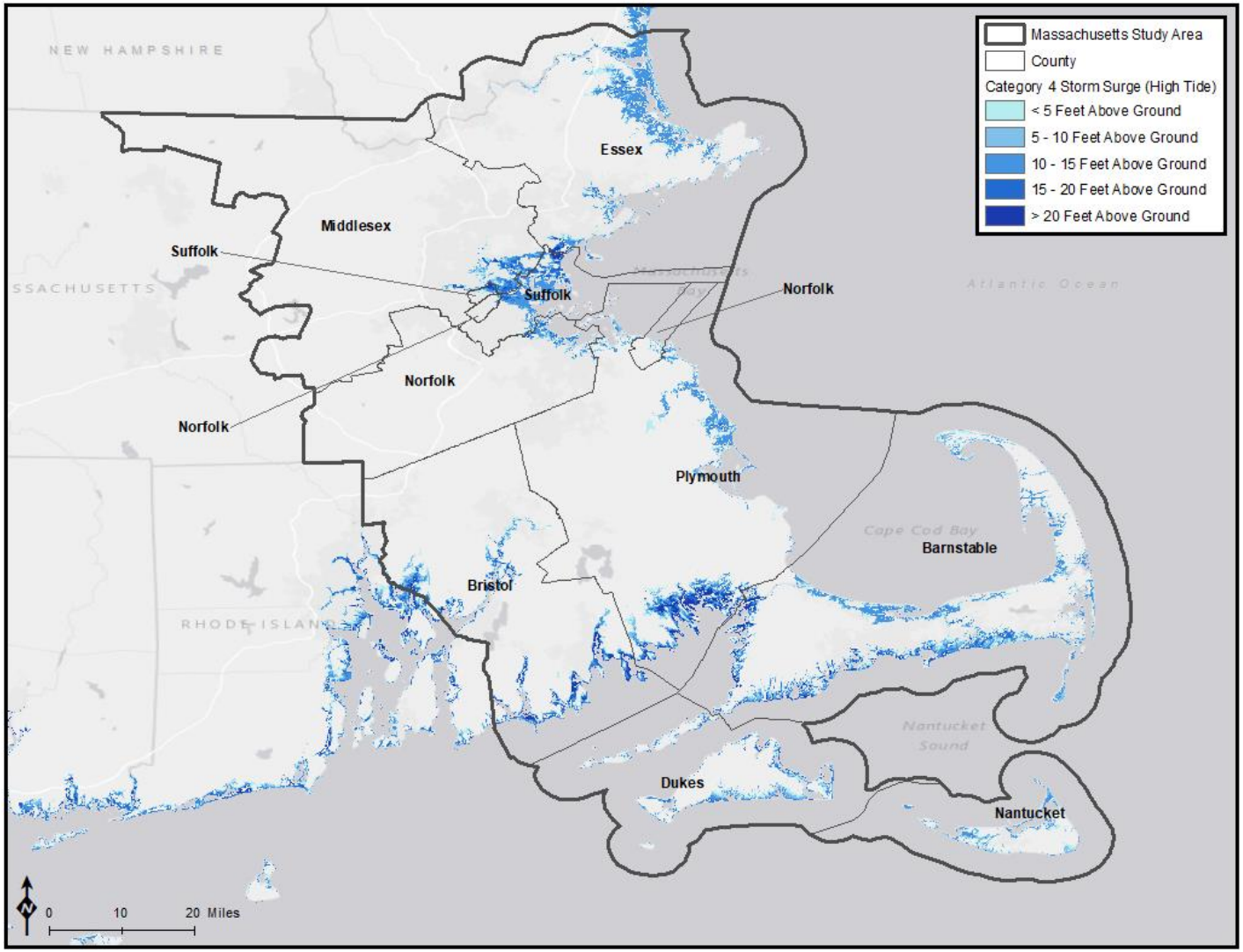
One result of sea level rise is more occurrences of minor but chronic tidal flooding, also called nuisance flooding, events along coastlines. At some locations, nuisance flooding can be brought about merely by high spring tides, independent of storms, winds, or other atmospheric conditions (Ray and Foster 2016). In Boston, tidal flooding began to occur in 2011 and is predicted to increase in frequency and severity in subsequent years (Ray and Foster 2016). In 2017, Boston racked up a record 22 nuisance tides according to a 2018 report by NOAA (Morton 2019). A research study examining the location, frequency, and severity of tidal flooding in Boston due to increases in sea level of between 1.0 and 6.0 feet, based on local tide gauge and National Weather Service data, was conducted in 2015. Results of the analysis indicate that in the absence of any new flood barriers, the incidence of minor tidal flooding will increase to about 75 times per year at a minimum within Boston Harbor and sea level rise will affect approximately 20% of the population and land with 1 foot of sea level (Ray and Foster 2016, Kruel 2016).

Also of concern to the coasts of Massachusetts is the shifting shoreline resulting from sea level rise, ocean currents, and sandy substrate. At a local scale, the shoreline is constantly changing from inundation, erosion, and transgression. These changes do not occur as a direct result of sea level rise, but sea level rise alters the processes shaping the shifting coast. An annual result of the shifting shoreline is that beaches tend to be wide and full during the summer, so they provide better protection from storms than do the depleted winter and spring beaches (Giese et al. 2015).

Impacts to the Massachusetts coast from sea level rise include increased erosion of wetlands and beaches and increased damage from coastal storms. Losing coastal wetlands would harm coastal ecosystems and remove an important line of defense against coastal flooding. Coastal cities and towns will become more vulnerable to storms in the coming century as sea level rises, shorelines erode, and storm surges become higher. In the city of Boston alone, the total cost of storm damages during the 21st century could be between $5 and $100 billion, depending on how the city responds to rising sea level (USEPA 2016b).

4.2.2.2 Storm Surge

Figure 4-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. Because of its northerly position, it is unlikely that a Category 5 hurricane would strike the Massachusetts coastline; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts. Storm surge is projected to impact areas in Massachusetts similar to those affected by sea level rise: along the northern coast of Essex County, the greater Boston area, throughout Cape Cod and Nantucket Bay, and especially along the coasts of Buzzards Bay (NOAA 2020a).



Source: NOAA 2018a

Figure 4-8. Projected Storm Surge throughout the Massachusetts Study Area for a Category 4 Hurricane

Changes in the frequency and intensity of coastal storms and the interactive effects with sea level rise increases the vulnerability of coastlines and coastal habitats to these natural hazards. Massachusetts experiences two types of coastal storms, summertime tropical cyclones (e.g., hurricanes), and wintertime "nor'easters"; these storm systems are described in greater detail in Chapter 1.4.2.2 (UMA 2017b). Both produce major precipitation events, although hurricanes tend to move quickly past the coast of Massachusetts and hit when beaches are wide and full, offering protection from storm surge (Giese et al. 2015). In Massachusetts, the majority of heavy precipitation events have occurred during the summer months of May through September. By 2100, Boston's 100-year coastal flood event is projected to recur every 1-2 years, on average, and increase in height from nearly 10 feet to more than 12 feet under a high emissions scenario. This is compared to the national rate of 100-year flood event now occurring every 60 years on average (UMA 2017b).

Nor'easters result from a low-pressure system offshore and can be intensified when high-pressure systems over northeastern New England or in the northern Atlantic blocks the northward movement of the low-pressure system. High winds blow in one direction over a long period of time, which creates huge waves. All coastal storms are most destructive when they persist over time and multiple high tides (NOAA 2020c). These winter storms are more damaging because beaches are depleted, as opposed to the wider beaches during hurricane season. Nor'easters are potentially more damaging because they can stagnate, causing more damage from prolonged storm surge (Giese et al. 2015). Nor'easters are especially potent at Cape Cod because of the long stretch of open water over the Gulf of Maine that lies northeastward of the Cape, giving waves a greater distance to increase in size and intensity (Giese et al. 2015).

Winter storms, such as blizzards and ice storms, are also occurring more frequently in Massachusetts. Severe snow and ice storms have more than doubled over the last 55 years relative to the previous 60 years. However, more precipitation is falling in the form of rain than snow. Nor'easters are a major driver of winter storms in Massachusetts and are becoming more intense and occurring more often in New England overall than in the past (UMA 2017b).

4.2.3 Summary – Physical Vulnerability

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. Sea level rise is projected to impact areas in Massachusetts primarily at seaward edges of the shoreline, along peninsulas, and islands. There will also be significant impacts from sea level rise near Plum Island and the Merrimack River, around Salem, throughout Boston, at Cape Cod Bay, and at the Long Point Wildlife Refuge Beach at Martha's Vineyard (NOAA 2018a). The sea level off the coast of Massachusetts has been rising at an average rate of 0.116 inches a year since 1950 and is expected to increase to between 1.6 feet (0.226 inches/year) and 6.6 feet (0.932 inches/year) by 2100. There are already over 27,564 properties at risk from tidal flooding in Massachusetts.

Sea level rise is variable within the Study Area. The Cape Cod Region is predicted to experience relatively higher rates of sea level rise as a result of land subsidence (Giese et al. 2015). Boston is particularly susceptible to the effects of sea level rise because much of its land was created by filling wetlands (Morton 2019).

Changes in the frequency and intensity of coastal storms and the interactive effects with sea level rise increases the vulnerability of coastlines and coastal habitats to these natural hazards. The two types of storms Massachusetts experiences, summertime tropical cyclones (e.g., hurricanes) and wintertime "nor'easters," both can contribute to storm surge issues (UMA 2017b). The winter nor'easters are more damaging because beaches are depleted, offering less protection, and because they persist over time and have multiple high tides (Giese et al. 2015).

Impacts to the Massachusetts coast from sea level rise and increased storm surges include increased erosion of wetlands and beaches and increased damage to the built environment (structures, infrastructure, etc.) from coastal storms.

In summary, physical characteristics of the Study Area influence land use and land cover, demographics, and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic region.

4.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

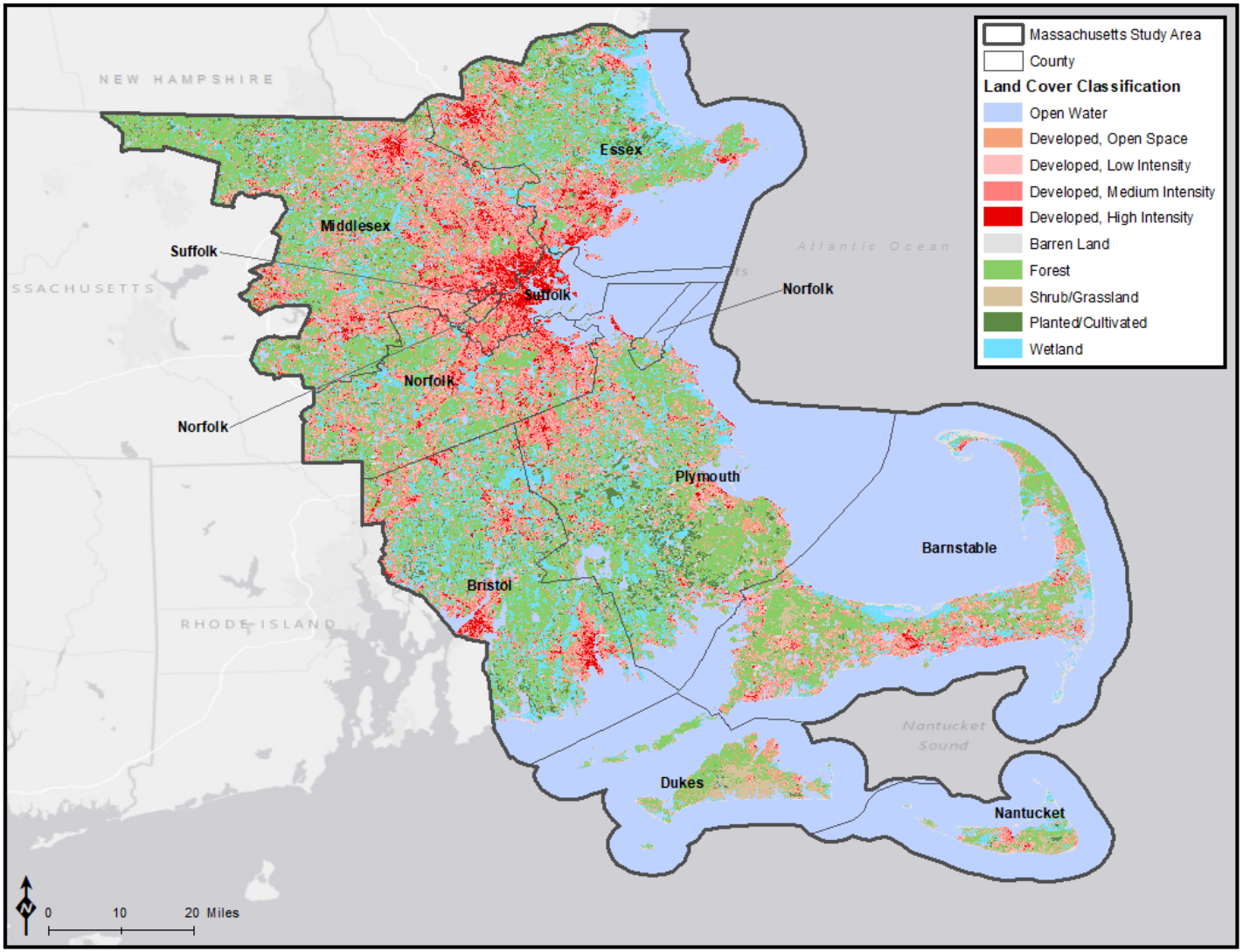
4.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The 2016 NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a).

Figure 4-9 displays the NLCD data for the Study Area. Table 4-3 presents the NLCD data for each of the 11 counties within the Study Area by acreage. Table 4-4 presents the NLCD data for each county within the Study Area by percentage and presents a summary of the overall land cover for each geographic unit. Although Table 4-3 includes data for open water land use, open water was ignored in Table 4-4 because this land cover would not be considered for future industrial development. Each county was then categorized based on its land cover trend as shown in Table 4-4 and Figure 4-9. The following section discusses the summary of this analysis.

Table 4-4 presents an assessment of the general land cover for each of the 11 counties in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 4-4, Figure 4-9 shows the majority land cover type within each county in the Study Area.

As shown in Table 4-4, a majority of the nine counties in the Study Area are predominantly developed, which makes up an average of 40.3% of the landcover. Suffolk County, within which the City of Boston is located, has the highest percent total developed land cover at 87.9% with a medium intensity developed landcover of 37.5% and Dukes has the lowest developed land cover at 17.1%. This is followed by forest, which makes up an average of 32.2% of the landcover, with Plymouth County with the highest percent at 41.6% and Suffolk County with the lowest percent at 4.5%. Bristol and Essex Counties have some areas of wetland, with 23.9% and 21.0% land cover, respectively. Dukes and Nantucket Counties also have fairly large areas of shrub/grassland at 29.7% and 21.2%, respectively.



Source: NLCD 2016a

Figure 4-9. National Land Cover in Massachusetts Study Area

Table 4-3. Acres of Land Cover by NLCD Classifications in Massachusetts Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Barnstable	835,504	27,834	42,587	25,777	3,761	99,958	20,081	96,174	10,868	1,941	28,820	577,663
Bristol	442,319	31,437	36,387	34,240	12,011	114,075	3,075	130,722	8,474	14,814	85,148	86,011
Dukes	314,176	6,440	3,452	1,143	216	11,250	3,694	26,017	19,537	846	4,507	248,325
Essex	530,221	28,020	38,286	46,250	13,362	125,918	3,684	104,720	4,200	13,532	66,885	211,281
Middlesex	542,041	61,553	72,584	83,514	27,015	244,665	2,737	189,184	6,660	13,937	68,496	16,361
Nantucket	194,012	2,377	2,614	1,611	226	6,827	3,079	8,944	6,500	549	4,727	163,384
Norfolk	284,385	35,492	41,037	40,440	10,870	127,838	1,267	82,911	2,551	3,239	38,282	28,297
Plymouth	699,706	43,697	44,092	29,293	7,174	124,257	4,932	175,189	8,572	29,775	78,454	278,528
Suffolk	76,939	1,725	3,966	14,262	13,515	33,468	710	1,706	507	138	1,530	38,881
Study Area Total	3,919,305	238,575	285,005	276,530	88,148	888,257	43,261	815,568	67,869	78,771	376,848	1,648,731

Source: NLCD 2016a

Table 4-4. Percentage of Land Cover by NLCD Classification (Excluding Open Waters) and Predominant Classification for Counties/Cities in the Massachusetts Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Barnstable	10.8	16.5	10.0	0.01	38.8	7.8	37.3	4.2	0.8	11.2	Developed and Forest
Bristol	8.8	10.2	9.6	0.03	32.0	0.9	36.7	2.4	4.2	23.9	Developed, Forest, Wetland
Dukes	9.8	5.2	1.7	0.00	17.1	5.6	39.5	29.7	1.3	6.8	Forest and Shrub/Grassland
Essex	8.8	12.0	14.5	0.04	39.5	1.2	32.8	1.3	4.2	21.0	Developed, Forest, Wetland
Middlesex	11.7	13.8	15.9	0.05	46.5	0.5	36.0	1.3	2.7	13.0	Developed and Forest
Nantucket	7.8	8.5	5.3	0.01	22.3	10.1	29.2	21.2	1.8	15.4	Developed, Forest, Shrub/Grassland
Norfolk	13.9	16.0	15.8	0.04	49.9	0.5	32.4	1.0	1.3	14.9	Developed and Forest
Plymouth	10.4	10.5	7.0	0.02	29.5	1.2	41.6	2.0	7.1	18.6	Forest and Developed
Suffolk	4.5	10.4	37.5	0.36	87.9	1.9	4.5	1.3	0.4	4.0	Developed
Study Area Total	10.5	12.6	12.2	3.9	40.3	1.9	35.9	3.0	3.5	16.6	Developed and Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In Massachusetts, 3.4% of the land cover in the Study Area changed at least once. Figure 4-10 and **Error! Not a valid bookmark self-reference.** show the land cover change within the Study Area from 2001 to 2016. Middlesex County experienced the most significant land cover change at 6.1% followed closely by Norfolk County at 5.8%. These were largely changes from or to any one of the urban land cover types. These land cover change characteristics include both land and water. Therefore, based on Figure 4-10, it is likely that Dukes County has experienced a greater total change if water is excluded. The City of Lowell is in Middlesex County and the City of Cambridge is on the border of the county. Both counties are part of the Boston-Cambridge-Newton MSA; therefore, it is likely that these land changes are associated with urban development. Dukes County is comprised largely by Martha's Vineyard and Chappaquiddick Islands. The land cover change here is largely from or to any of the forest classes, or from or to herbaceous wetlands to woody wetlands. Comparing the locations of these changes against Figure 4-14 in Chapter 4.3.2.5, it appears some of this change could be related to protected areas, possibly regrowth of some vegetation or change in the nature of vegetation. Nantucket County experienced the least land cover change at only 1.1%, closely followed by Suffolk County at 1.3% and Barnstable County at 1.4% (MRLC 2016).

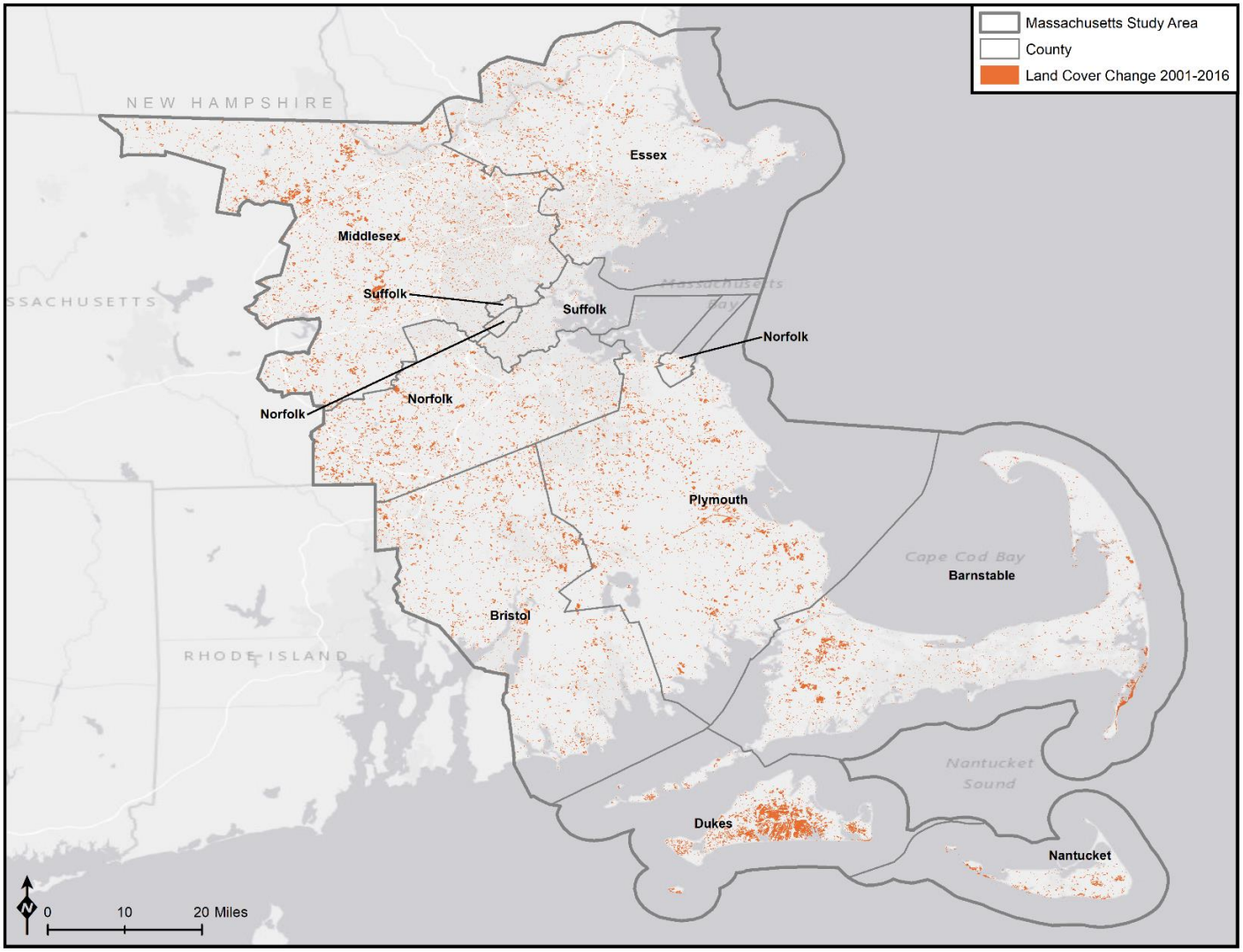
Table 4-5. Land Cover Change within the Massachusetts Study Area

Geographic Unit	County - Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Barnstable	835,542	11,846	1.4
Bristol	442,322	17,520	4.0
Dukes	314,214	15,716	5.0
Essex	530,237	14,002	2.6
Middlesex	542,041	33,030	6.1
Nantucket	194,339	2,226	1.1
Norfolk	284,387	16,505	5.8
Plymouth	699,708	21,328	3.0
Suffolk	76,940	1,012	1.3
Study Area Total	**3,919,732**	**133,184**	**3.4**

Source: NLCD 2001-2016

It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serves as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of Massachusetts may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of "forest" could be very broad.

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.



Source: NLCD 2001-2016

Figure 4-10. Land Cover Change in the Massachusetts Study Area

4.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

4.3.2.1 Existing and Future Land Use

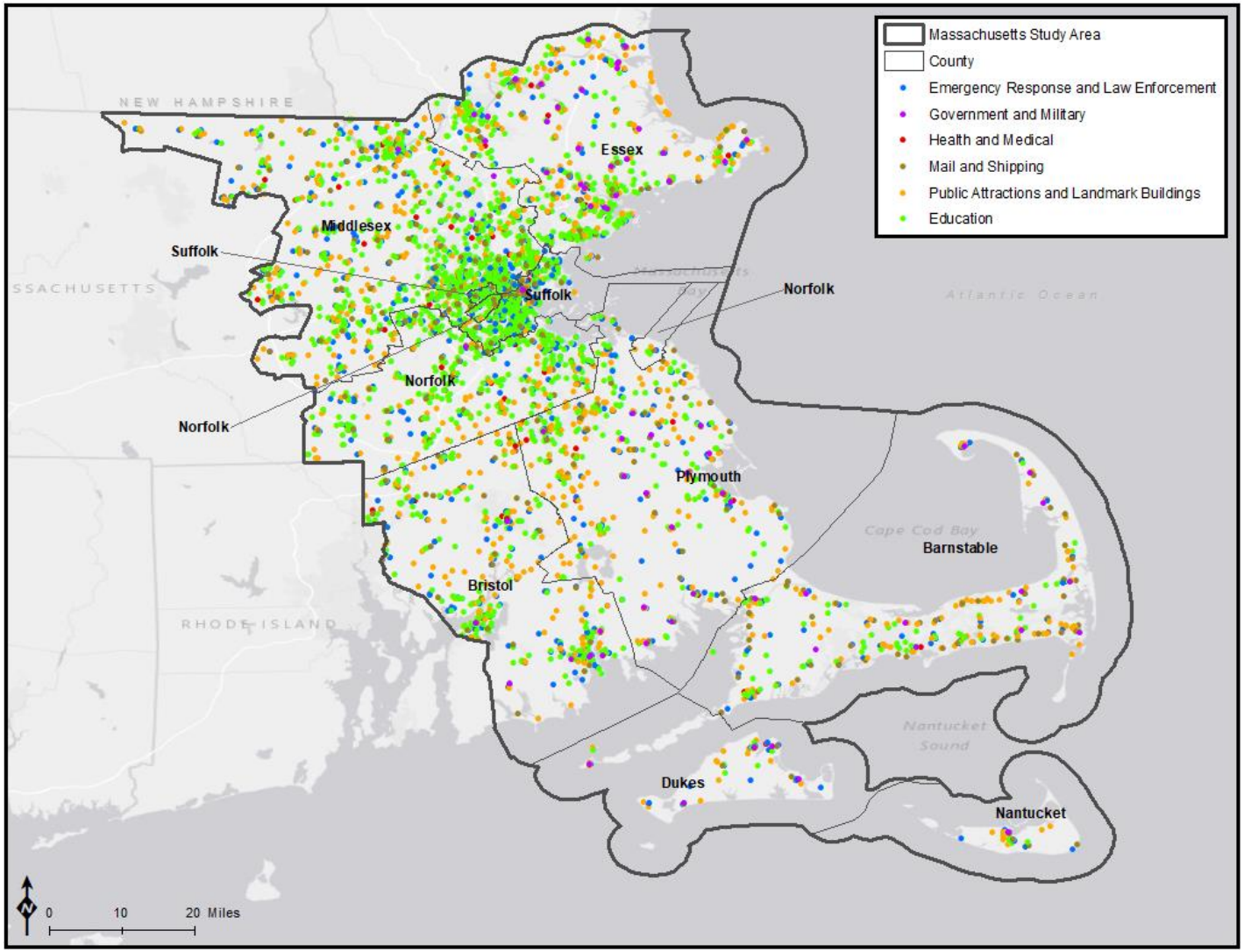
The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 4-11 presents locations of infrastructures at the broad scale of the Study Area. Figure 4-12 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 4.3.1, and the specific identified infrastructures and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

As determined in the land cover analysis in Chapter 4.3.1, land cover in the Study Area is largely either developed or forested. The land use maps in Figure 4-11 and Figure 4-12 indicate that (1) a large portion of land use is centered around education and public attractions/landmark buildings, (2) impervious surfaces are highly correlated with where most of the population lives, and (3) education is heavily clustered in Suffolk and Middlesex Counties and lightly scattered evenly within the Study Area whereas public attractions and landmark buildings are distributed evenly throughout each county.

The existing land use maps for the Study Area indicate that impervious surfaces are associated with urban land use and transportation corridors, and public attractions and landmark buildings are associated with urban land use or impervious surfaces. Existing land use data show that the density of public attractions and buildings is even throughout the Study Area.

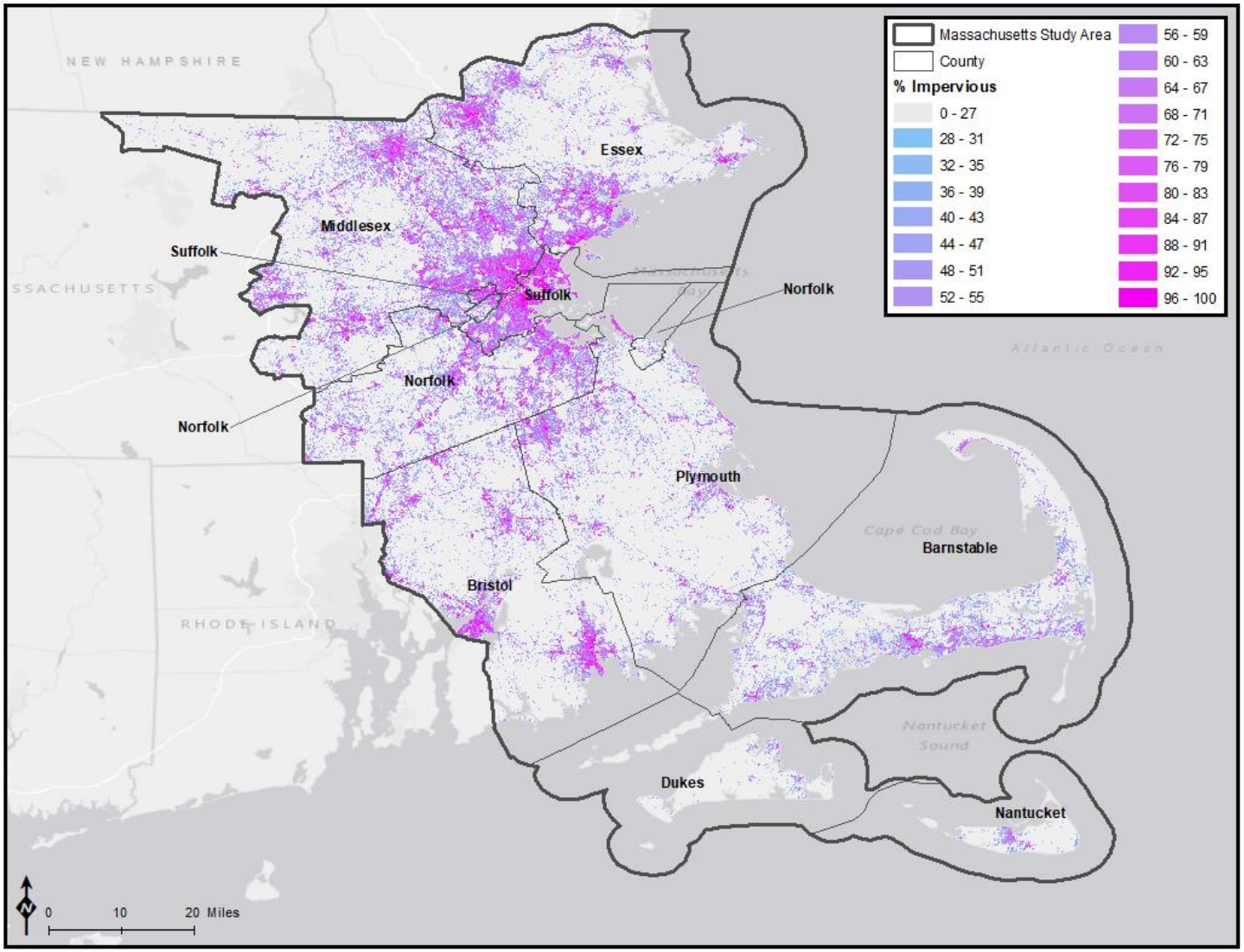
The land use data show the influence of the regional population density (discussed in Chapter 4.4.1) on the distribution and concentration of various land uses. Regions with higher population densities tend to coincide with the more concentrated land uses, which is consistent with the economic development regions that host larger transportation networks, more industries, and greater recreational resources.

County government systems in New England States are not as active compared to other parts of the country. In the Study Area, towns and cities are grouped into planning regions, but not by county. Therefore, evaluation of the comprehensive plan, master plan, or regional plan of each region of interest will be essential during future OCS-related project analysis. The Commonwealth of Massachusetts' website could be of assistance in locating some of the regional plans (Mass.gov 2019a). Additionally, municipality or county websites may also include such planning documents. Municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the Project Developers in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time. Appendix B includes links to relevant planning documents.



Source: USGS 2017

Figure 4-11. Select Existing Land Uses within the Massachusetts Study Area



Source: NLCD 2016b

Figure 4-12. Impervious Surfaces within the Massachusetts Study Area

Massachusetts is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. Massachusetts' Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 138 census tracts identified as Opportunity Zones in the State, several of which are located in the Study Area. An interactive map of opportunity zones is located at https://www.mass.gov/service-details/opportunity-zone-map (Mass.gov 2020c).

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). Counties and municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

4.3.2.2 Zoning

Massachusetts' counties and municipalities are grouped into Metropolitan Planning Organizations (MPO). The purpose of these MPOs are to create a fair and impartial setting to achieve regional decision making that effectively engage local communities and stakeholders (Mass.gov 2019a). The counties in the Study Area include Essex County, Middlesex County, Suffolk County, Norfolk County, Bristol County, Plymouth County, Dukes County, Barnstable County, and Nantucket County (Figure 4-1). These counties are grouped into different MPOs.

- Merrimac Valley Metropolitan Planning Organization includes parts of Essex County
- Northern Middlesex Council of Governments includes parts of Middlesex County
- Boston Region Metropolitan Planning Organization includes parts of Essex County, Middlesex County, Norfolk County, Plymouth County, and all of Suffolk County
- Southeastern Massachusetts includes parts of Bristol County, Plymouth County, and Norfolk County
- Old Colony Metropolitan Planning Organization includes parts of Plymouth County and Bristol County
- Cape Cod Metropolitan Planning Organization includes all of Barnstable County
- Martha's Vineyard Commission includes all of Dukes County
- Nantucket Planning and Economic Development Commission includes all of Nantucket County

According to the separate Massachusetts MPOs' online websites, each MPO, except for the Boston Region MPO, oversees the decision making for towns, cities, and whole counties regarding their local ordinances, transportation, city and building planning, data collection, and zoning (NMCOG 2019, Boston Region MPO 2019, Cape Cod Commission 2019, MVPC 2019, MVC 2019, Nantucket MA 2019, OCPC 2019, SRPEDO 2019). The Boston Region MPO, due to the magnitude of the transportation infrastructure within that region, focuses on transportation and the federally required metropolitan transportation planning process rather than other aspects of the government and community (Boston Region MPO 2019). The MPOs produce Regional Policy Plans, which are the equivalent of a comprehensive or master plan. The Commonwealth of Massachusetts' website could be of assistance in locating regional plans, as well as the individual MPO websites.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a

zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during OCS-related project analysis. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

4.3.2.3 Industrial Incentives

The Commonwealth of Massachusetts has several incentive programs that would benefit future project developers associated with OCS-related projects. Massachusetts' incentive programs include tax credits, grants, and tax exemptions, and include:

- The Economic Development Incentive Program (EDIP): Provides tax credits to eligible companies that retain or create full time jobs. Awarded tax credits can be directed to the company's State income tax, and in some cases, refundable taxes can be granted (BLS & Co. 2019).
- Economic Opportunity Area Credit (EOAC): A component of the EDIP, this credit can only be applied if the taxpaying entity had the project certified within an economic opportunity area (EOA). The EOAC is used to offset personal income tax and is determined by the cost of qualified purchased property. (Mass.gov 2019b).
- Brownfields Tax Credit (BTC): To be qualified for this credit, business corporations must clean up contaminated property in the Commonwealth of Massachusetts to the standards set by the Department of Environmental Protection. The taxpayer may receive a credit that accounts for 25% or 50% of the cost of cleanup (Mass.gov 2019c).
- Regional Economic Development Organization (REDO) Grant Program: The REDO grant is for organizations or businesses that support local economic and development in Massachusetts. The amount granted is determined by the previous year's operating budget of the organization or business (BLS & Co. 2019).

These programs incentivize based on the corporation or business contributing to the local and State economy or improving the immediate area in which the corporation is located. The Commonwealth's government also has strong energy-saving programs and tailored plans to implement energy efficiency in businesses. A company looking to create and maintain an oil- and/or gas-related business might want to consider building with the Commonwealth's energy incentives in mind. However, it should be noted that, as of December 2018, the Massachusetts Department of Energy Resources released the Massachusetts Comprehensive Energy Plan that detailed the State's decreasing needs on fossil fuels, energy efficiency, and a statewide commitment to renewable energy sources (Mass.gov 2018).

4.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 4-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting

future analyses and once site-specific information is known. Types of facilities shown on this figure include:

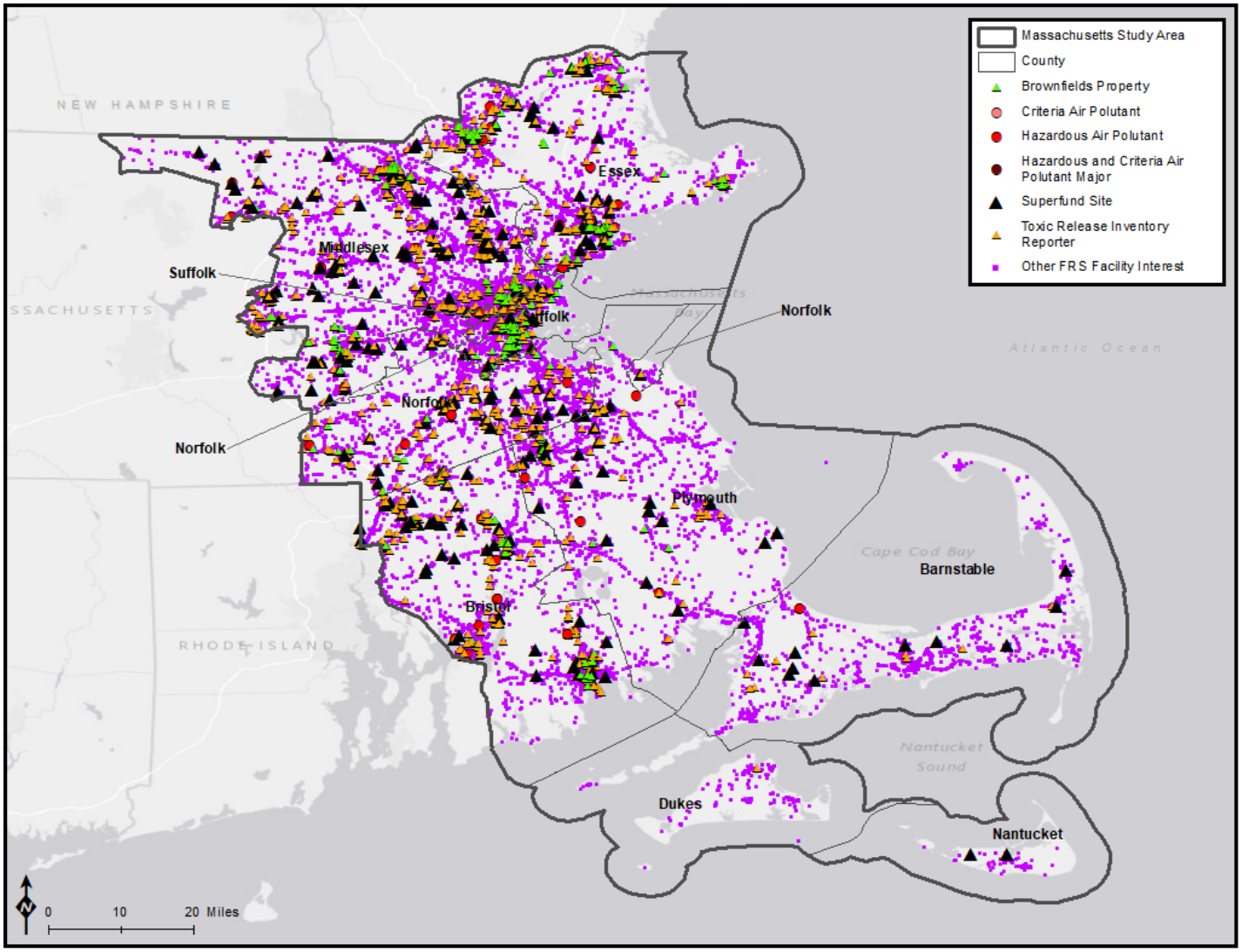
- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 4-13, the largest concentration of industry is located in the areas of Suffolk, Essex, Middlesex, and Norfolk Counties.

According to the Massachusetts Executive Office of Labor and Workforce Development, industry projections for Massachusetts to the year 2026 show industries including agriculture and livestock, forestry, professional and technical services, and healthcare and social services to increase significantly (listed industries are expected to increase between 14 and 35% depending on the specific industry) (EOLWD 2019). Industries expected to lose numbers in their respective workforces are textile mills, paper manufacturing, primary metal manufacturing, and appliance retail stores (EOLWD 2019). Expected growth in industries related to land, natural resources, and professional and technical services could be an indicator into the expected workforce available for an OCS-related associated company. Chapter 4.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

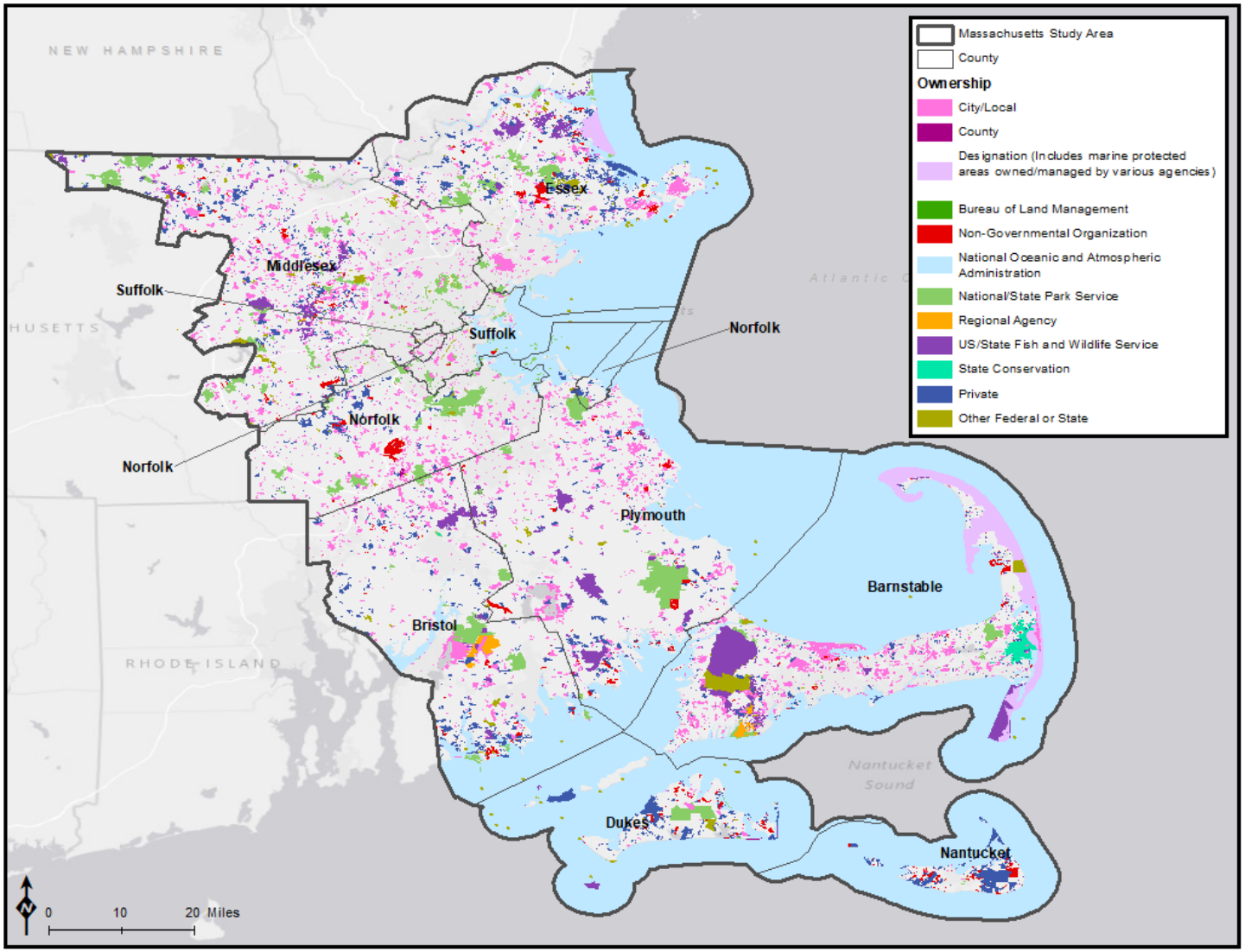
4.3.2.5 Protected Areas

The PAD-US, which is produced by the USGS, is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of fauna and flora within the ecosystem, as well as recreational activities and any other use of the land through “legal or other effective means.” The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands (USGS 2019f). The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time. Figure 4-14 presents the protected areas within the Study Area. The “designation” category in the PAD-US database includes marine protected areas that are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.



Source: USEPA 2018a

Figure 4-13. USEPA Facility Register Service Record for the Massachusetts Study Area



Source: USGS 2019f

Figure 4-14. Protected Areas within the Massachusetts Study Area

Protected lands in the Study Area include those owned and/or managed by the city/local area, the National/State Park Service, some governmental organizations, private individuals, regional agencies, and the National/State Fish and Wildlife Service. These protected lands include sanctuaries, seashores, reserves, islands, reservations, State parks, wildlife refuges and beaches.

Visually, Barnstable County has the largest protected areas in the Study Area. Some of the protected lands include the Cape Cod National Sea Shore, Mashpee NWR, and Joint Base Cape Cod. Both Dukes and Nantucket Counties contain areas of privately owned land, with privately owned land area comprising a large land mass in Nantucket County.

In 1961, President John F. Kennedy authorized the establishment of the Cape Cod National Seashore. This was monumental, as it was the first time that the Federal government had used land that was privately owned to create a national park. Today, the Cape Cod National Seashore encompasses more than 43,000 acres stretching 40 miles from Provincetown to Chatham (Massmoments 2019). The seashore includes natural features such as beaches, ponds, marshes, dunes, and woodlands as well as historic sites such as lighthouses, historic houses and structures, and museums. (Britannica 2019).

Nantucket Sound is recognized as a historic and archeological property in association with both American Indian history and European settlement of Cape Cod and the islands, also, as described in Chapter 4.2.1.1, an estuary of national significance. The entire island of Nantucket is designated as both an Historic District and a National Historic Landmark because of its historical association with the American whaling industry as well as the preservation of its unique whaling industry-related architecture. The NPS has identified the Town of Nantucket as an outstanding surviving example of an early 19th century New England seaport town (Save Our Sound 2019).

Located in the towns of Mashpee and Falmouth, Mashpee NWR encompasses 6,000 acres and is the Cape's second largest open, accessible conservation land. Established in 1995, it is the only refuge in the NWR system that is managed cooperatively by eight conservation landowners and the Friends organization: a mixture of Federal, State, tribal, private, and nonprofit groups (Friends of the Mashpee National Wildlife Refuge 2018). Massachusetts' park system is one of the largest State park systems in the country with 450,000 acres of forests, parks, greenways, and historical sites (massvacation.com 2019). There are also numerous other NWRs in the Study Area including Parker River NWR, Thatcher Island NWR, Great Meadows NWR, Assabet River NWR, Massasoit NWR, and Nantucket NWR. Information on each NWR can be accessed via an interactive map on the USFWS website.

In 1935, the War Department approved acquisition of up to 200,000 acres of land in Cape Cod for military training (JBCC 2020). Joint Base Cape Cod is a full-scale, joint-use base home to five military commands (Army National Guard, Air National Guard, Combat Communications, Space Warning Squadron, and the U.S. Coast Guard at Air Station Cape Cod) supporting a variety of missions (JBCC 2019).

Many protected areas are maintained by city/local ownership in the Study Area, most of which are clustered in Middlesex County, Barnstable County, and the central portion of Bristol County. The names of these reservations, preserves, parks, and conservation lands can be seen via an interactive map with data taken from the PAD-US (protectedlands.net 2019).

Figure 4-14 shows the protected areas within the Study Area. Overall, the southern region of the Study Area has the largest area of protected lands primarily because of Joint Base Cape Cod; the Cape Cod National Seashore; State conservations, areas owned by the city such as preserves, reservations, parks, and conservation lands; and the many NWRs in the surrounding area. There is only one protected national seashore (Cape Cod) that extends for 40 miles in Barnstable County. Suffolk County, containing the city of Boston, contains the fewest protected areas in the Study Area primarily because it contains many

impervious surfaces and has the highest population density in the Study Area. Overall, protected lands abound throughout the Study Area and will need to be considered during potential OCS-related project analyses, particularly once site-specific information is known.

4.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Massachusetts, resided in the area long before the era of European exploration. They were nomadic people who set up small camps and manufactured fluted projectile points as they followed the herds of migrating animals. (Brooks 2019, Mullholland and Curran n.d.). As described in Chapter 4.4.5.4, when English settlers arrived, they encountered five main Algonkian tribes: the Nauset, the Wampanoag, the Massachusetts, the Nipmuc, and the Pocumtuck (Encyclopedia.com 2020b). New diseases arrived with the Europeans decimating the indigenous populations. Eventually, permanent English settlements resulted in conflicts between the groups which contributed to further decimation of some tribes the Algonkian peoples or lead to them abandoning the area (Encyclopedia.com 2020b).

In the early 1600's there were two separate colonies within the boundaries of present-day Massachusetts: Plymouth Colony and Massachusetts Bay Colony. Plymouth Colony, or Old Colony, was settled by immigrants from the Mayflower around Plymouth and Cape Cod. The colonists who traveled to the New World on the Mayflower were a small group of Separatists who had fled Europe to practice their religion without official interference. The colonists were never granted a royal charter from the king, so their government became based on the Mayflower Compact created in 1620. The Old Colony rapidly became overshadowed by its Puritan neighbor to the north, the Massachusetts Bay Colony, founded in 1628. The Massachusetts Bay Colony expanded rapidly, and by the mid-1640s it began absorbing settlements in Maine and New Hampshire. The government of the colony was based on the royal charter granted by King Charles I, and governed by John Winthrop. The Puritans essentially established a theocracy with close ties between the government and the clergy (Clark et al. 2019). Though church and State were legally separate, they were mutually reinforcing agencies; thus, when Roger Williams and Anne Hutchinson were separately found guilty of heresy in the 1630s, they were banished by the Commonwealth of Massachusetts (Encyclopedia.com 2020b). Continued lack of interference from Great Britain allowed the colonists to gain a tradition of self-reliance and self-government. It is also notable that Maine remained a part of Massachusetts until 1820, when it was established as a separate State (Clark et al. 2019).

European settlers feared the hostile American Indians of Massachusetts (i.e., Narragansetts), so they formed an alliance with the Wampanoag and, in 1621, made a pact (peace treaty) with the Wampanoag chief, Massasoit. Massasoit died in 1661 and his son Metacom (King Philip) became chief in 1662. Metacom did not maintain peace with the settlers and King Philip's War (1675-1676) was the Native Americans' efforts to stop English settlement on their land. The English settlers fought many battles with the Wampanoag, Nipmuck, Pocumtuck, and Narragansett Indians during King Philip's War (Clark et al. 2019). Like many of the settlements in the Massachusetts Bay Colony, Salem (Essex County) was under a lot of stress at the time due to disease epidemics, warfare with local Native Americans, crop failures, political turmoil brought about by the colony's loss of the original charter in 1684, and the establishment of a new royal charter in 1691. It is believed these issues were some of the underlying factors that caused the Salem Witch Trials that began in the winter of 1692. Three women were accused of practicing witchcraft, and one of the women, Tituba, confessed that she was in fact a witch. Tituba's confession triggered a mass hysteria in the settlement, prompting the colonists to turn on each other and the beginning of the Salem Witch Trials, during which hundreds of people were accused and 19 people were

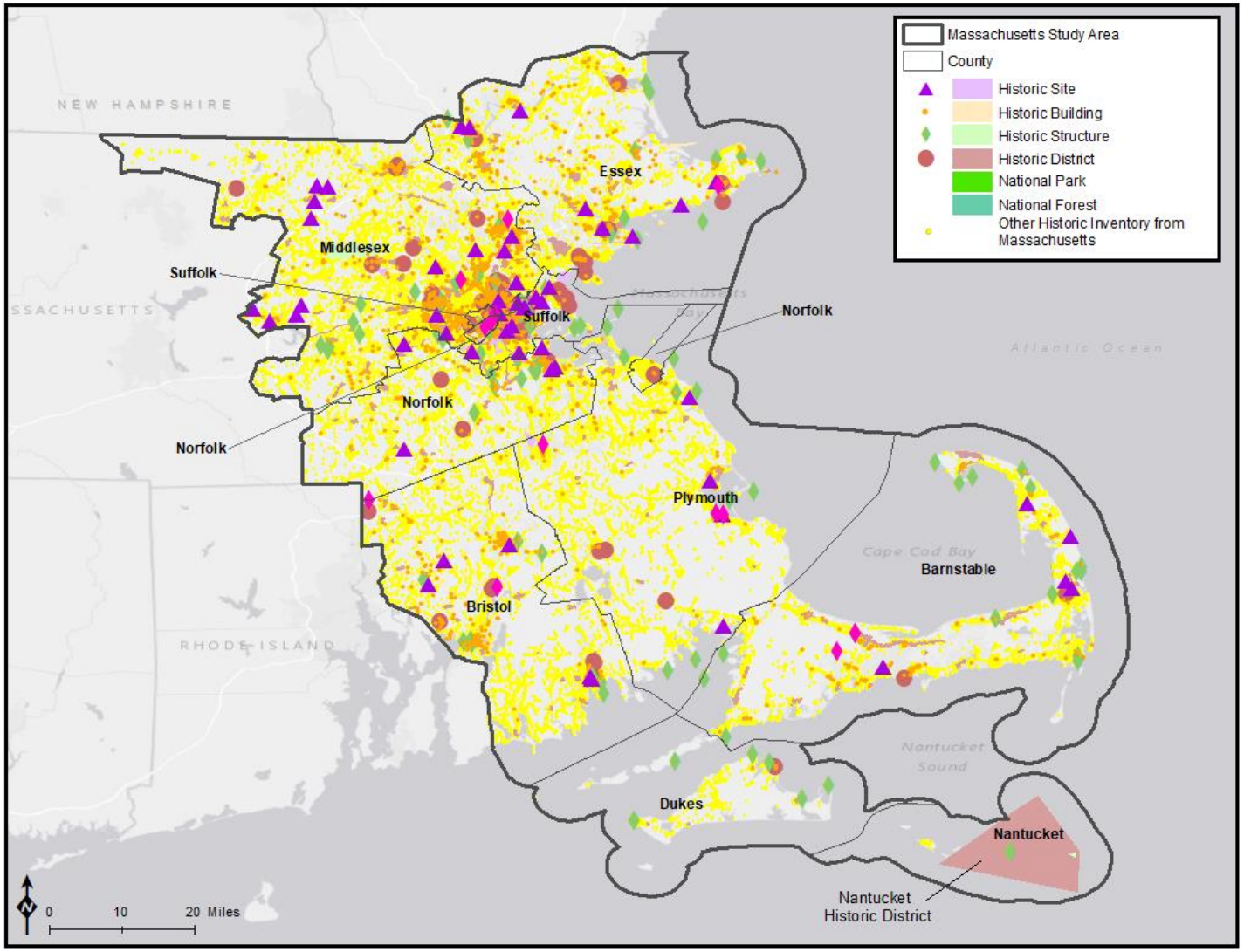
executed (Brooks 2016). Today, Salem's House of Seven Gables and other "haunted" houses from this witchcraft era are still standing (Clark et al. 2019).

Repeated fights against the American Indians were common, as Massachusetts men joined with British troops to fight the French and their Indian allies during the French and Indian War (1756-1763) (Clark et al. 2019). Notable battles in Boston include the Boston Massacre (1770) and the Boston Tea Party, which resulted in the closure of the port of Boston (December 16, 1773). Several major battles of the American Revolutionary War (1775-1783) were also fought in Massachusetts. On April 19, 1775, the opening shots of the American Revolutionary War, also known as "the shot heard round the world," occurred at the Battles of Lexington and Concord. Other important battles fought in Massachusetts include the Battle of Princeton, Siege of Boston, Battle of Bunker Hill, and the Battle of Gloucester. As such, many historical landmarks and protected areas in the Study Area are related to the Revolutionary War era.

Massachusetts also played an important role in the Civil War (1861-1865), as they were actively involved in the antislavery abolitionist movement. Men served in the Union Army and Navy. After the signing of the Emancipation Proclamation in 1862, the 54th Massachusetts Volunteer Infantry became the first regiment of African American soldiers in the Union army; the unit was led by white officers. There are several Civil War era historic sites, monuments, and buildings in Massachusetts that people can visit today (MOTT 2020).

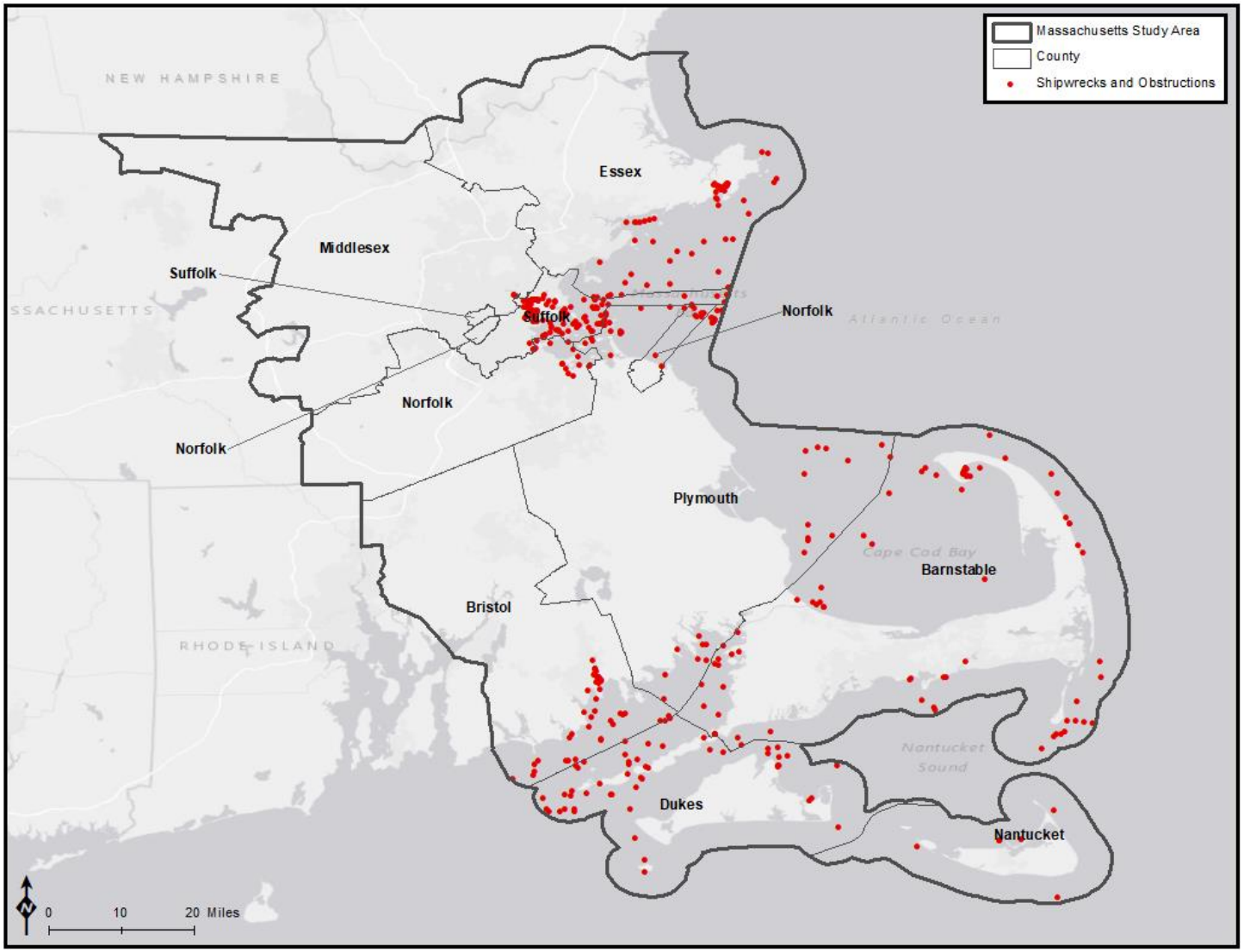
The New England Renaissance, also called the American Renaissance, was a literary period from the 1830s to about 1865. The movement was centered in New England and was closely associated with Transcendentalism. The Transcendentalist movement was led by preacher, philosopher, and poet Ralph Waldo Emerson, who expounded his concepts of individual spiritual freedom and inspired deeper and darker revelations in others. Ralph Waldo Emerson's house in Concord (Middlesex County) is a national historic landmark (Clark et al. 2019).

Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with Native Americans, colonial settlements, Puritanism, the French and Indian War, the American Revolution, the War of 1812, the American Civil War, the American Renaissance, and the Industrial revolution, and World War I and II. Massachusetts's economy was historically based overwhelmingly on fishing and shipbuilding industry, with agriculture making relatively small contributions, and foreign commerce. The Commonwealth's leading manufactured products were shoes and woven goods. Today, Massachusetts is a leader in the manufacture of high-technology products (Encyclopedia.com 2020b). Because of the duration of the human presence in the Commonwealth of Massachusetts, Massachusetts has an abundance of historic sites. Figure 4-15 and Figure 4-16 present a summary of many of these historic locations, including maritime sites and shipwrecks located in the Massachusetts Bay, Cape Cod Bay, or the Atlantic Ocean.



Sources: NPS 2014, USFS 2019a

Figure 4-15. Cultural and Historic Sites within the Massachusetts Study Area



Source: NOAA 2016a

Figure 4-16. Shipwrecks and Obstructions within the Massachusetts Study Area

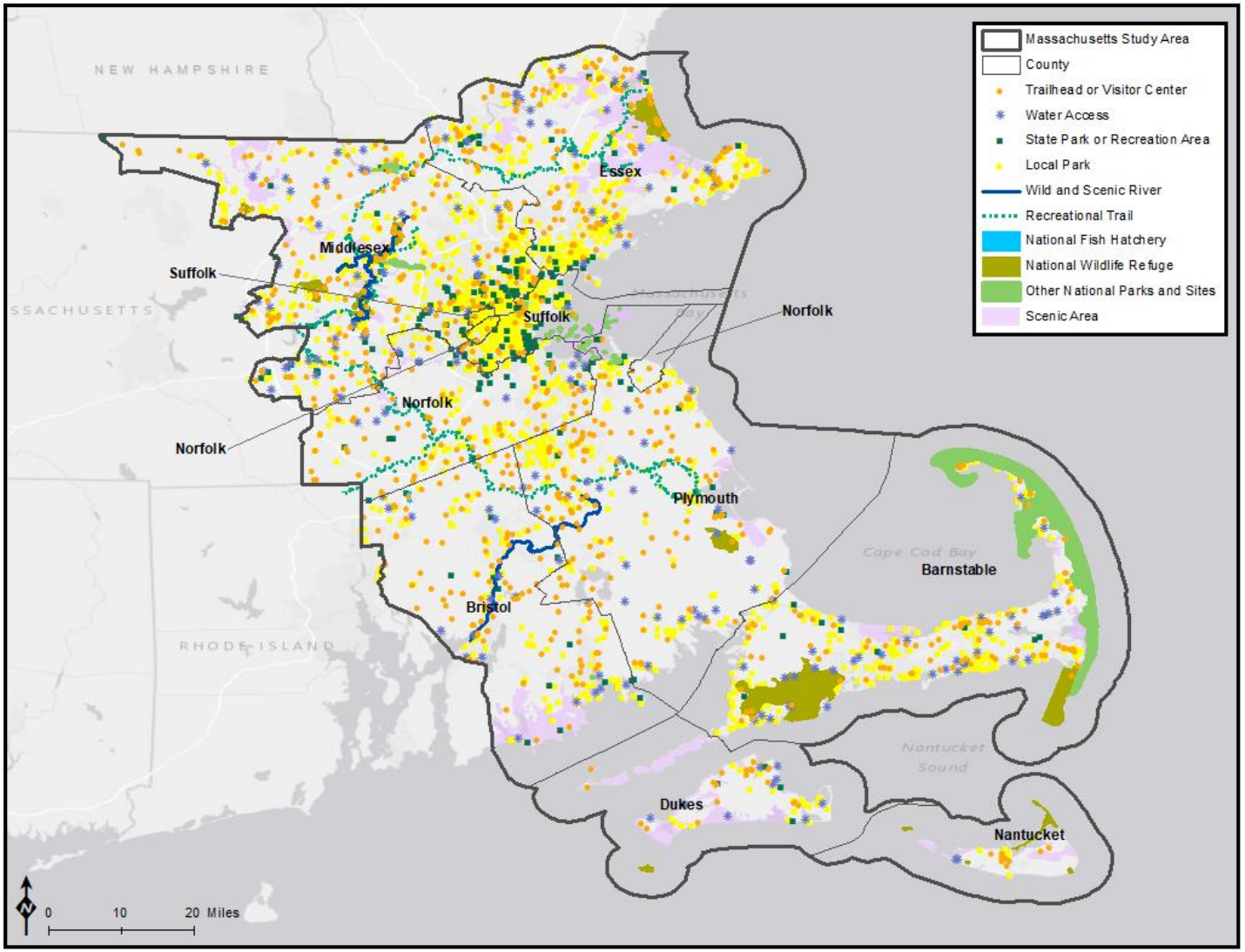
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Massachusetts) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 4-15 and Figure 4-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Massachusetts's cultural and historical resources, detailed cultural resource surveys of proposed future OCS project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

4.3.2.7 Recreation

The Study Area has diverse recreational opportunities including national parks, State forests, State and local parks, wildlife management areas, historical and cultural resources, national monuments, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 4-17. The cultural and historic resources shown in Figure 4-15 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 4-14. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 4.3.2.6), transportation (Chapter 4.3.2.8), tourism employment (included in Chapter 4.4.4), and rental housing (included in Chapter 4.4.3).

Eighteen of the 20 largest cities in Massachusetts are in the Study Area, many of which are destinations for tourists. As shown in Figure 4-17, there are numerous parks and recreation areas in and surrounding Suffolk County. The primary tourist destination in the Study Area is Boston in Suffolk County. Boston is the largest city in Massachusetts, and several of the cities surrounding Boston in the adjacent counties of Middlesex, Essex, and Norfolk County are also in the top 20 largest cities in Massachusetts.



Sources: MassGIS 2019, MassGIS 2018a, MassGIS 2018b, NPS 2014, USFS 2019b

Figure 4-17. Select Recreational Resources within the Massachusetts Study Area

Suffolk County

In 2017, Suffolk County generated $9.2 billion in direct domestic travel expenditures, which helped support 48,300 jobs (MOTT 2018). There are many recreational resources and opportunities in Boston, which include historical sites, professional sporting events, artistic and cultural events, and beaches.

Some historical buildings and sites located in Boston are from the American Revolution in Boston National Historic Park, including the Old State House, Old North Church, the Paul Revere House, and the Charlestown Navy Yard (NPS 2019k). Other sites include the Boston African American National Historic Site (NPF 2020), museums, zoos, and gardens.

There are also several professional sporting events in the greater Boston Region for teams, including the Boston Red Sox (baseball), Boston Celtics (basketball), New England Patriots (football), Boston Bruins (ice hockey), New England Revolution (Soccer), and Boston Cannons (lacrosse).

Because of the location of Boston on the coast of Massachusetts, there are several opportunities to visit beaches, Boston Harbor Islands, wildlife sanctuaries and refuges; take fishing tours and harbor or whale watching cruises; and go fishing, boating, kayaking, and sailing in the Boston Harbor (massvacation.com 2020). Boston has a boardwalk called the Boston Harborwalk that is a 43-mile linear park along Boston's shoreline that connects to over 40 parks, a dozen museums, 7 beaches, and hundreds of restaurants and stores (Boston Harbor Now 2020).

Some of the notable annual events in the Boston area include the St. Patrick's Day Parade (March), Boston Marathon (April), Boston Dragon Boat Festival (June), Boston Pops July 4th Fireworks Spectacular (July), Boston Harbor Fest (July), The Big E Eastern State Exposition (September), Annual Scallop Fest (September), Working Waterfront Festival (September), and the Head of the Charles Regatta (October) (Top Events USA 2020c).

Essex, Middlesex, and Norfolk Counties

Because of their proximity to the City of Boston, Essex County, Middlesex County, and Norfolk County share a portion of the economic impacts associated with tourism to the region. In 2017, domestic travel spending was approximately $949.9 million in Essex County supporting 7,100 jobs, $2.7 billion in Middlesex County supporting 22,200 jobs, and $1.2 billion in Norfolk County supporting 10,900 jobs (MOTT 2018).

Notable tourist destinations and activities in Essex County include the Salem Maritime National Historic Site, Salem Witch Museum, Essex Shipbuilding Museum, the Parker River NWR on Palm Island, whale watching, fishing, harbor cruises and charters, and visiting beaches, wildlife refuges, State Forests, State Parks and State Reservations.

Notable tourist destinations in Middlesex County include historical landmarks and sites protected by the NPS such as Minute Man National Historical Park, Lowell National Historic Park, and Longfellow House - Washington's Headquarters National Historic Site. Middlesex and Norfolk Counties also have several museums, NWRs, and State forests, parks, and reservations that are popular recreational destinations.

Plymouth and Bristol Counties

Plymouth and Bristol Counties have several trailheads and local parks, as well as beaches, reservations, parks, and forests used for recreation. Plymouth County also has a cultural district in the City of Plymouth with Plymouth Rock, Pilgrim Sarcophagus, the Mayflower Meetinghouse (Pilgrims' church), National

Monument to the Forefathers, and several other cultural and historic statues, houses, and museums (see Plymouth 2020).

Barnstable, Dukes, and Nantucket Counties

In 2017, domestic travel spending was approximately $1.1 billion in Barnstable County, $143 million in Dukes County, and $172 million in Nantucket County (MOTT 2018). The main tourist destination in Barnstable County is Cape Cod National Seashore, which has 44,600 acres of aquatic and terrestrial ecosystems and was visited by 3,926,462 people in 2018 (NPS 2018a, NPS 2019l). Other notable recreational activities in Barnstable County include visiting museums, beaches, lighthouses, wildlife sanctuaries and management areas, Mashpee NWR, the Cape Cod Rail Trail (a 22-mile paved trail for walking, running, biking, and horseback riding), and Nickerson State Park (1,900 acres) which has campgrounds, an amphitheater, and hiking and biking trails. Visitors can also go boating, kayaking, whale watching, and take ferry rides and ecotours (VacationIdea 2020b).

In Dukes County, Martha's Vineyard is the main island and can only be accessed by ferry. Martha's Vineyard has a total of 124.6 miles of tidal shoreline with approximately one-third of the land being protected. The Dukes County economy is largely supported by vacationers who spend their time on hiking and biking trails in Manuel F. Correllus State Forest (5,300 acres in the center of the Island) and other State parks and preserves, taking sunset cruises, visiting lighthouses, touring the Aquinnah Cliffs, renting summer cottages, and visiting the beaches (U.S. News 2019c). There are also several annual events in Dukes County such as road races, parades, golf tournaments, and fishing tournaments that are listed on the Dukes County website (Dukes County 2019).

Like Dukes County, Nantucket County is only accessible by ferry and is popular for boating, sailing, fishing, and golfing. In Nantucket County, tourists can also visit the beaches, museums, historic sites, lighthouses, and the Coskata-Coatue Wildlife Refuge, which is on the northern tip of Nantucket County (VacationIdea 2020c). The entire island of Nantucket is considered the Nantucket Historic District, which is a National Historic Landmark with buildings and structures from the 1700s and 1800s (NPS 2020b). There are also several annual events and festivals in Nantucket County throughout the year including the Nantucket Daffodil Festival (April), Wine and Food Festival (May), Figawi Regatta Race Weekend (May), Sam Sylvia Pro-Am Golf Tournament (June), Nantucket Community Sailing Opera House Cup Race (August), Nantucket Art Festival (September-October), and various races and parades (NICC 2020).

Summary

In summary, there are many recreational activities within the Study Area found in areas along the coast, as well as inland, natural settings, urban settings, parks/greenspaces, and built attractions. Recreational opportunities in Suffolk, Essex, Middlesex, and Norfolk Counties feature historical landmarks and museums, sporting events, and dining and shopping. There is no official peak season for tourism to this area so it is likely that travel costs (e.g., hotels) will be consistent year-round. However, peak travel to the Barnstable, Dukes and Nantucket Counties occurs between Memorial Day and Labor Day because the beaches and water-related activities are the primary attractions. Therefore, travel costs will be higher during the summer months in this portion of the Study Area. Also, there are several annual festivals and events that occur throughout the Study Area, especially in the Boston Area. Therefore, potential impacts on these events and attractions should be considered during the planning phase and site selection process for future projects. Because many of the recreational attractions are also protected lands and historical landmarks, there will likely be limitations for development near these areas. Future potential projects would need to consider such recreational resources during their site selection process. Local information on additional attractions and events should also be considered by checking relevant city and county tourism websites and event pages once site-specific project information is known.

4.3.2.8 Transportation Resources

Massachusetts contains a diverse transportation system. The Commonwealth's location in the northeast U.S. positions itself to be within several major markets including New York, Philadelphia, and Canada. The Commonwealth has 192 miles of coastline and 1,519 miles of tidal shoreline (NOAA 2020e). The miles of coastline and two large offshore municipalities, Nantucket and Martha's Vineyard, are connected to the mainland through a series of ferry services.

The Study Area has a wide variety of transportation resources due to its geographic location and the Boston Metropolitan Area. Massachusetts has

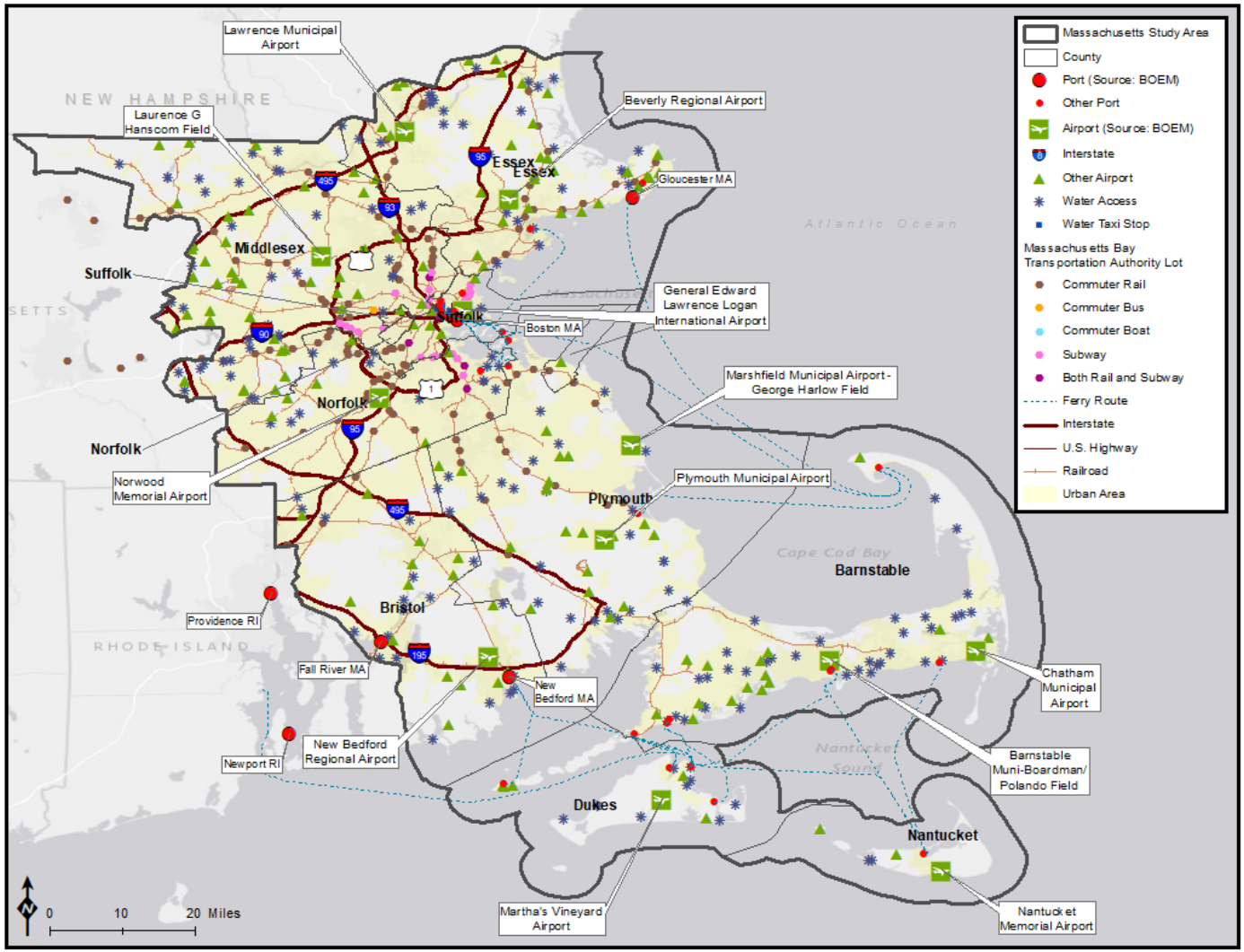
- 36,723 miles of public roads,
- 5,192 bridges,
- 28 public-use airports,
- 1,057 miles of freight railroads,
- 4 major ports and several smaller seaports, and
- multiple ferry routes between Massachusetts Bay, Cape Cod Bay, and Nantucket Sound.

Massachusetts has two main agencies that oversee transportation resources in the Commonwealth. The Massachusetts Department of Transportation manages public roads, public transit, aeronautics and aviation, and transportation licensing throughout the State (Mass.gov 2019d). The second agency is the Massachusetts Bay Transportation Authority, which is governed by Massachusetts Department of Transportation and the Fiscal and Management Control Board. The Massachusetts Bay Transportation Authority manages and provides subway, bus, commuter rail, ferry and paratransit services to eastern Massachusetts (MBTA 2019a). Both agencies, have development plans and budgets to promote transportation infrastructure upgrades and increase efficiency of Massachusetts transportation systems (MBTA 2019b). Massachusetts has a large metropolitan area located on the coast of Massachusetts Bay that makes up approximately half of the overall Study Area. The Boston Metropolitan Area contains several major roadways, an international airport along with several regional and municipal airports, and the Port of Boston.

Major roadways in the Study Area include U.S. I-95, which traverses the northern and western sides of the State, and U.S. Interstate 495 in the north and south, and U.S. I-95 only in the south; these roadways connect the Study Area laterally (Figure 4-18). U.S. Route 1 traverses through the Boston Metropolitan Area, and no major roadways connect Barnstable County in the south of the Study Area to the north and west of the Study Area (Figure 4-18).

General Edward Lawrence Logan International Airport, located in Boston, is one of the busiest airports in the Nation despite operating in the second smallest footprint among the top 20 major American airports (Massport.com 2019). Including General Edward Lawrence Logan International Airport, there are 11 other regional and municipal airports in the Study Area.

The Port of Boston is a major source of economic growth, contributing almost $9 billion to the Commonwealth's economy every year (WPS 2019b). The Port of Boston is able to do this by being equipped to handle over 15 million tons of cargo and having the onshore infrastructure to sort, store, and ship out cargo utilizing a rail transfer facility at Beacon Park and a dedicated haul road that connects to U.S. Interstates 93, 90, and 95 (WPS 2019b). The Port of Boston also contains a complex of private petroleum and liquefied natural gas terminals that could be leased/bought/used by a company associated with Federal OCS-related activities (WPS 2019b). Other ports of significance include ports located in New Bedford and Gloucester, along with many other smaller ports that can be seen in Figure 4-18. The number of ports allow for regular ferry services to reach Dukes, Barnstable, and Nantucket Counties to connect areas of the State that lack a major highway route.



Sources: MassDOT 2019, MassDOT 2012, MassDOT 2013, MassGIS 2012, MassGIS 2019, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 4-18. Transportation Resources within the Massachusetts Study Area

4.3.3 Summary – Land Cover and Land Use

Nine counties in the Study Area are predominantly developed, which makes up an average of 40.3% of the landcover. Suffolk County, within which the City of Boston is located, has the highest percent total developed land cover and Dukes has the lowest developed land cover. Bristol and Essex Counties have some areas of wetland while Dukes and Nantucket Counties have fairly large areas of shrub/grassland. Most of the land cover change throughout the Study Area is from one developed type to another. The exception is in Dukes County where land cover changes are between various vegetation types.

The Study Area is divided into eight MPOs that regulate regional decision-making regarding government regulations, community guidelines, transportation, economic plans, building planning, and zoning. Each MPO provides a Regional Policy Plan that acts as a comprehensive plan for the MPO Regions.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, many OCS-related projects would benefit from adherence to existing zoning ordinances. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies.

The Commonwealth of Massachusetts has several incentive programs (the EDIP, EOAC, BTC, and REDO in particular) that could attract a large company to the area by reducing the amount of taxes the company would pay annually. The incentive programs' benefits should be considered against the cost of investing into the Study Area. Additionally, as of December 2018, the Massachusetts Department of Energy Resources released the Massachusetts Comprehensive Energy Plan, which detailed the States' decreasing needs on fossil fuels, energy efficiency, and a statewide commitment to renewable energy sources (Mass.gov 2018). This focus on more renewable energy sources may factor into the types of projects local municipalities and counties in Massachusetts may support or welcome.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, the nature of sites that are potentially impacted should be evaluated during project analysis and alternative sites considered that may have lesser impacts to these areas.

The Study Area has a diverse and robust transportation network of roadways, interstates, public transportation systems, rail, airports, and ports. Many of these systems converge in the Greater Boston area and connect this city to adjacent metropolitan areas up and down the coast making Boston a transportation hub.

4.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental

impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

4.4.1 Population

Massachusetts' population is increasing, but at a slow rate. Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. According to the USCB, Massachusetts' estimated population was 6.8 million in 2017. As shown in Table 4-6, population grew 3.7% since the 2010 Census, having added approximately 241,690 people. During the same period, the population of the U.S. grew at a faster rate (4%) from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. The population of the U.S. grew at its slowest pace since 1937, according to 2018 USCB estimates. The data show that the annual rate of the Nation's population growth was 0.62% for the year ending July 2018, hitting an 80-year low, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). Massachusetts is affected by the nationwide trend of aging population, as indicated by its declining rate of natural increase. According to USCB 2018 estimates, the Commonwealth's natural increase declined 38.5% from 2011 (19,164 people) to 2018 (11,791 people). Natural increase accounted for 30.3% of population increase between 2017 and 2018; the rest of the increase came from positive net migration (USCB 2019b). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence. However, Massachusetts is not part of this national trend, as domestic migration resulted in population loss of 25,755 people between 2017 and 2018 (USCB 2019b). According to Census Bureau 2018 estimates, high percentages of people leaving Massachusetts moved to New Hampshire, Florida, New York, and Rhode Island (USCB 2019c). According to a recent article, many people are leaving the Commonwealth because of a new job or transfer (Governing.com 2018). The region tends to lose more by out-migration than it gains by domestic in-migration; however, a steady stream of international immigrants more than offsets the loss (UMass 2015a). Population loss due to domestic migration was offset by a gain of approximately 53,013 residents from international immigration, resulting in a small overall population gain (USCB 2019b).

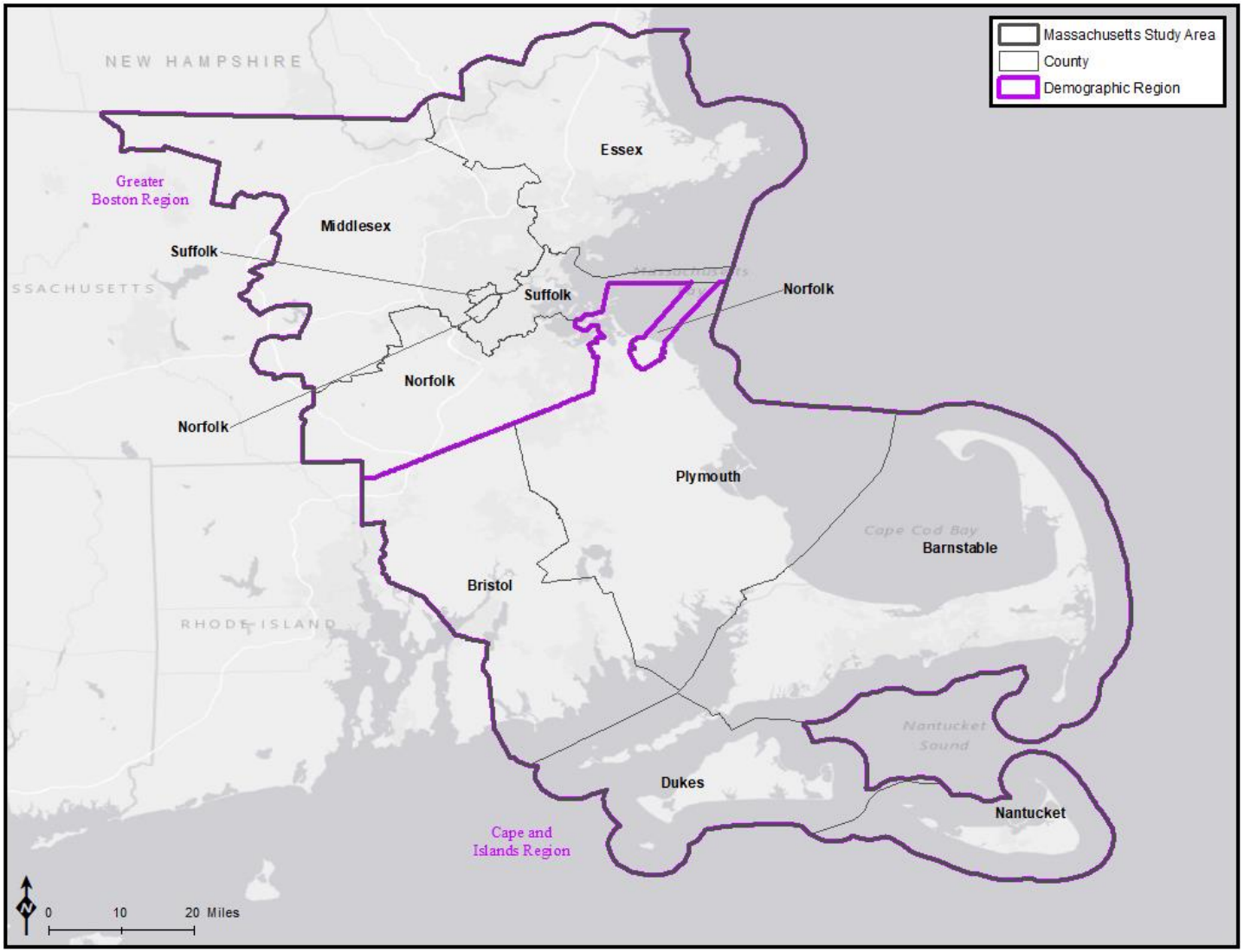
4.4.1.1 Study Area Trends

Figure 4-19 shows the two demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 4.2 (e.g., physiographic regions, economic regions, etc.) because they are derived from official demographic regions used by the University of Massachusetts Donahue Institute. The nine counties within the Study Area are located within two demographic regions defined as Cape and Islands and Greater Boston (UMass 2015a).

Table 4-6. 2010 and 2017 Total Population and Population Projections Through 2035 in the Massachusetts Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2035)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2035) (%)
Cape and Islands	**Barnstable**	215,888	213,900	205,411	192,894	187,674	-0.9	-12.3
	Bristol	548,285	557,016	563,618	572,196	573,960	1.6	3.0
	Dukes	16,535	17,275	17,305	17,972	18,453	4.5	6.8
	Nantucket	10,172	10,912	10,678	11,371	12,004	7.3	10.0
	Plymouth	494,919	509,114	519,998	538,676	544,388	2.9	6.9
	Total Cape and Islands Region	***1,285,799***	***1,308,217***	***1,317,010***	***1,333,109***	***1,336,479***	***1.7***	***2.2***
Greater Boston	**Essex**	743,159	775,860	798,824	824,650	831,063	4.4	7.1
	Middlesex	1,503,085	1,582,857	1,611,789	1,673,074	1,694,670	5.3	7.1
	Norfolk	670,850	694,389	729,296	771,889	786,274	3.5	13.2
	Suffolk	722,023	780,685	809,433	888,796	914,644	8.1	17.2
	Total Greater Boston Region	***3,639,117***	***3,833,791***	***3,949,342***	***4,158,409***	***4,226,651***	***5.3***	***10.2***
	Study Area Total	**4,924,916**	**5,142,008**	**5,266,352**	**5,491,518**	**5,563,130**	**4.4**	**8.2**
	Massachusetts	**6,547,629**	**6,789,319**	**6,950,668**	**7,231,126**	**7,319,469**	**3.7**	**7.8**
	United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**364,862,000**[4]	**4.0**	**13.7**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - UMass 2015a; 4 - USCB 2018b



Source: UMass 2015a

Figure 4-19. Demographic Regions of the Massachusetts Study Area

According to 2017 population estimates, the Study Area represented 75.7% (5.1 million residents) of the overall State population of 6.8 million. Table 4-6 shows population growth and decline in the Study Area counties, as well as their location within the demographic regions. Between 2010 and 2017, eight out of nine counties gained population, while one (Barnstable County) lost population. During the same period, the population of the Study Area grew 4.4%, faster than the Commonwealth (3.7%) and the Nation (4.0%). Between 2010 and 2017, the Greater Boston Region grew 5.3%, faster than the Cape and Islands Region, which grew only 1.7% (USCB 2017a, USCB 2017d).

Figure 4-20 shows population counts in census block groups within the nine counties located in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 4-21, the MSAs present in the Study Area are

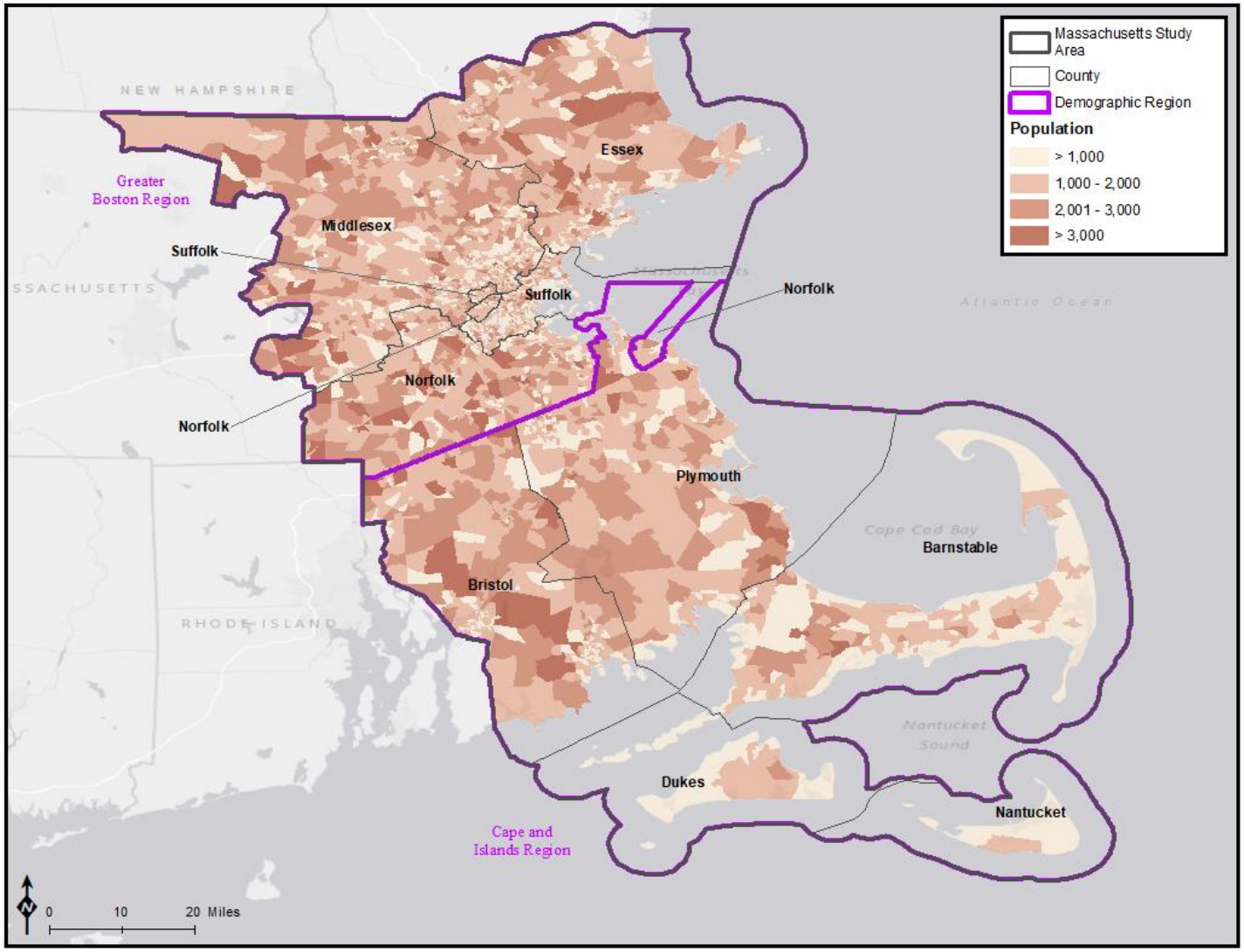
- Boston-Cambridge-Newton, MA-NH;
- Providence-Warwick, RI-MA; and
- Barnstable Town, MA.

No MSAs are located in rural Dukes and Nantucket Counties, located in the Cape and Islands Region (Data.gov 2017, USDA 2013).

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population, but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is also reflected in Massachusetts. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 4-7, the Study Area is 3,520 square miles, representing 44.9% of the Commonwealth's total land area of 7,838 square miles. Therefore, approximately three quarters (75.7%) of Massachusetts' population resided in 44.9% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.

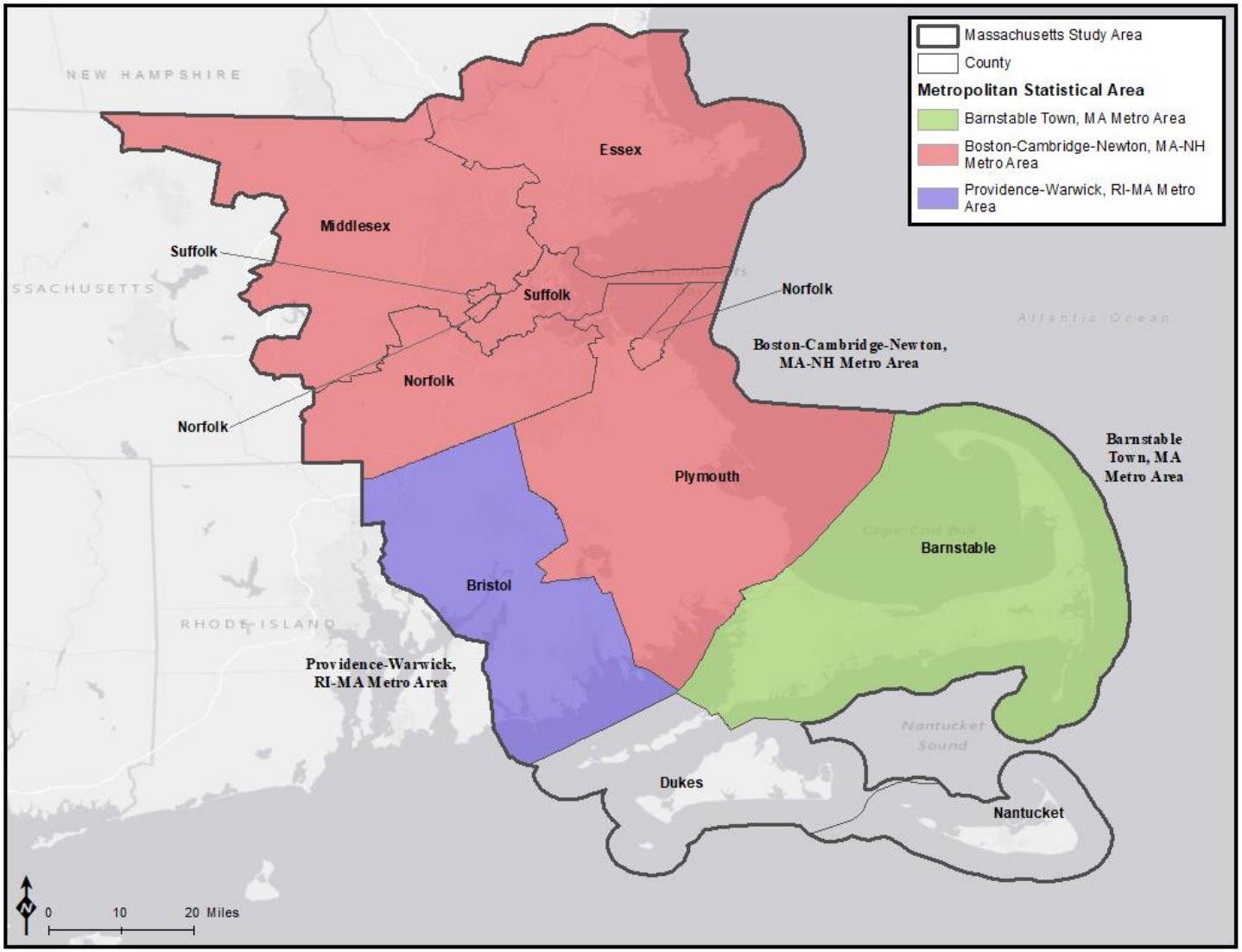
According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 4-22, which shows population per square mile in the Study Area. Population densities in the Study Area ranged from 167 persons per square mile in Dukes County (which is a small island) to 13,403 persons per square mile in Suffolk County (located in the populous Boston-Cambridge-Newton metropolitan area) (USCB 2017d, USCB 2017c, USDA 2013).

The Greater Boston area is Massachusetts' major employment and population center. The area attracts people for its coastal location as well as many positive economic drivers that have brought prosperity to the city and communities surrounding metropolitan Boston (Clayton-Matthews and Nakosteen 2017). A thriving university and technology sector attracted high-skilled immigrants as well as millennials within the last decade. As a result, Massachusetts alone accounted for more than half of the population growth in the Northeast during the decade (Gebeloff 2020).



Source: USCB 2017r

Figure 4-20. Population in the Massachusetts Study Area Counties by Census Block Group



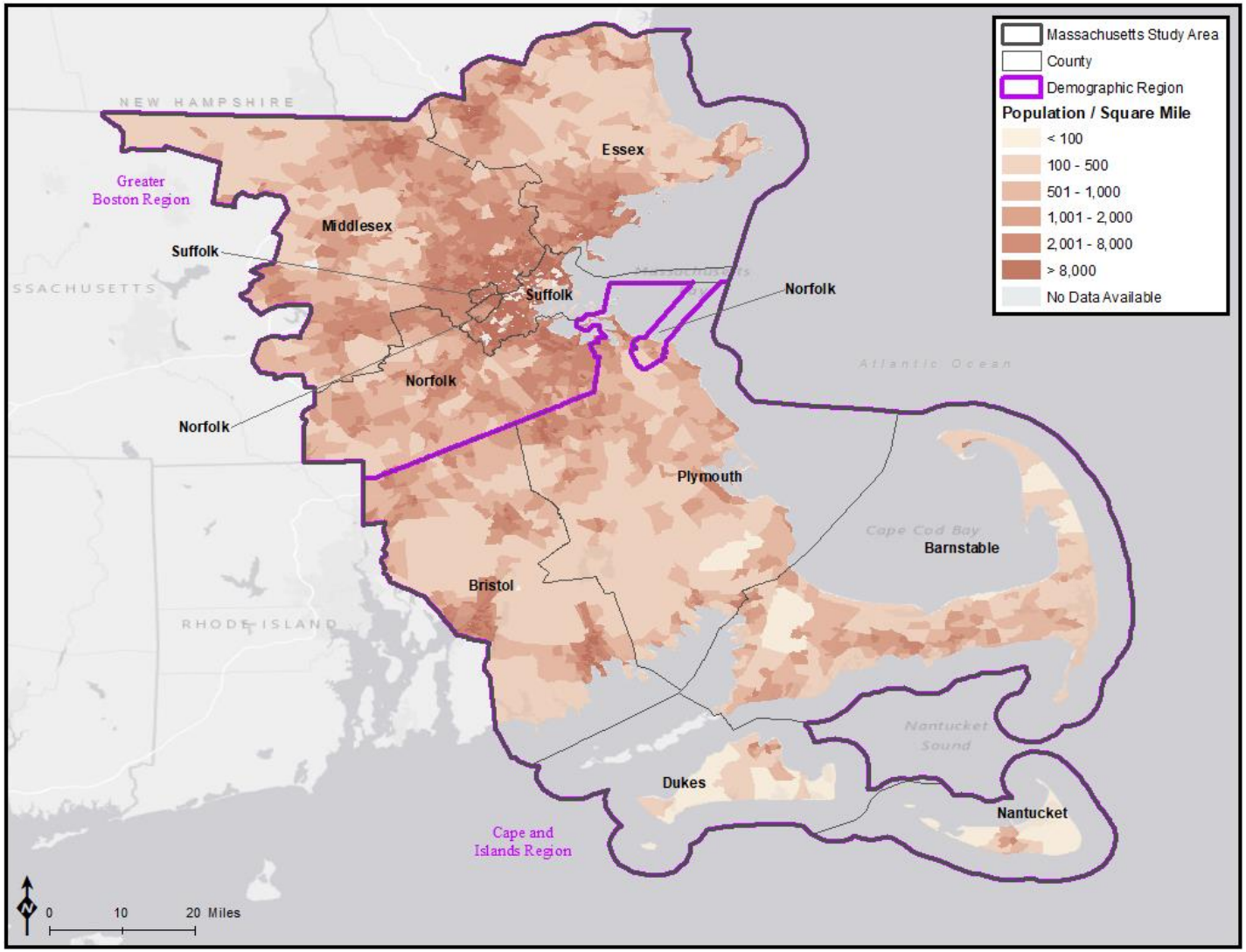
Source: USCB 2017s

Figure 4-21. Metropolitan Statistical Areas Located within the Massachusetts Study Area

Table 4-7. 2017 and 2035 Population Density in the in the Massachusetts Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2035)	Land Area (Square Miles)	2017 Population Density (people per square mile of land area)	2035 Population Density (people per square mile of land area)
Cape and Islands	**Barnstable**	213,900	187,674	394	542.6	476.1
	Bristol	557,016	573,960	553	1,007.1	1,037.7
	Dukes	17,275	18,453	103	167.4	178.8
	Nantucket	10,912	12,004	46	236.5	260.2
	Plymouth	509,114	544,388	659	772.6	826.2
	Total Cape and Islands Region	***1,308,217***	***1,336,479***	***1,756***	***745.2***	***761.3***
Greater Boston	**Essex**	775,860	831,063	492	1,575.4	1,687.5
	Middlesex	1,582,857	1,694,670	818	1,935.4	2,072.1
	Norfolk	694,389	786,274	396	1,753.1	1,985.1
	Suffolk	780,685	914,644	58	13,403.4	15,703.3
	Total Greater Boston Region	***3,833,791***	***4,226,651***	***1,765***	***2,172.5***	***2,395.2***
	Study Area Total	**5,142,008**	**5,563,130**	**3,520**	**1,460.7**	**1,580.3**
	Massachusetts	**6,789,319**	**7,319,469**	**7,838**	**866.2**	**933.8**
	United States	**321,004,407**	**364,862,000**	**3,531,905**	**90.9**	**103.3**

Sources: UMass 2015a, USCB 2017a, USCB 2017d, USCB 2018b



Sources: UMass 2015a, USCB 2017r

Figure 4-22. Population Density in the Massachusetts Study Counties by Census Block Group

4.4.1.2 Population Projections

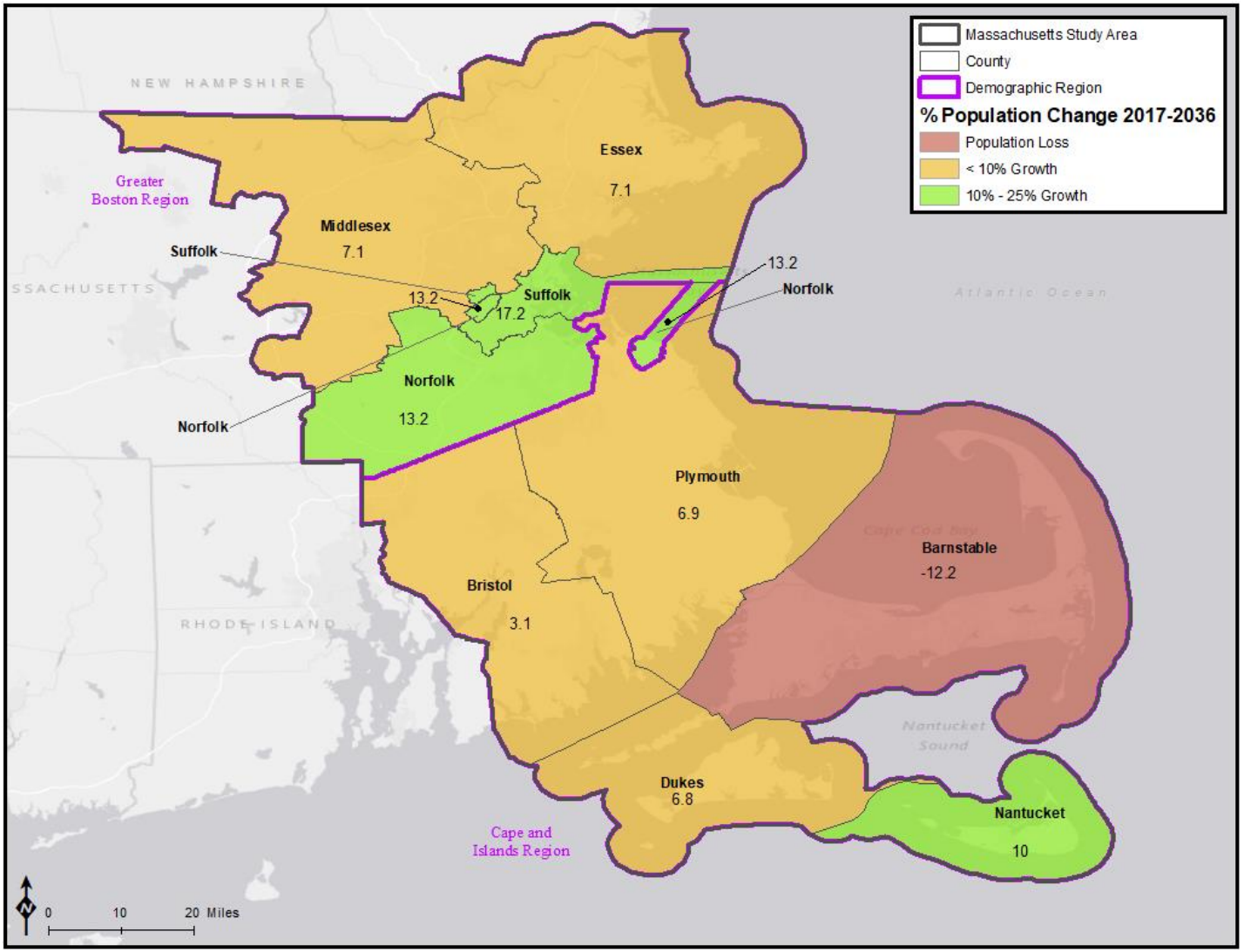
Massachusetts' population is projected to grow 7.8% (7.3 million residents) by 2035. Population in the Study Area is projected to follow a similar pattern to that of the State, growing 8.2% (5.6 million residents) by 2035. The Nation's population is projected to grow 13.7% (364.8 million), more than the State and the Study Area. Table 4-6 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2035, delineated by region (USCB 2017d, USCB 2017c, USCB 2018b, UMass 2015a). Figure 4-23 shows the overall projected percent change in population in each county during the same period.

Population projections were prepared by the UMass Donahue Institute, who predicts strong growth in the Greater Boston Region. Municipalities in the region encompass the cities of Boston, Cambridge, Quincy, and Newton. Projections for the region are driven by expected gains in natural increase and international immigration. The Greater Boston Region attracts more domestic and international migrants than any other area in the State. According to UMass Donahue Institute, the region tends to lose more by out-migration than it gains by domestic in-migration; however, a steady stream of international immigrants more than offsets the loss. The relatively young population of the region, including international immigrants who tend to be younger than the State's median age, ensures a higher fertility rate, which has a positive impact on natural increase (UMass 2015a).

More people are predicted to move to the Study Area. As shown in Table 4-6, projections indicate that 76.0% (5.6 million people) of the State's population will reside in the Study Area by 2035 as compared to 75.7% (5.1 million people) in 2017. Growth will not be uniform across the Study Area. Strong growth trends are expected to continue in the Greater Boston Region, projected to be 10.2% between 2017 and 2035. Continued rapid growth is projected in Suffolk and Norfolk Counties, which are located in the Boston metropolitan area. According to UMass Donahue Institute, strong growth projections are driven by continued positive natural increase and international immigration (USCB 2017d, USCB 2017c, USCB 2018b, UMass 2015a).

Relatively modest growth of 2.2% is predicted for the Cape and Islands Region. According to UMass Donahue Institute, this is due to a pattern of out-migration by youth as they leave the region in pursuit of college or job opportunities elsewhere, as well as a large number of deaths characteristic of an older resident population. Of the nine counties in the Study Area, eight are projected to increase population, while one county (Barnstable) is projected to decrease in population (USCB 2017d, UMass 2015a).

Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future (NOAA 2013). As shown in Table 4-7, this trend is apparent in the Study Area, as population density is projected to increase from 1,460 persons per square mile to 1,580 persons per square mile in the Study Area between 2017 and 2035 (USCB 2017d, USCB 2017c, UMass 2015a). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.



Source: UMass 2015a

Figure 4-23. Overall Projected Population Change from 2017-2035 in the Massachusetts Study Area by County

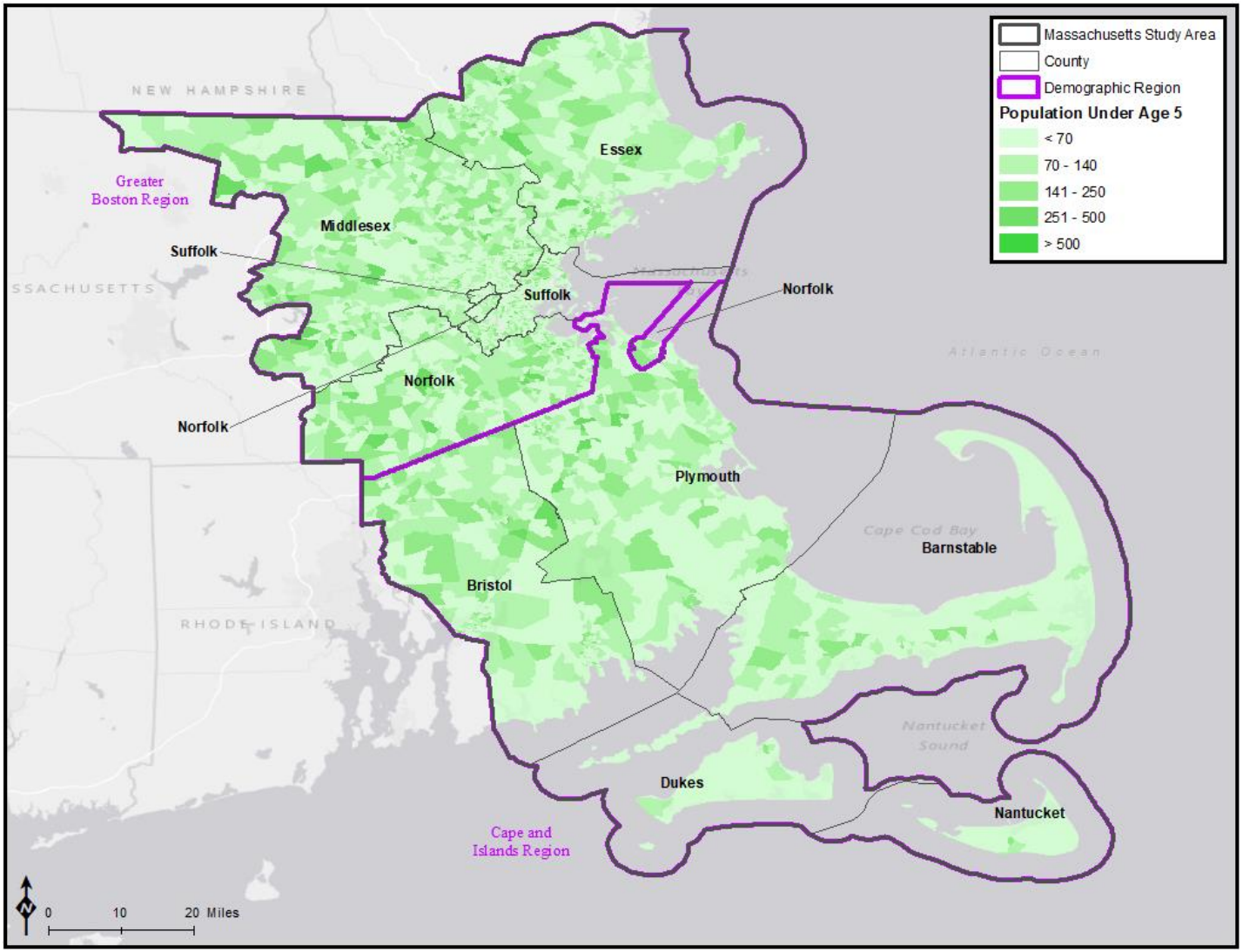
4.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 are also evident in Massachusetts and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as young children and elderly who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 4-24 and Figure 4-25 show the 2017 estimated population "Under Age 5" and "Over Age 65," respectively. Figure 4-26 and Figure 4-27 show the projected change in these groups by 2035. Table 4-8 shows age distribution by region for these groups for the 2017 estimated population and 2035 projected population in the U.S., Massachusetts, and the Study Area (Brookings Institute 2018, USCB 2017b, UMass 2015a).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area (USCB 2017b). According to 2017 estimates, the population of young children represented 6.2% of the U.S. population, 5.3% in Massachusetts, and 5.4% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase suppresses population growth, resulting in the aging of the general population. Table 4-8 shows the breakdown by demographic region. Projections by the year 2035 indicate this group's decline in the Nation (5.7%), the State (5.0%), and the Study Area (5.1%) (USCB 2017b, USCB 2018b, UMass 2015a).

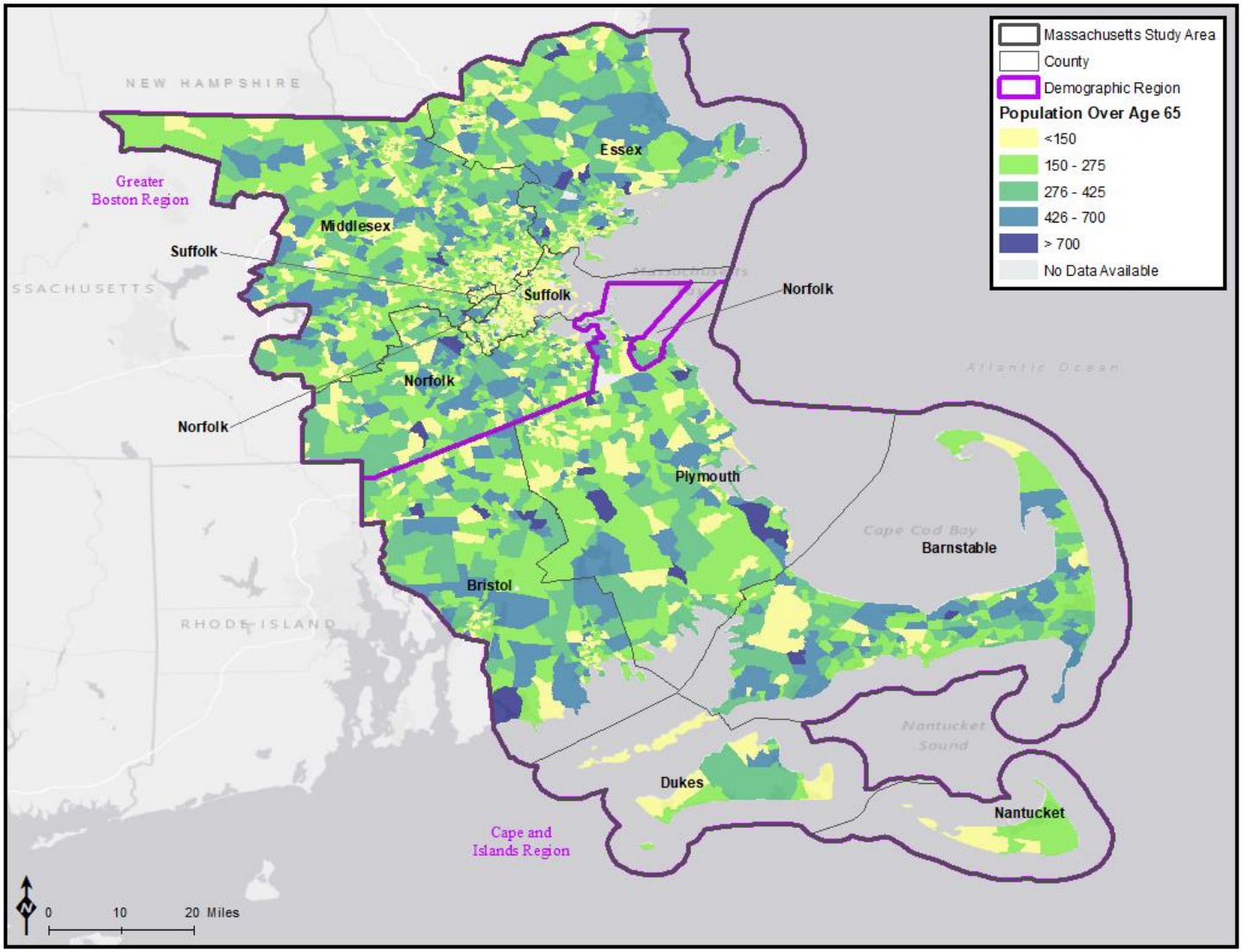
Table 4-8 indicates that the Cape and Islands Region had a smaller percentage (5.0%) of young children than the Greater Boston Region (5.5%) in 2017. By 2035, the percentage of young children is projected to decline further in the Cape and Islands Region (4.9%) and the Greater Boston Region (5.1%). For the study area, this is an overall decrease of 0.3% in the proportion of the population under age 5 from 2017-2035.

According to 2017 estimates shown in Table 4-8, the elderly represented 14.9% of the U.S. population, 15.5% in Massachusetts, and 15.4% in the Study Area. The population of elderly is projected to rise, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2035, the population of elderly Americans is projected to increase to 21.3% in the U.S., 23.0% in the State, and 22.5% in the Study Area. Each region in the Study Area projects an increase in the elderly population. The less populated Cape and Islands Region had the largest percentage (18.4%) of elderly in 2017; a further increase to 25.8% is projected by 2035. For the study area, this is an overall increase of 7.1% in the proportion of the population over age 65 from 2017-2035 (USCB 2017b, USCB 2018b, UMass 2015a).



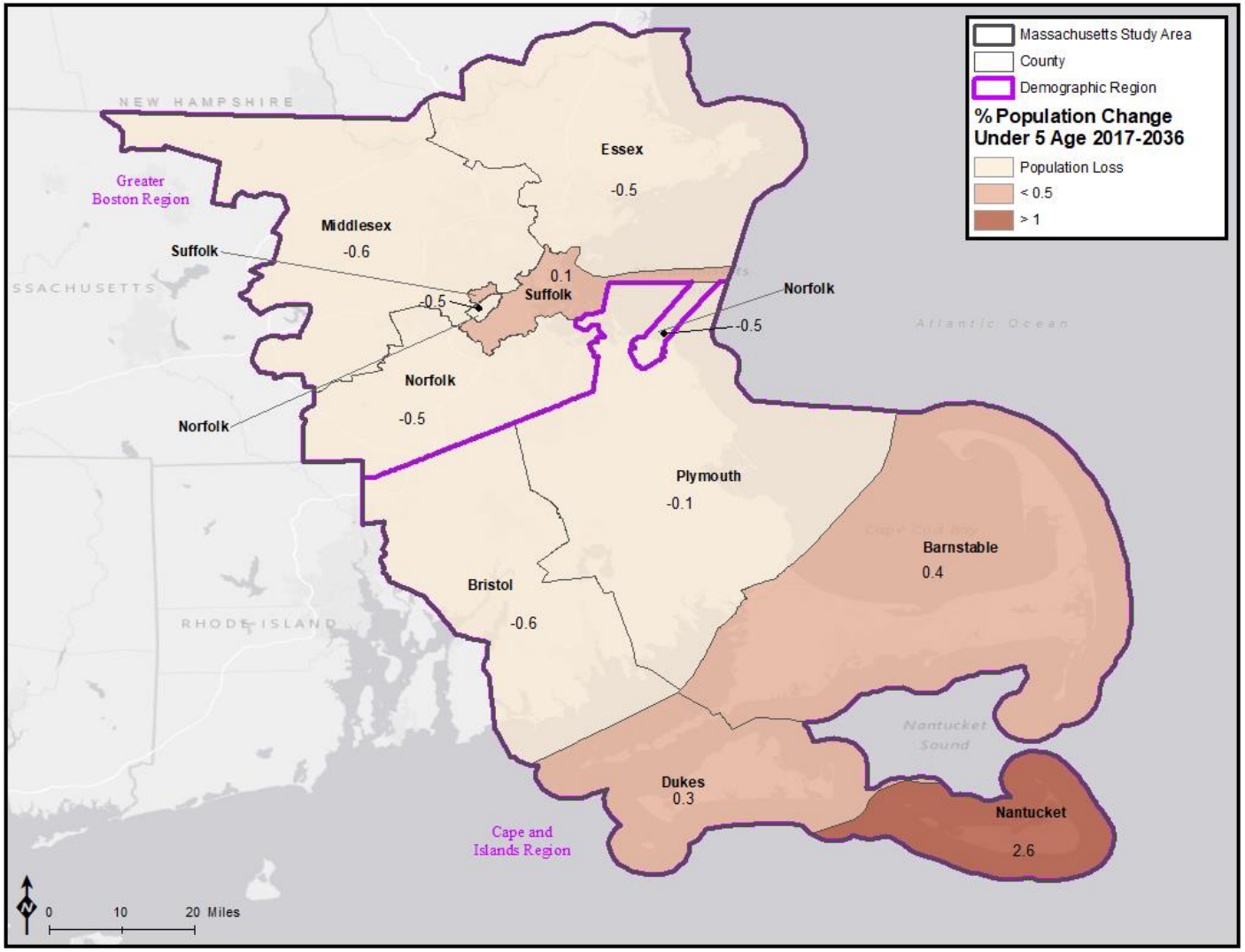
Source: USCB 2017r

Figure 4-24. Population Under Age 5 in the Massachusetts Study Area by Census Block Group



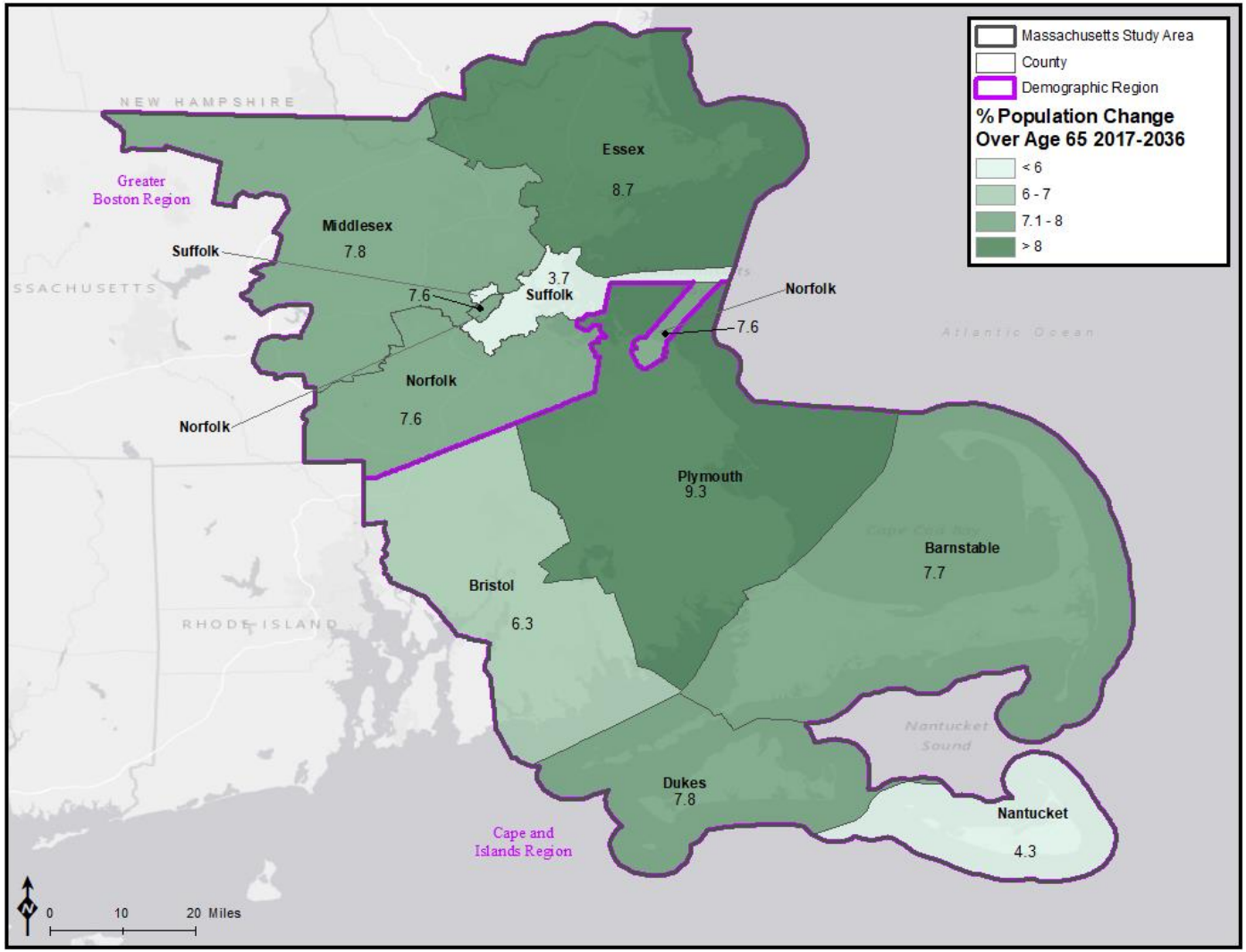
Source: USCB 2017r

Figure 4-25. Population Over Age 65 in the Massachusetts Study Area by Census Block Group



Source: UMass 2015a

Figure 4-26. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Massachusetts Study Area by 2036



Source: UMass 2015a

Figure 4-27. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Massachusetts Study Area by 2036

Table 4-8. Population Under Age 5 and Over Age 65 in the Massachusetts Study Area

Region	Geographic Unit	2017 Estimates					Projected 2035				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2035)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Cape and Islands	**Barnstable**	213,900	7,962	3.7	60,860	28.5	187,674	7,723	4.1	67,762	36.1
	Bristol	557,016	29,460	5.3	89,144	16.0	573,960	27,191	4.7	128,114	22.3
	Dukes	17,275	755	4.4	3,659	21.2	18,453	864	4.7	5,339	28.9
	Nantucket	10,912	551	5.0	1,605	14.7	12,004	915	7.6	2,286	19.0
	Plymouth	509,114	27,012	5.3	84,804	16.7	544,388	28,571	5.2	141,682	26.0
	Total Cape and Islands Region	***1,308,217***	***65,740***	***5.0***	***240,072***	***18.4***	***1,336,479***	***65,264***	***4.9***	***345,183***	***25.8***
Greater Boston	**Essex**	775,860	43,794	5.6	123,692	15.9	831,063	43,062	5.2	205,163	24.7
	Middlesex	1,582,857	87,359	5.5	228,153	14.4	1,694,670	83,626	4.9	376,963	22.2
	Norfolk	694,389	37,428	5.4	110,873	16.0	786,274	38,234	4.9	185,576	23.6
	Suffolk	780,685	42,672	5.5	88,307	11.3	914,644	50,978	5.6	137,168	15.0
	Total Greater Boston Region	***3,833,791***	***211,253***	***5.5***	***551,025***	***14.4***	***4,226,651***	***215,900***	***5.1***	***904,870***	***21.4***
	Study Area Total	**5,142,008**	**276,993**	**5.4**	**791,097**	**15.4**	**5,563,130**	**281,164**	**5.1**	**1,250,053**	**22.5**
	Massachusetts	**6,789,319**	**362,855**	**5.3**	**1,049,751**	**15.5**	**7,319,469**	**365,896**	**5.0**	**1,679,917**	**23.0**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**364,862,000**	**20,993,000**	**5.7**	**77,997,000**	**21.3**

Sources: UMass 2015a, USCB 2017b, USCB 2018b

The Greater Boston Region is exceptionally young relative to other regions in Massachusetts due to its unique age-specific migration pattern driven by the massive in-migration of young adults followed by steady out-migration of residents as they age and take their children with them. According to UMass Donahue Institute, people come to Boston in their late teens and early twenties for education, economic opportunities, or the cultural amenities of urban life. There is no mass exodus immediately after graduation but rather a steady outflow through the upper age groups. A good number of young adults stay through their twenties (thus contributing to a steady number of births), but as they age into their thirties, they are increasingly more likely to move out of the region. The rates of net out-migration are particularly high among those in their thirties and early forties (young families) as well as among those nearing or in retirement age (UMass 2015a).

International migration is also a major factor in understanding population change in the Greater Boston Region. According to UMass, immigration contributes over 150,000 new area residents every 5 years. While approximately one-third of these represent college students who leave the country when their studies conclude, over 100,000 new immigrants per 5-year period are expected to remain in the region. As a result, rapid population growth over the next few years is projected as the swell of millennials (the children of the baby boom generation) age through their twenties. Because the region tends to lose residents to out-migration as they move through the family-building and retirement phases of life, UMass expects population growth to slow in the 2020s as the millennials age into their thirties and early forties and more baby boomers enter their sixties and seventies. However, the region's population will continue to grow during this time as international immigration and a steady number of births will more than offset population loss associated with domestic out-migration and the gradual rise in the number of resident deaths (UMass 2015a).

According to UMass, the impact of the nationwide trend of increasing mortality rates and declining fertility rates due to the large number of aging baby boomers will be exacerbated in the Cape and Islands Region, as its age profile is notably older than both the State and the Nation. In 2010, residents 70 years and older comprised 9% of the U.S. population and 10% of the State population compared to 17% in the Cape and Islands. The Cape and Islands Region is dominated by a pattern of aging in place, net domestic out-migration of the area's youth, and natural population decrease as a result of increasing mortality rates; these converging trends are reflected by lower overall population growth (2.2%) in the Study Area counties located in this region (UMass 2015a).

4.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area, are presented in Table 4-9.

As shown in Table 4-9, in 2017 homeownership in Massachusetts was 62.4%, lower than the Nation (63.8%) and higher than the Study Area (61.7%). Renters comprised approximately 37.6% and 38.3% of the State and Study Area, respectively, in 2017. The percentage of households in renter-occupied housing units in the Nation was lower (36.2%) (USCB 2017m).

Table 4-9. Housing Utilization and Vacancy Rates in the Massachusetts Study Area

Region	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Cape and Islands	**Barnstable**	162,629	95,011	67,618	41.6	74,862	78.8	20,149	21.2	$375,000	$1,199
	Bristol	233,550	215,903	17,647	7.6	135,144	62.6	80,759	37.4	$280,400	$855
	Dukes	17,677	6,139	11,538	65.3	4,770	77.7	1,369	22.3	$674,600	$1,441
	Nantucket	12,030	3,761	8,269	68.7	2,438	64.8	1,323	35.2	$995,900	$1,689
	Plymouth	204,764	184,195	20,569	10.0	139,821	75.9	44,374	24.1	$344,400	$1,185
	Total Cape and Islands Region	***630,650***	***505,009***	***125,641***	***19.9***	***357,035***	***70.7***	***147,974***	***29.3***	***NA***	***NA***
Greater Boston	**Essex**	311,179	291,659	19,520	6.3	186,007	63.8	105,652	36.2	$373,400	$1,135
	Middlesex	626,351	593,784	32,567	5.2	371,697	62.6	222,087	37.4	$453,300	$1,455
	Norfolk	275,925	262,324	13,601	4.9	181,881	69.3	80,443	30.7	$433,000	$1,450
	Suffolk	328,662	303,676	24,986	7.6	110,361	36.3	193,315	63.7	$430,900	$1,419
	Total Greater Boston Region	***1,542,117***	***1,451,443***	***90,674***	***5.9***	***849,946***	***58.6***	***601,497***	***41.4***	***NA***	***NA***
	Study Area Total	**2,172,767**	**1,956,452**	**216,315**	**10.0**	**1,206,981**	**61.7**	**749,471**	**38.3**	**$403,475**	**$1,317**
	Massachusetts	**2,864,989**	**2,585,715**	**279,274**	**9.7**	**1,612,329**	**62.4**	**973,386**	**37.6**	**$352,600**	**$1,173**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

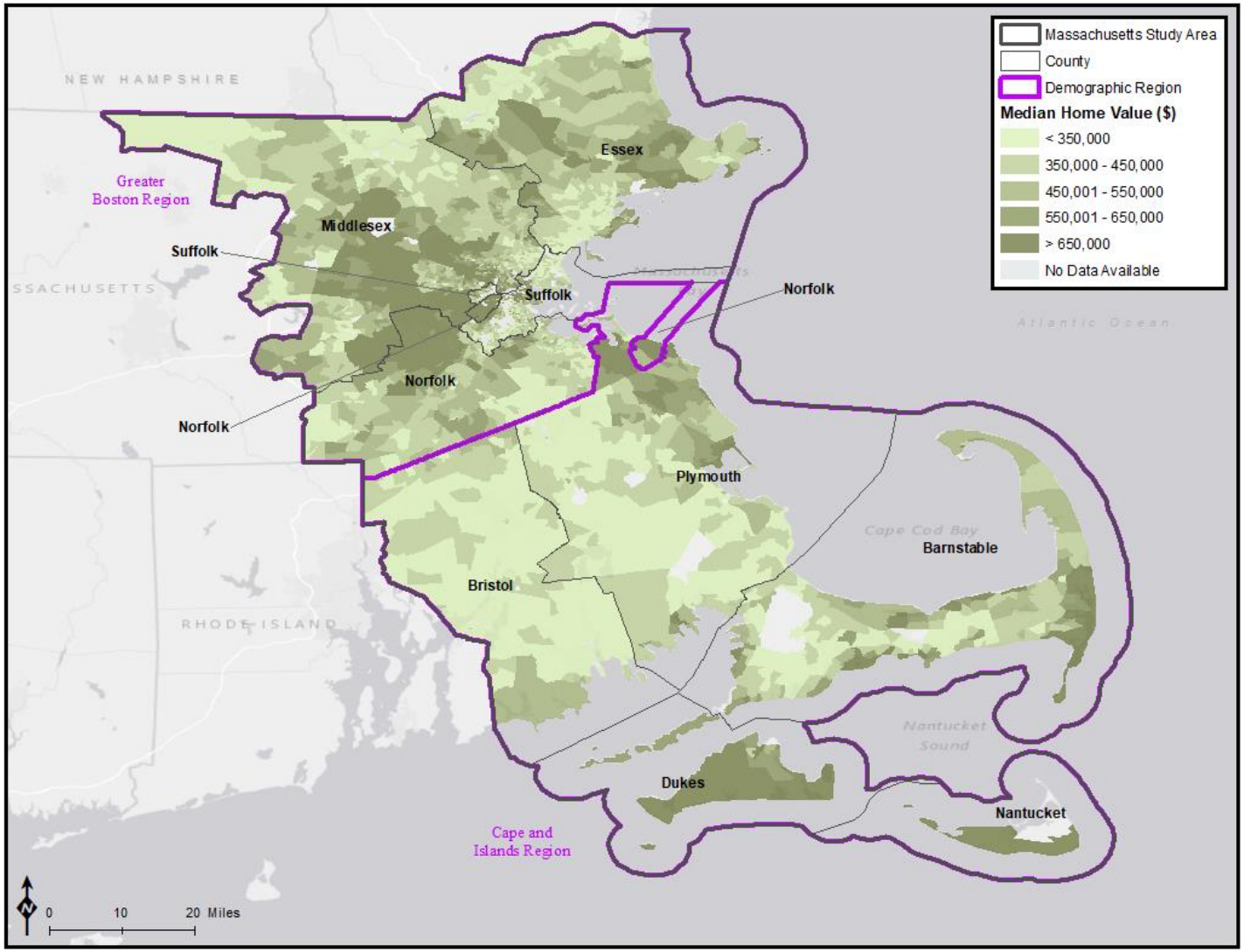
Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m

Figure 4-28 illustrates median home values in the Study Area, indicating that home values were highest in the Greater Boston Region in 2017, located within the Boston-Cambridge-Newton metropolitan area (USCB 2017r). The Boston-Cambridge-Newton metropolitan area was categorized as "hot" by Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market. According to Zillow, home values in the metropolitan area were $485,849 and increased 1.6% during the 12-month period ending November 2019. Home values in the State increased 4.1% during the same period. The Providence-Warwick metropolitan area was categorized as "very hot," which indicates market conditions favorable to sellers, after posting a 1.6% increase during the same period. The Barnstable Town metropolitan area was categorized as "warm" having declined 0.5%. Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including Massachusetts (Zillow).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low-Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

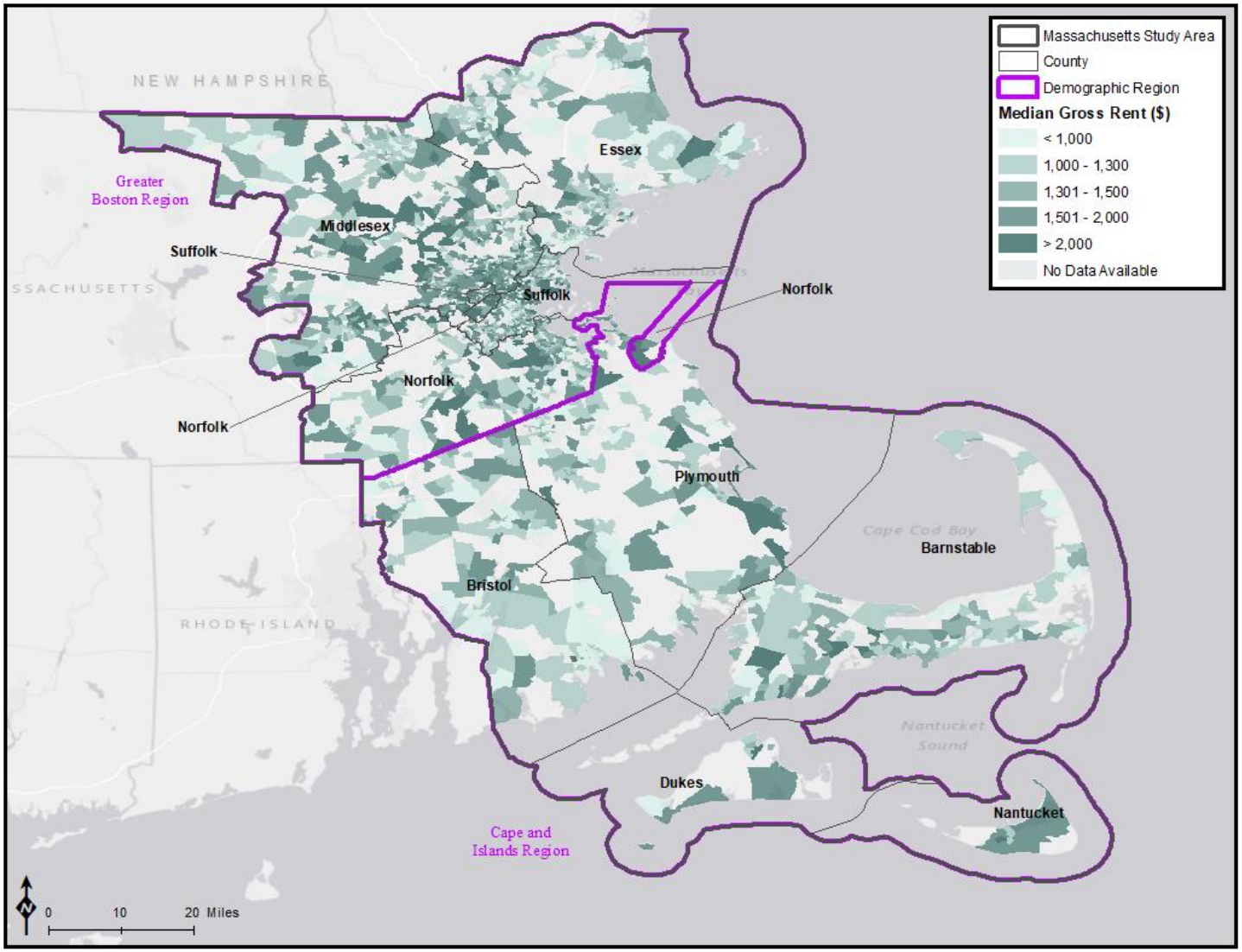
Figure 4-29 illustrates median gross rent in the Massachusetts Study Area by Census Block Group. According to the National Low-Income Housing Coalition, as of 2019, fair market rent for a two-bedroom rental unit in the State is $1,758. In these conditions, a minimum wage worker would have to work approximately 113 hours a week in order to afford a two-bedroom fair market rate home. Massachusetts has a shortage of approximately 169,809 rental homes affordable and available to extremely low-income households. Approximately 313,053 (32%) of renter households in Massachusetts are considered extremely low income; approximately 184,701 (59%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (30%), single caregivers (36%), and disabled (24%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a).

As shown in Table 4-9, home vacancy rates in Massachusetts (9.7%) in 2017 were lower than the Nation (12.2%) and the Study Area (10.0%). Figure 4-30 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (19.9%) in the Cape and Islands Region and the lowest in the Greater Boston Region (5.2%) (USCB 2017g). Low vacancy rates may drive home prices higher and encourage development in surrounding areas. High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Nantucket, Dukes, and Barnstable Counties have high vacancy rates due to the high number of second homes in the area. Estimates produced by the Cape Cod Commission, using survey data on second homes indicate that the seasonal population on Cape Cod, when averaged over a full year, is equivalent to 68,856 full-time residents (UMass 2015a).



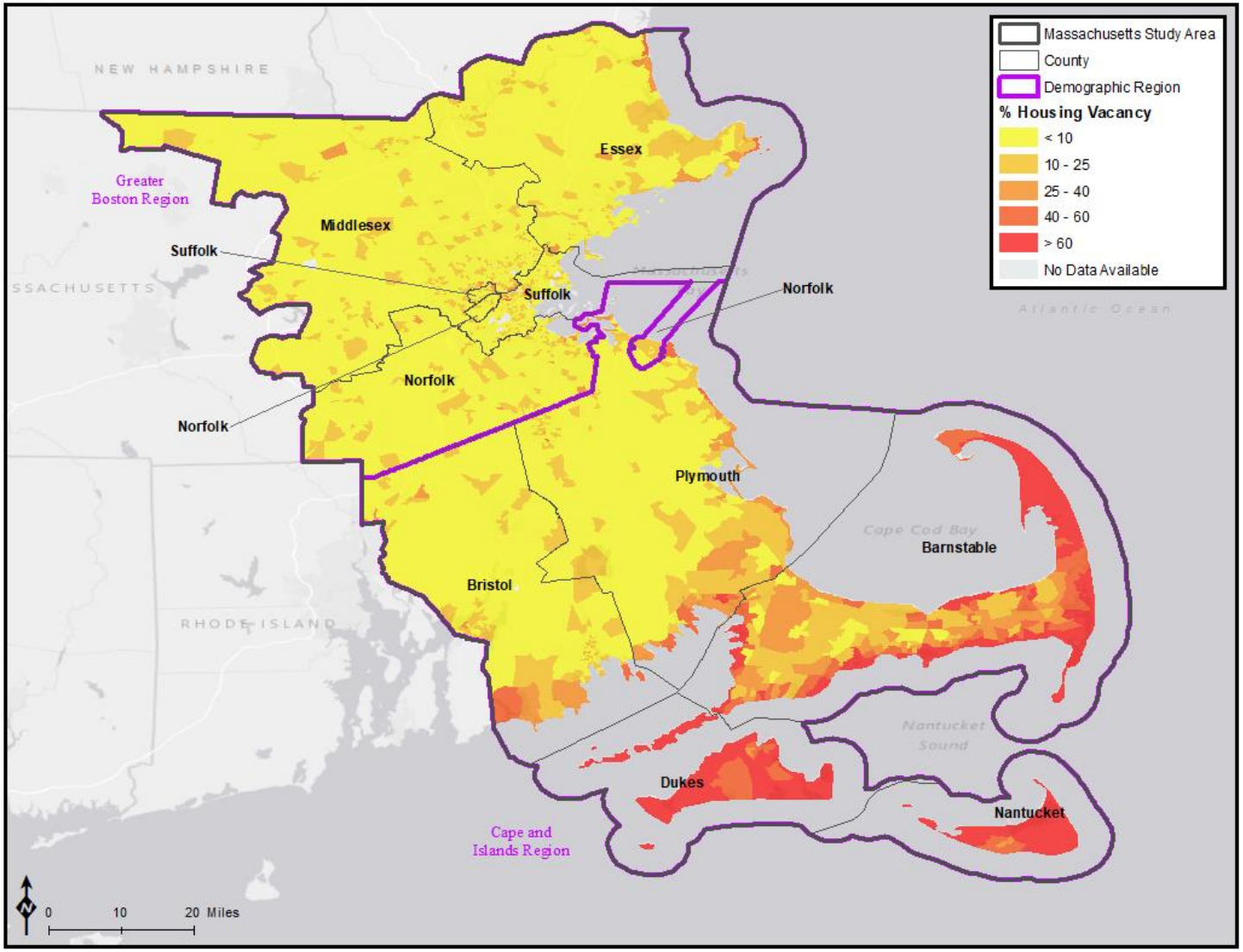
Source: USCB 2017r

Figure 4-28. Median Home Value in the Massachusetts Study Area by Census Block Group



Source: USCB 2017r

Figure 4-29. Median Gross Rent in the Massachusetts Study Area by Census Block Group



Source: USCB 2017r

Figure 4-30. Housing Vacancy Rates in the Massachusetts Study Area by Census Block Group

4.4.4 Employment

4.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 4-10. In 2017, the Study Area had a total employment of 2.7 million jobs, representing approximately 76.8% of the total jobs in Massachusetts and 1.8% of the total jobs in the U.S. (USCB 2017p).

Massachusetts' 2018 Annual Gross Domestic Product was 569.5 billion, which represented 2.8% of the Nation's gross domestic product (BEA 2019).

Table 4-10. Census Bureau Labor and Industry Statistics for the U.S., Massachusetts, and the Massachusetts Study Area (number of jobs)

Industry	United States	Percent (%)	Massachusetts	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**3,525,672**		**2,711,111**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	13,907	0.4	8,653	0.3
Construction	9,564,541	6.4	194,219	5.5	148,244	5.5
Manufacturing	15,477,389	10.3	317,979	9.0	226,070	8.3
Wholesale trade	4,042,867	2.7	80,307	2.3	61,619	2.3
Retail trade	17,167,000	11.4	368,782	10.5	274,712	10.1
Transportation and warehousing, and utilities	7,681,579	5.1	129,763	3.7	96,672	3.6
Information	3,173,300	2.1	83,579	2.4	68,347	2.5
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	262,118	7.4	210,858	7.8
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	478,350	13.6	401,150	14.8
Educational services, and health care and social assistance	34,781,348	23.1	993,880	28.2	749,552	27.6
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	308,836	8.8	238,867	8.8
Other services, except public administration	7,371,226	4.9	155,899	4.4	121,017	4.5
Public administration	7,025,870	4.7	138,053	3.9	105,350	3.9

Source: USCB 2017p

Table 4-10 and Figure 4-31 show the number of jobs in each major industry sectors for the U.S., the State, and the Study Area. The dominant industry sectors in the Study Area are educational services and health

care and social assistance (27.6%); professional, scientific, and management, and administrative and waste management (14.8%); retail trade (10.1%); and arts, entertainment, and recreation, and accommodation and food services (8.8%). Generally, the dominant employment categories in the Study Area are similar to those of the State. Massachusetts has a larger proportion of manufacturing jobs (9.0%) as compared to the Study Area (8.3%), but less than the Nation (10.3%) (USCB 2017p). Massachusetts has virtually no petroleum or oil industry, except for a Federal gas reserve to avoid winter shortages that is able to warm one fourth of the households in the Commonwealth. The Boston Harbor takes in refined petroleum products to disperse throughout the State (EIA 2019).

Figure 4-32 shows the location of jobs within the Study Area. The greater portion of jobs are located in the Greater Boston Region near the high-density MSA of Boston-Cambridge-Newton. Job distribution is less robust in the relatively low-density Cape and Islands counties, especially rural Dukes and Nantucket Counties. Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services (USDA 2013).

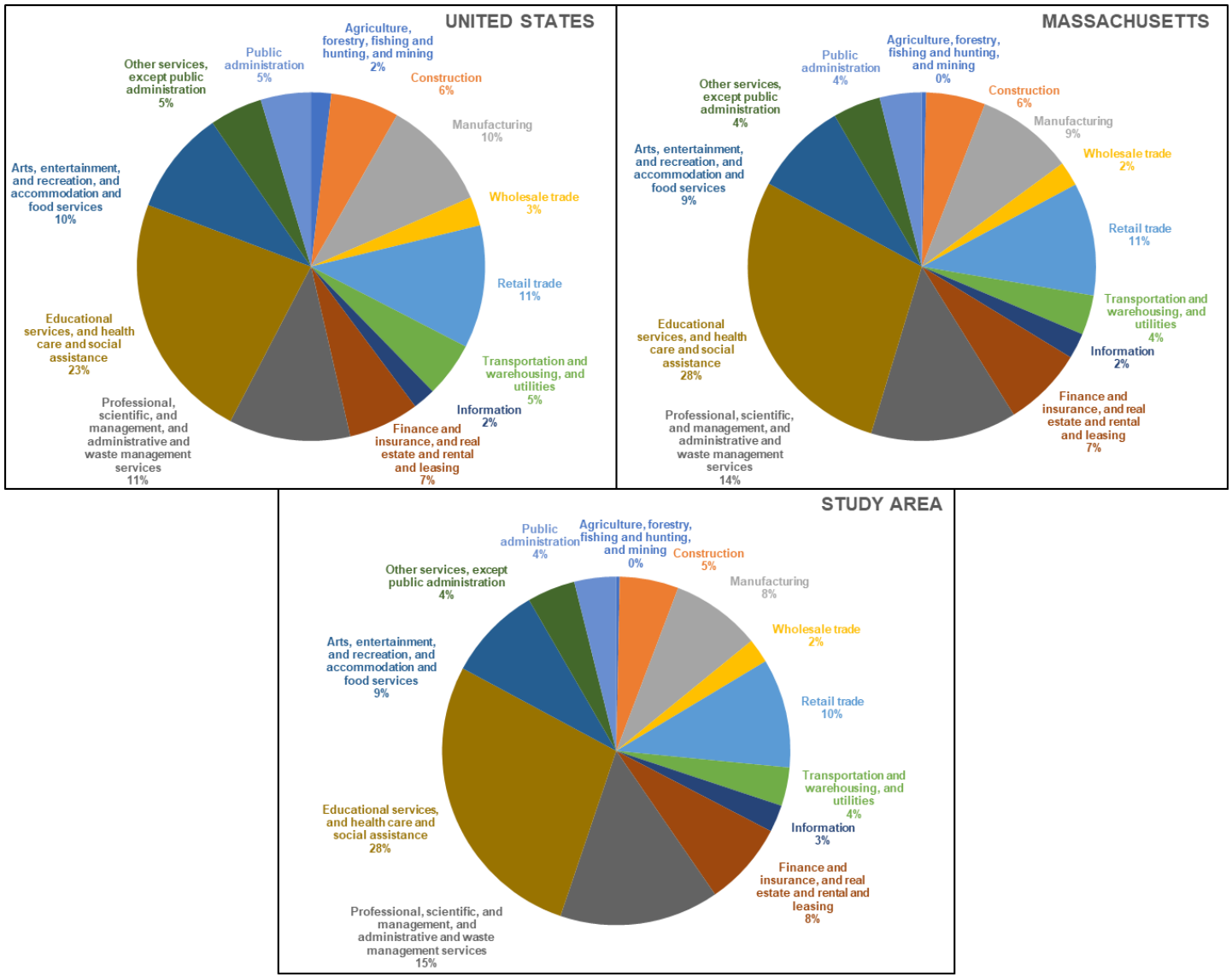
4.4.4.1.1 Massachusetts' Ocean Economy

Overall, Massachusetts' ocean economy ranked 11th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 4-11, Massachusetts' ocean economy accounted for 100,272 maritime jobs in 2016, accounting for 2.9% of Massachusetts' employment (NOAA 2016b, USCB 2017i). Within the State, Tourism and Recreation was the dominant sector, accounting for 78.8% (75,788) of maritime jobs. The Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 97,476 maritime jobs, representing 97.2% of total maritime jobs in the State. Suffolk County had the greatest number of maritime jobs (24,514), representing 19.7% of maritime jobs in the Study Area. Figure 4-33 shows the percent of maritime related jobs to total jobs in each county in the Massachusetts Study Area. The highest percentage of maritime jobs to overall county jobs were in Nantucket (29.2%), Dukes (21.5%), and Barnstable (21.6%) Counties, indicative of less economic diversity in rural areas and their coastal locations (USDA 2013, NOAA 2016b). The counties in the Cape and Islands Roads Region have a higher percentage of maritime related jobs, reflecting their proximity to the ocean and maritime employment opportunities.

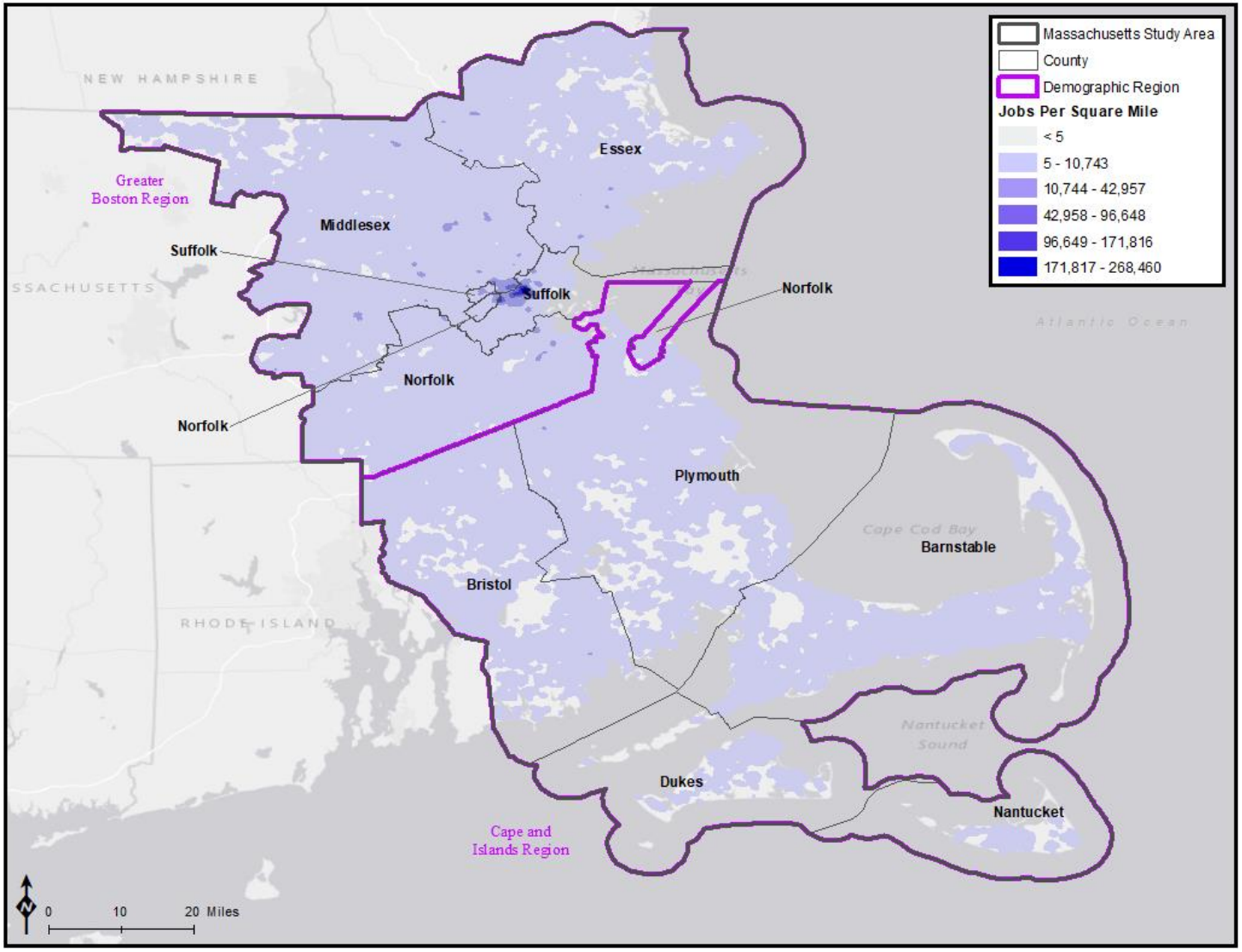
4.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 4-11, in 2017 Massachusetts had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, Massachusetts had a median income of $74,167 (28.6% higher than the Nation's median income) and a per capita income of $39,913 (28% higher than the Nation's per capita income). The Study Area had lower median income ($73,533) but higher per capita income ($41,913) as compared to the State (USCB 2017k, USCB 2017n).



Source: USCB 2017p

Figure 4-31. Number of Jobs by Industry Sector for the U.S., Massachusetts, and the Massachusetts Study Area



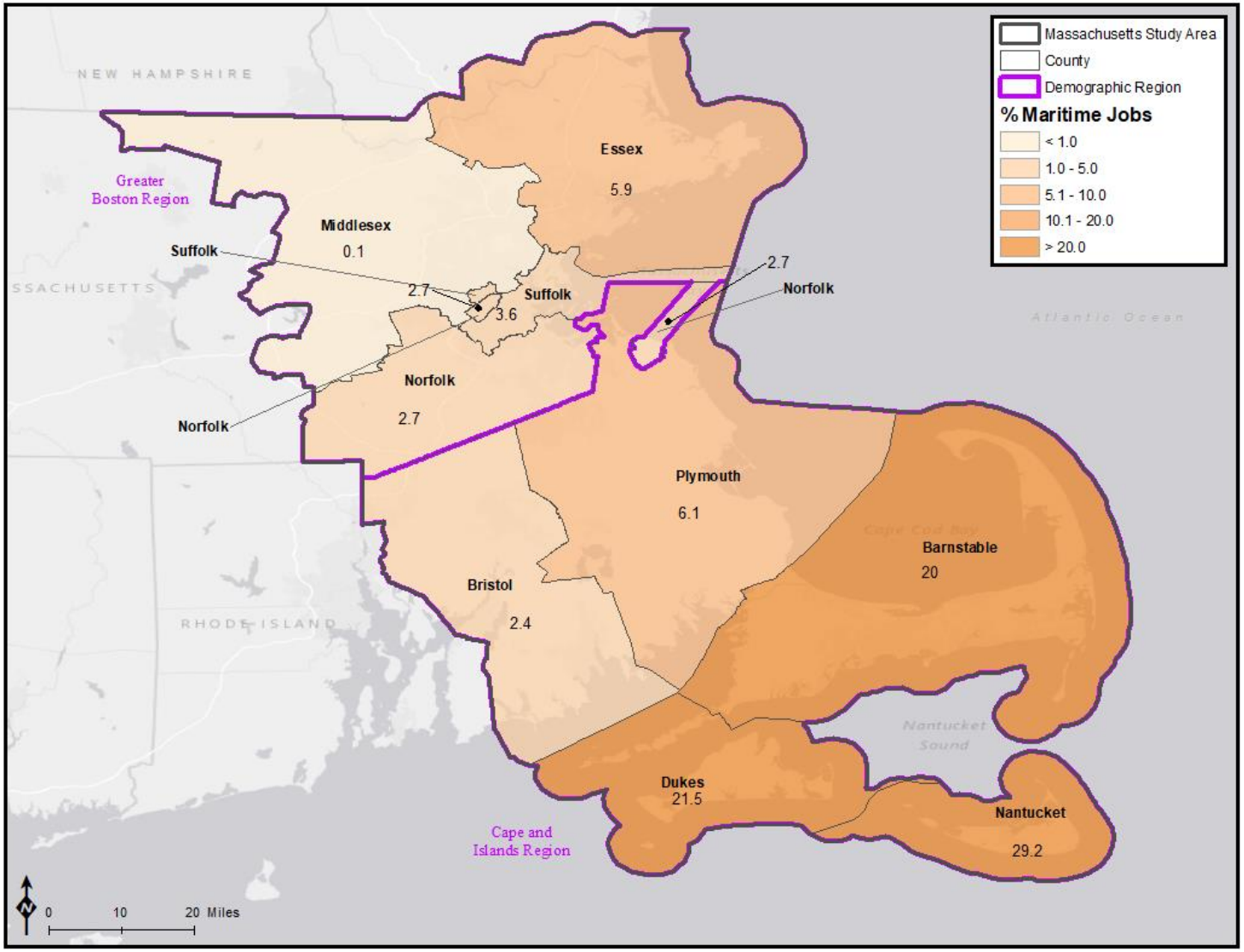
Source: USCB 2017r

Figure 4-32. Jobs per Square Mile in the Massachusetts Study Area by Census Block Group

Table 4-11. Employment Data in the Massachusetts Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017) [1]	Civilian Labor Force [1]	Employed (Civilian Labor Force) [1]	Unemployed (Civilian Labor Force) [1]	Percent Unemployed [1] (%)	Total Jobs [2]	Maritime Jobs [3]	Percent Maritime Jobs [3] (%)	Median Household Income (2017) [4]	Per Capita Income (2017) [5]
Cape and Islands	Barnstable	110,774	110,258	104,246	6,012	5.5	86,346	17,830	20.6	$68,048	$40,886
	Bristol	299,506	299,300	278,538	20,762	6.9	224,180	5,328	2.4	$62,514	$32,406
	Dukes	9,460	9,454	9,172	282	3.0	7,388	1,589	21.5	$67,535	$42,956
	Nantucket	6,679	6,659	6,408	251	3.8	5,607	1,636	29.2	$91,942	$47,924
	Plymouth	278,717	278,442	261,653	16,789	6.0	188,200	11,447	6.1	$82,081	$39,247
	Total Cape and Islands Region	***705,136***	***704,113***	***660,017***	***44,096***	***6.3***	***511,721***	***37,830***	***7.4***	***NA***	***NA***
Greater Boston	Essex	423,449	423,072	397,621	25,451	6.0	324,768	19,221	5.9	$73,533	$38,604
	Middlesex	907,744	906,269	862,873	43,396	4.8	915,829	5,985	0.7	$92,878	$47,616
	Norfolk	388,817	388,609	367,385	21,224	5.5	362,135	9,926	2.7	$95,668	$49,816
	Suffolk	456,594	455,769	423,215	32,554	7.1	688,414	24,514	3.6	$61,242	$38,031
	Total Greater Boston Region	***2,176,604***	***2,173,719***	***2,051,094***	***122,625***	***5.6***	***2,291,146***	***59,646***	***2.6***	***NA***	***NA***
	Study Area Total	**2,881,740**	**2,877,832**	**2,711,111**	**166,721**	**5.8**	**2,802,867**	**97,476**	**3.5**	**$73,533**	**$41,943**
	Massachusetts	**3,755,481**	**3,750,528**	**3,525,672**	**224,856**	**6.0**	**3,510,691**	**100,272**	**2.9**	**$74,167**	**$39,913**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 4-33. Maritime Jobs in the Massachusetts Study Area by County

As shown in Table 4-11, in 2017 median household income in the regions comprising the Study Area ranged from an average of $68,048 (Cape and Island Region) to an average of $83,206 (Greater Boston Region). In 2017, per capita income ranged from an average of $40,684 (Cape and Island Region) to an average of $43,517 (Greater Boston Region). Figure 4-34 shows median household income in the Study Area by census block group. Figure 4-35 shows per capita income in the Study Area by census block group. The figures portray high median household and per capita incomes in the Greater Boston Region (USCB 2017k, USCB 2017n).

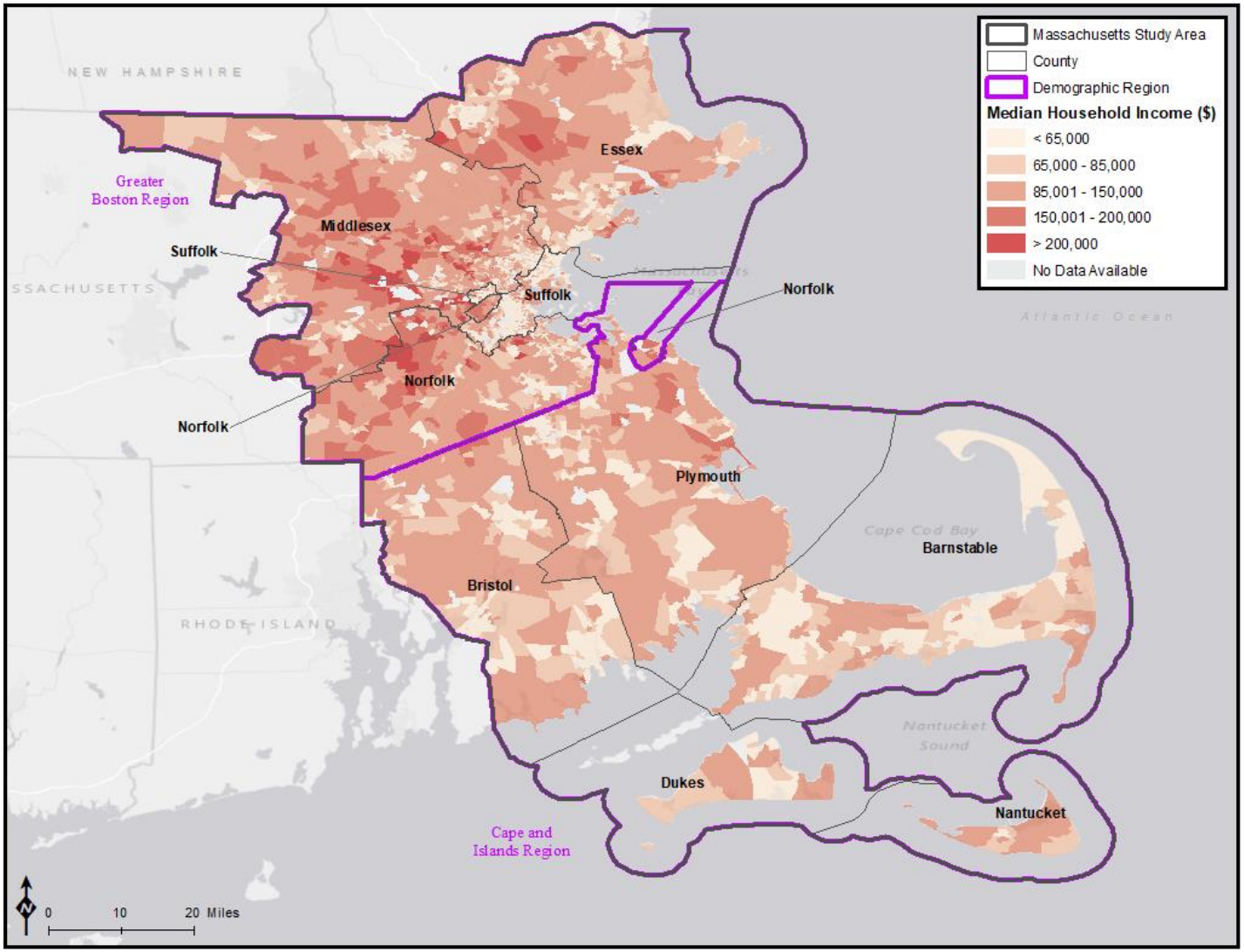
Regional disparities exist between the Greater Boston and the Cape and Islands Regions. According to MassBenchmarks Journal, Massachusetts has become the second wealthiest State in terms of per capita income. However, the State's dynamic mix of high-technology and education-intensive industries prosperity has not been evenly distributed regionally and between different income groups. In the eastern part of the State, an economy has prevailed with tight labor markets, high wages and salaries, high levels of education, and a complex of firms that have spawned and made the most of agglomeration effects. World-class universities and hospitals have also enriched this economic fabric. While the rest of Massachusetts does maintain industry cluster strengths in sectors like manufacturing, fishing, higher education, and health care, they trail the Boston area in higher-wage fields like life sciences, technology, research and development, and professional services. As a result, many communities outside the Greater Boston Region have come up short on economic dynamism and prosperity. Their fate has brought stubbornly high unemployment, a dearth of quality jobs and economic opportunities, and an absence of positive economic drivers (Clayton-Matthews and Nakosteen 2017).

4.4.4.3 Unemployment Rates

Figure 4-36 shows the 2017 unemployment rates in the counties in the Study Area by census block group. Table 4-11 presents unemployment rates for each county in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 5.8%, similar to the State (6.0%) but less than the Nation (6.6%), reflecting the availability of jobs in high-density urban areas. Within the Study Area, unemployment rates ranged from 3.0% in Dukes County (Cape and Island Region) to 7.1% in Suffolk County (Greater Boston Region) in 2017 (USCB 2017h).

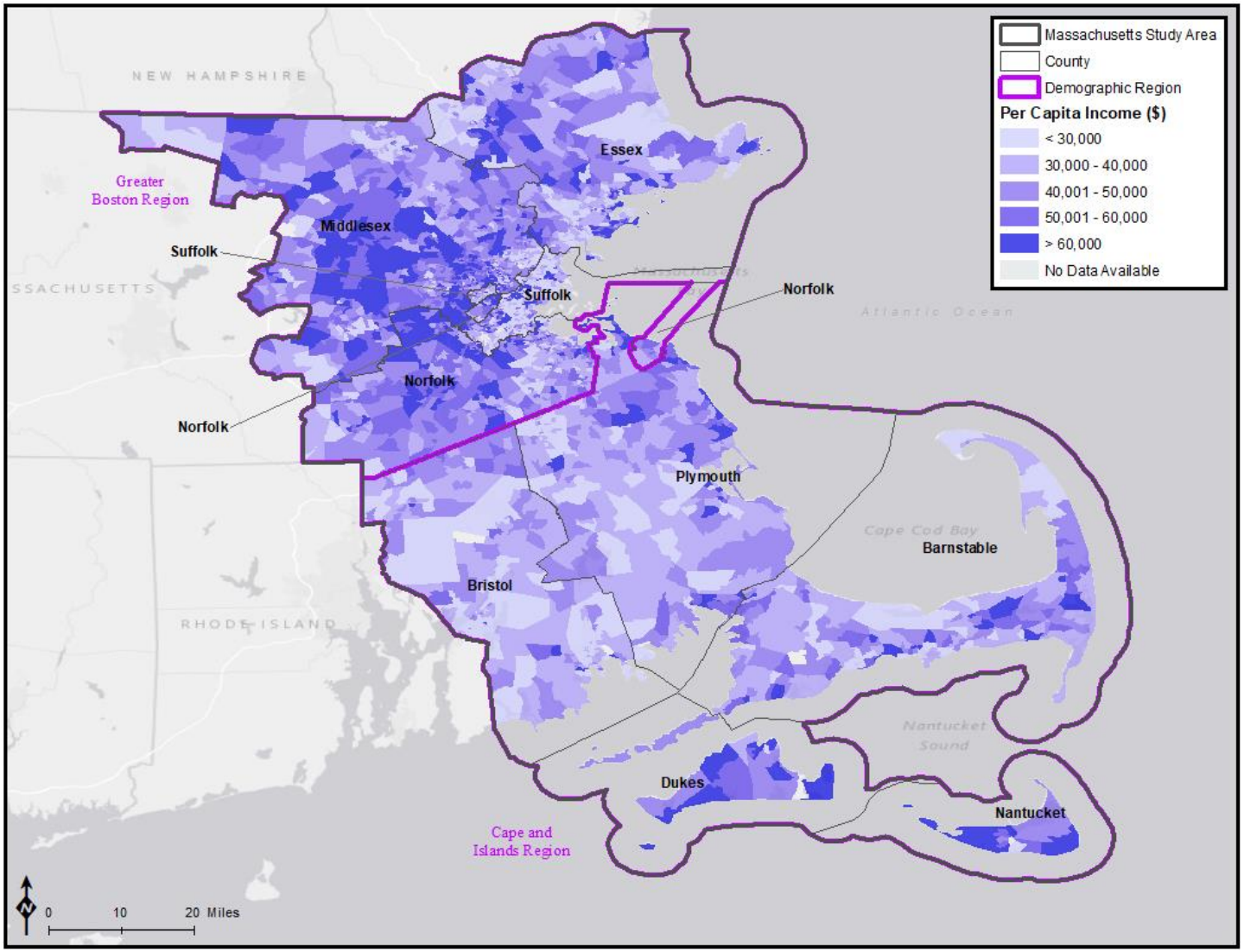
The unemployment rate was 6.3% in the Cape and Islands Region in 2017, with the highest rates occurring in Bristol County (6.9%) (USCB 2017h). The unemployment rate was 5.6% in the Greater Boston Region in 2017, with counties in this region ranging from 4.8% (Middlesex County) to 7.1% (Suffolk County) (USCB 2017h). Dukes County had the lowest unemployment rate (3.0%) (USCB 2017h).

According to MassBenchmarks, the State may face worker shortages in the future after its long expansion. Employment in Massachusetts has grown considerably faster than the working age population and almost twice as fast as the labor force. While this is good news for workers and signals a healthy State economy, employers may be facing difficulties in finding qualified workers to hire. The downside of a "hot" labor market can be shortages of available qualified workers (Clayton-Matthews and Nakosteen 2017).



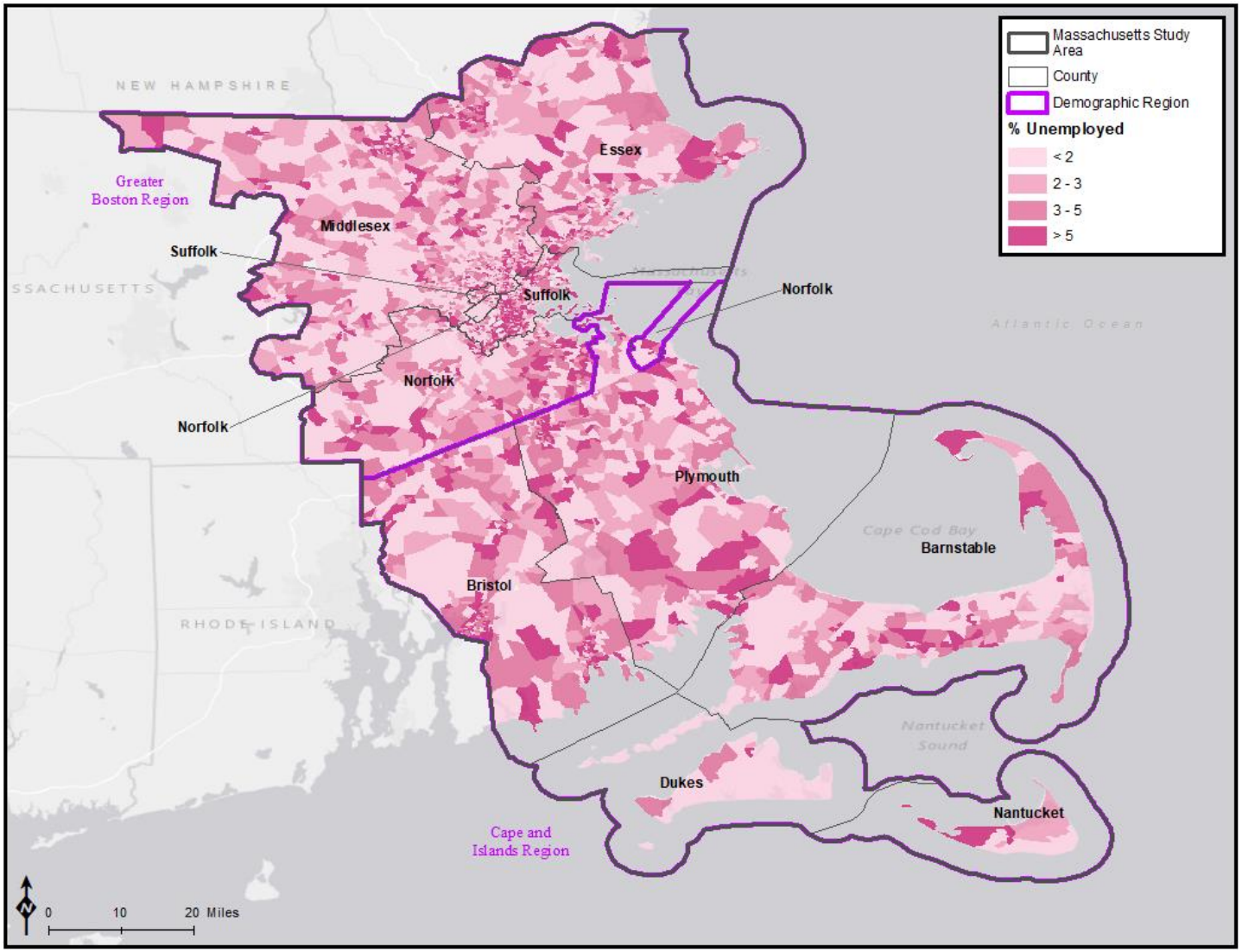
Source: USCB 2017r

Figure 4-34. Median Household Income in the Massachusetts Study Area by Census Block Group



Source: USCB 2017r

Figure 4-35. Per Capita Income in the Massachusetts Study Area by Census Block Group



Source: USCB 2017r

Figure 4-36. Unemployment Rates in the Massachusetts Study Area by Census Block Group

4.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 4-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in counties comprising the Study Area, the State, and the Nation (USCB 2017t).

Figure 4-37 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associate's, bachelor's, and/or advanced degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Massachusetts, 24.6% of the working-age population earned only a high school diploma; 23.2% earned a college or advanced degree.
- In the Study Area, 23.9% of the working-age population earned only a high school diploma; 24.0% earned a college or advanced degree (USCB 2017q).

Figure 4-38 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

In general, the regional percentages of workers with various educational achievement levels is consistent with State and national levels with the exception of workers with bachelor's and graduate or professional degrees. For these achievement levels, the number of workers in the Greater Boston Region with bachelor's and graduate or professional degrees significantly exceeded the national percentages, though they were still in line with the State percentages as shown in Table 4-12. This is unsurprising given the quantity and quality of the educational institutions in this region as well as the presence of major corporations and institutions.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

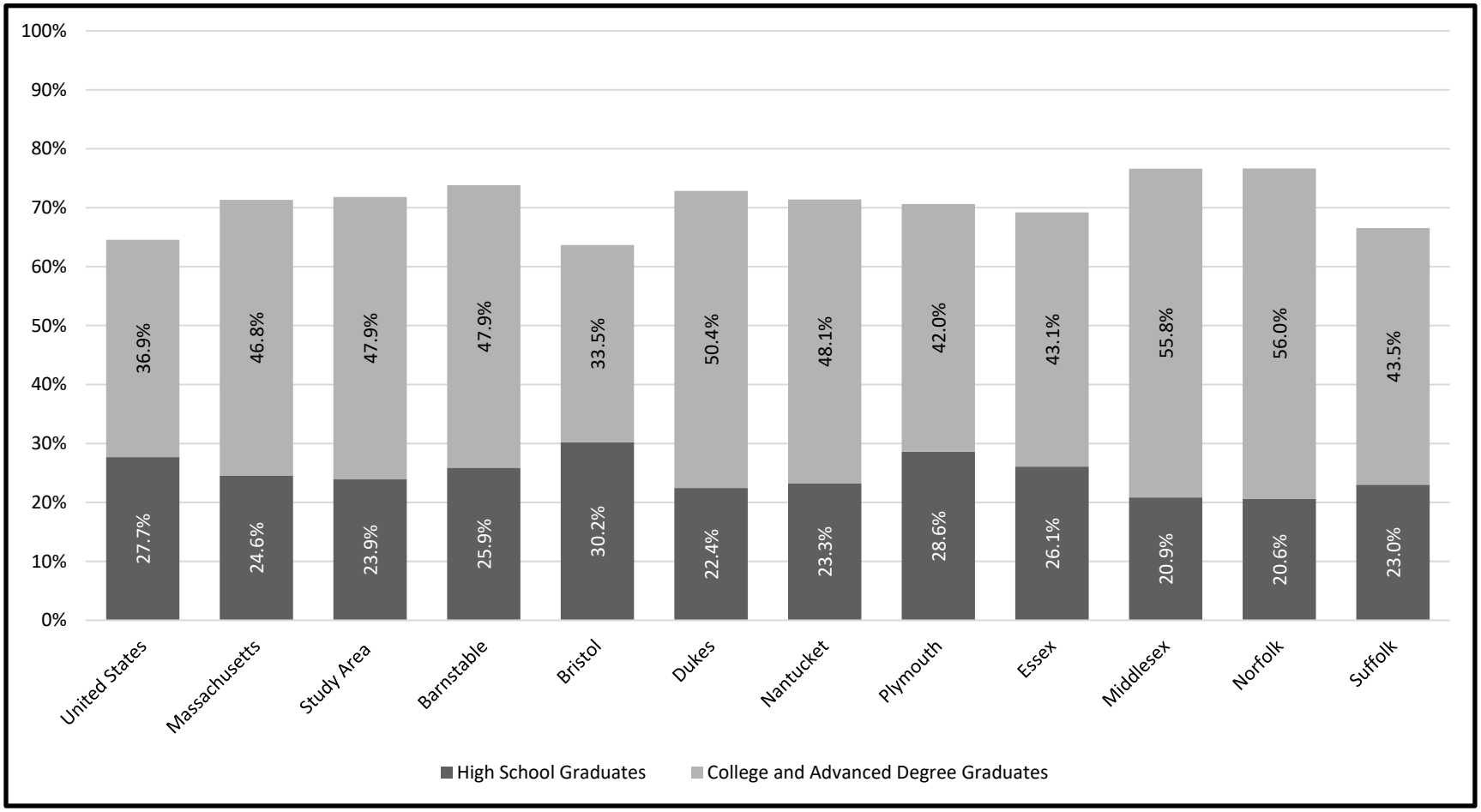
4.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" are necessary.

Table 4-12. Educational Attainment in the Massachusetts Study Area

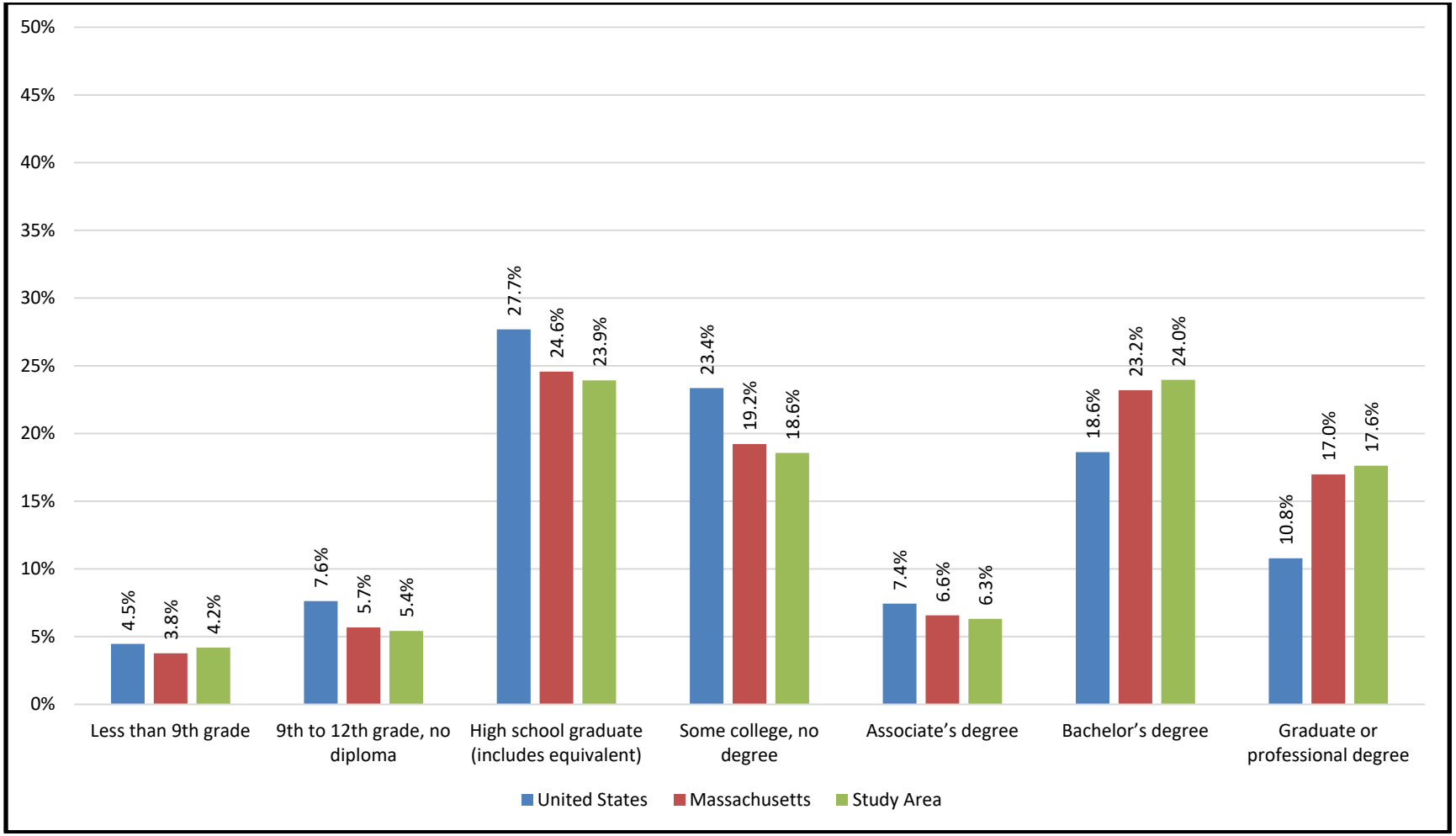
Region	Geographic Unit	Number							Total	Percent						
		Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Cape and Islands	**Barnstable**	2,451	6,769	46,723	38,002	15,078	41,957	29,419	180,399	1.4	3.8	25.9	21.1	8.4	23.3	16.3
	Bristol	32,103	35,279	132,932	92,475	35,387	72,641	39,283	440,100	7.3	8.0	30.2	21.0	8.0	16.5	8.9
	Dukes	122	492	3,146	3,192	912	3,850	2,301	14,015	0.9	3.5	22.4	22.8	6.5	27.5	16.4
	Nantucket	93	484	2,023	1,909	507	2,058	1,618	8,692	1.1	5.6	23.3	22.0	5.8	23.7	18.6
	Plymouth	9,894	21,015	113,187	85,416	34,688	86,082	45,718	396,000	2.5	5.3	28.6	21.6	8.8	21.7	11.5
	Total Cape and Islands Region	***44,663***	***64,039***	***298,011***	***220,994***	***86,572***	***206,588***	***118,339***	***1,039,206***	***4.3***	***6.2***	***28.7***	***21.3***	***8.3***	***19.9***	***11.4***
Greater Boston	**Essex**	30,081	37,530	158,263	119,186	44,397	134,294	83,083	606,834	5.0	6.2	26.1	19.6	7.3	22.1	13.7
	Middlesex	39,296	54,489	263,036	201,269	66,627	335,528	301,153	1,261,398	3.1	4.3	20.9	16.0	5.3	26.6	23.9
	Norfolk	13,045	22,608	112,478	91,558	35,935	153,065	116,394	545,083	2.4	4.1	20.6	16.8	6.6	28.1	21.4
	Suffolk	44,764	43,479	148,941	128,414	25,553	153,003	103,484	647,638	6.9	6.7	23.0	19.8	3.9	23.6	16.0
	Total Greater Boston Region	***127,186***	***158,106***	***682,718***	***540,427***	***172,512***	***775,890***	***604,114***	***3,060,953***	***4.2***	***5.2***	***22.3***	***17.7***	***5.6***	***25.3***	***19.7***
	Study Area Total	**171,849**	**222,145**	**980,729**	**761,421**	**259,084**	**982,478**	**722,453**	**4,100,159**	**4.2**	**5.4**	**23.9**	**18.6**	**6.3**	**24.0**	**17.6**
	Massachusetts	**207,140**	**311,767**	**1,348,863**	**1,055,158**	**360,700**	**1,273,522**	**932,085**	**5,489,235**	**3.8**	**5.7**	**24.6**	**19.2**	**6.6**	**23.2**	**17.0**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 4-37. High School, College, and Advanced Degree Graduate Rates in the Massachusetts Study Area



Source: USCB 2017q

Figure 4-38. Educational Attainment in the Massachusetts Study Area

Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- Native tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

4.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

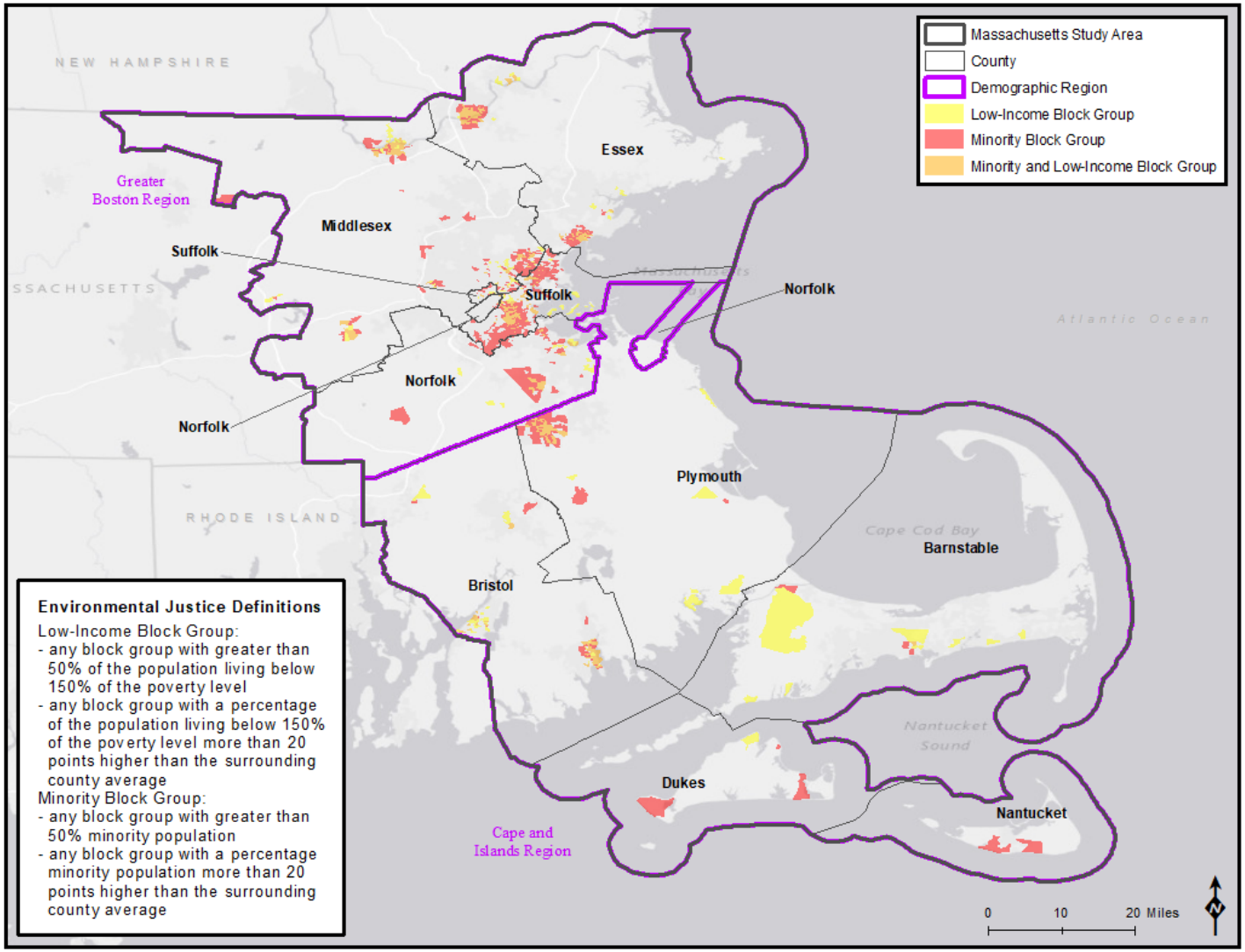
Figure 4-39 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

4.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 4-13 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 5,142,008 people living in the Study Area, approximately 1,441,496 (28.0%) are minority as compared to 38.5% in the Nation. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 3,775 block groups in the Study Area, approximately 11.1% (420 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with high percentages of minority populations. As shown in Table 4-13, both the Cape and Islands Region and the Greater Boston Region had similar percentages of minority block groups (12.7% and 10.6%, respectively) (USCB 2017f). Within the overall Study Area the largest minority group is Black or African-American (7.3%) followed by Asian (7.1%) and Hispanic or Latino (5.2%) (USCB 2017f).

As illustrated in Figure 4-39, all the counties in the Study Area contain census block groups with high percentages of minority populations. Percentages vary greatly by county, ranging from 0% in Nantucket County to 18.7% in Bristol County (USCB 2017f).



Source: USCB 2017r

Figure 4-39. Minority and Low-Income Population in the Massachusetts Study Area by Census Block Group

Table 4-13. Low-Income and Minority Populations in the Massachusetts Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Income Less than 150% of the Poverty Level	Percent Population with Income Less than 150% of the Poverty Level (%)
Cape and Islands	**Barnstable**	213,900	192,917	20,983	9.8	196	5	2.6	10	5.1	210,968	28,629	13.6
	Bristol	557,016	461,175	95,841	17.2	390	59	15.1	73	18.7	541,142	106,955	19.8
	Dukes	17,275	15,021	2,254	13.0	20	3	15.0	1	5.0	17,124	1,958	11.4
	Nantucket	10,912	8,050	2,862	26.2	11	2	18.2	0	0.0	10,751	1,696	15.8
	Plymouth	509,114	416,813	92,301	18.1	359	75	20.9	40	11.1	497,683	65,104	13.1
	Total Cape and Islands Region	***1,308,217***	***1,093,976***	***214,241***	***16.4***	***976***	***144***	***14.8***	***124***	***12.7***	***1,277,668***	***204,342***	***16.0***
Greater Boston	**Essex**	775,860	558,478	217,382	28.0	546	119	21.8	75	13.7	759,365	134,059	17.7
	Middlesex	1,582,857	1,160,650	422,207	26.7	1,133	164	14.5	91	8.0	1,526,465	194,614	12.7
	Norfolk	694,389	532,276	162,113	23.3	474	59	12.4	22	4.6	676,707	69,939	10.3
	Suffolk	780,685	355,132	425,553	54.5	646	314	48.6	108	16.7	736,921	212,325	28.8
	Total Greater Boston Region	***3,833,791***	***2,606,536***	***1,227,255***	***32.0***	***2,799***	***656***	***23.4***	***296***	***10.6***	***3,699,458***	***610,937***	***16.5***
	Study Area Total	**5,142,008**	**3,700,512**	**1,441,496**	**28.0**	**3,775**	**800**	**21.2**	**420**	**11.1**	**4,977,126**	**815,279**	**16.4**
	Massachusetts	**6,789,319**	**4,952,367**	**1,836,952**	**27.1**						**6,552,347**	**1,140,200**	**17.4**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

4.4.5.1.2 Low-Income Populations

Table 4-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 4,977,126 people for whom poverty status is determined living in the Study Area, approximately 815,279 (16.4%) individuals have incomes less than 150% of the poverty level as compared to 23.7% nationally. Of the 3,775 census block groups in the Study Area, approximately 21.2% (800 block groups) are characterized by low-income populations (USCB 2017o). Therefore, the Study Area contains sensitive populations subject to environmental justice consideration.

Both regions contain percentages of low-income populations. As shown in Table 4-13, the Cape and Islands Region has the highest percentage of low-income population at 12.7%. The Greater Boston Region has similar low-income populations at 10.6% (USCB 2017o).

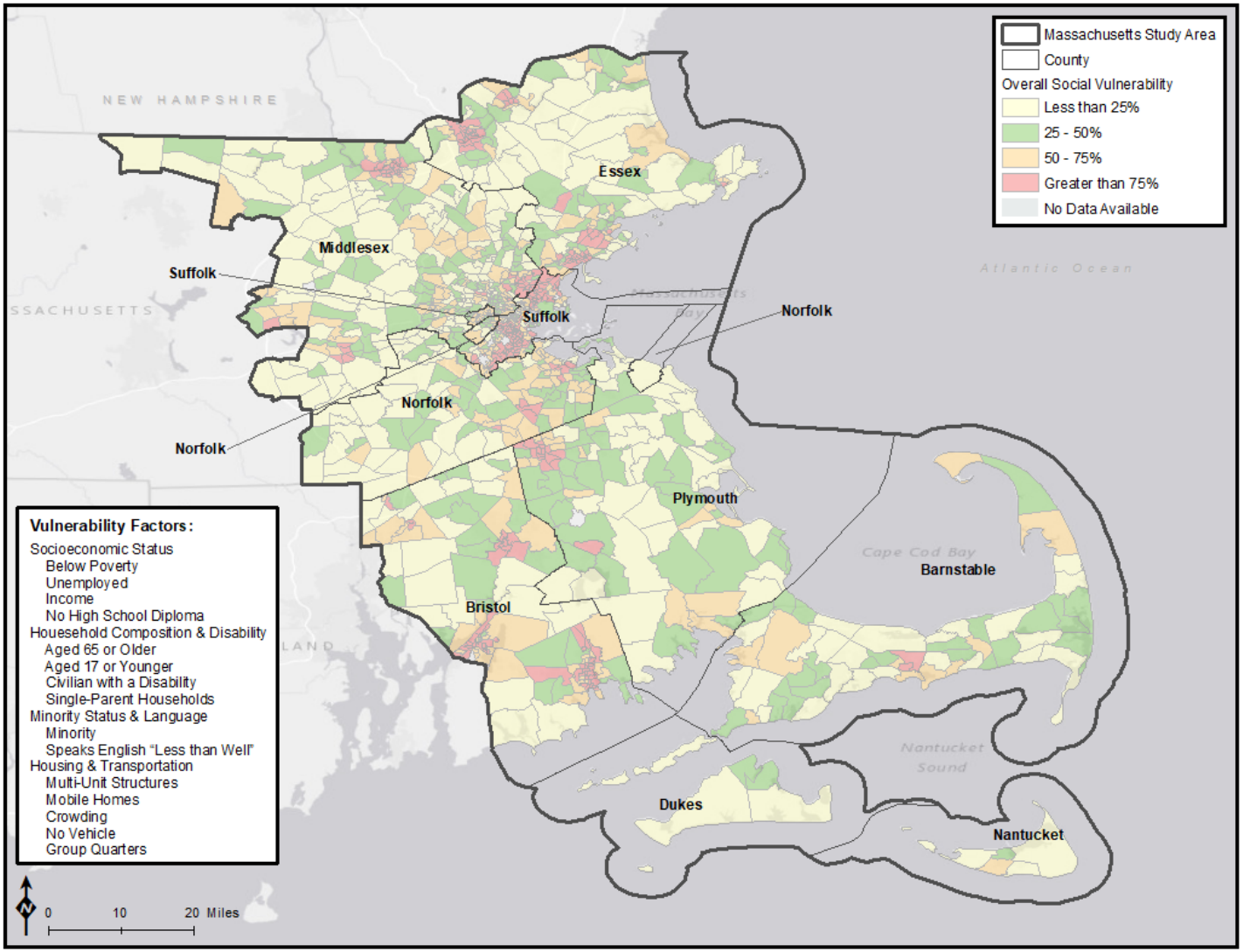
As illustrated in Figure 4-39, many counties contain census block groups with high percentages of low-income populations. The percentages range from 2.6% in Barnstable County to 48.6% in Suffolk County (USCB 2017o).

4.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and discussed in detail in “Fishing Communities” (Chapter 4.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community’s overall social vulnerability, as illustrated by census tract in Figure 4-40 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 4-40, Suffolk County (located in the Greater Boston Region) has the greatest proportion of census block groups with a greater than 75% vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).



Source: CDC 2016

Figure 4-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Massachusetts Study Area by Census Tract

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 4-41 combines the CDC SoVI index (as shown in Figure 4-40) with minority and low-income populations (as shown in Figure 4-39) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC's vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Suffolk and Norfolk counties.

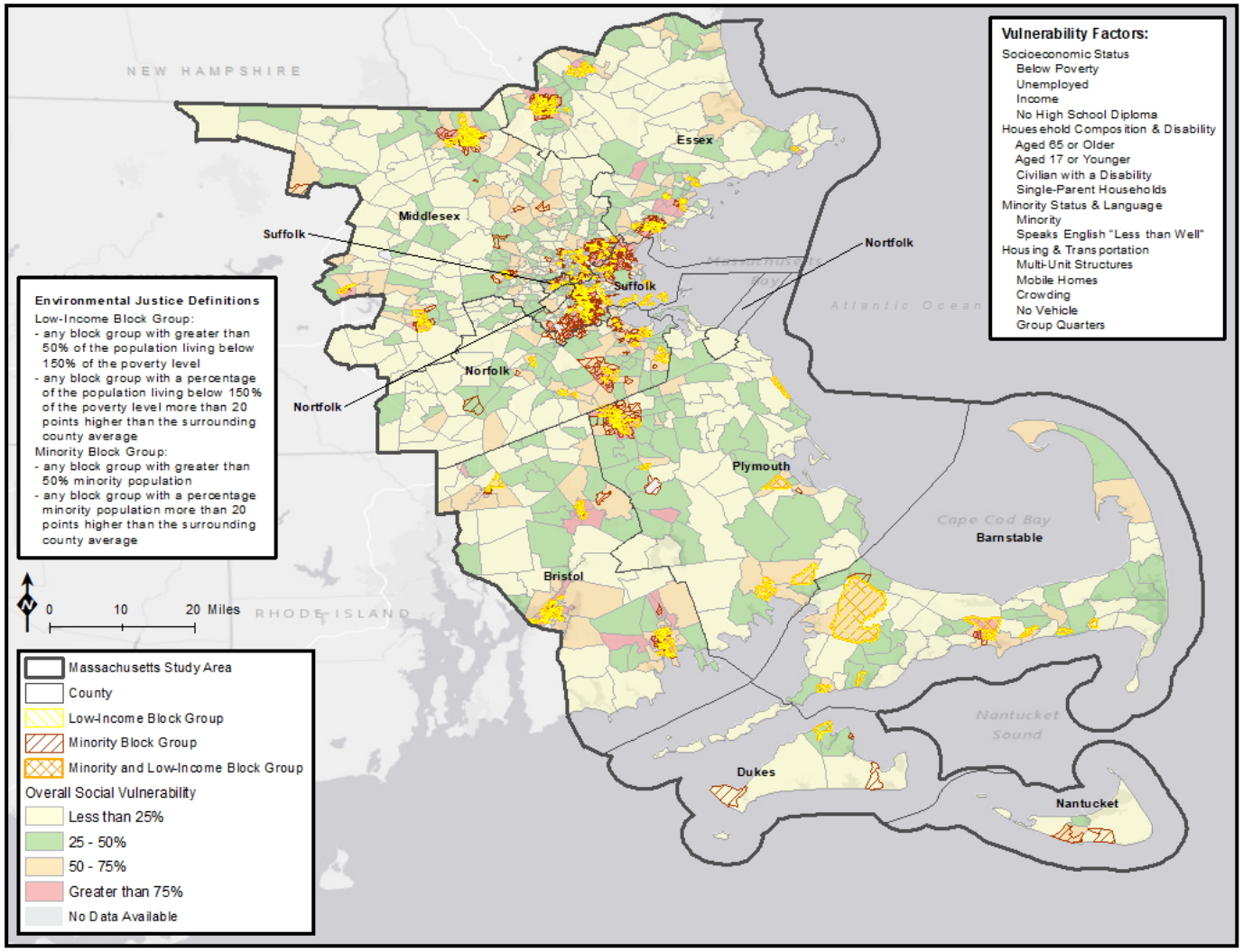
Figure 4-42 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 4-42 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 4.2.2.2 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

As discussed in Chapter 4.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many inhabit locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area (CDC 2016).

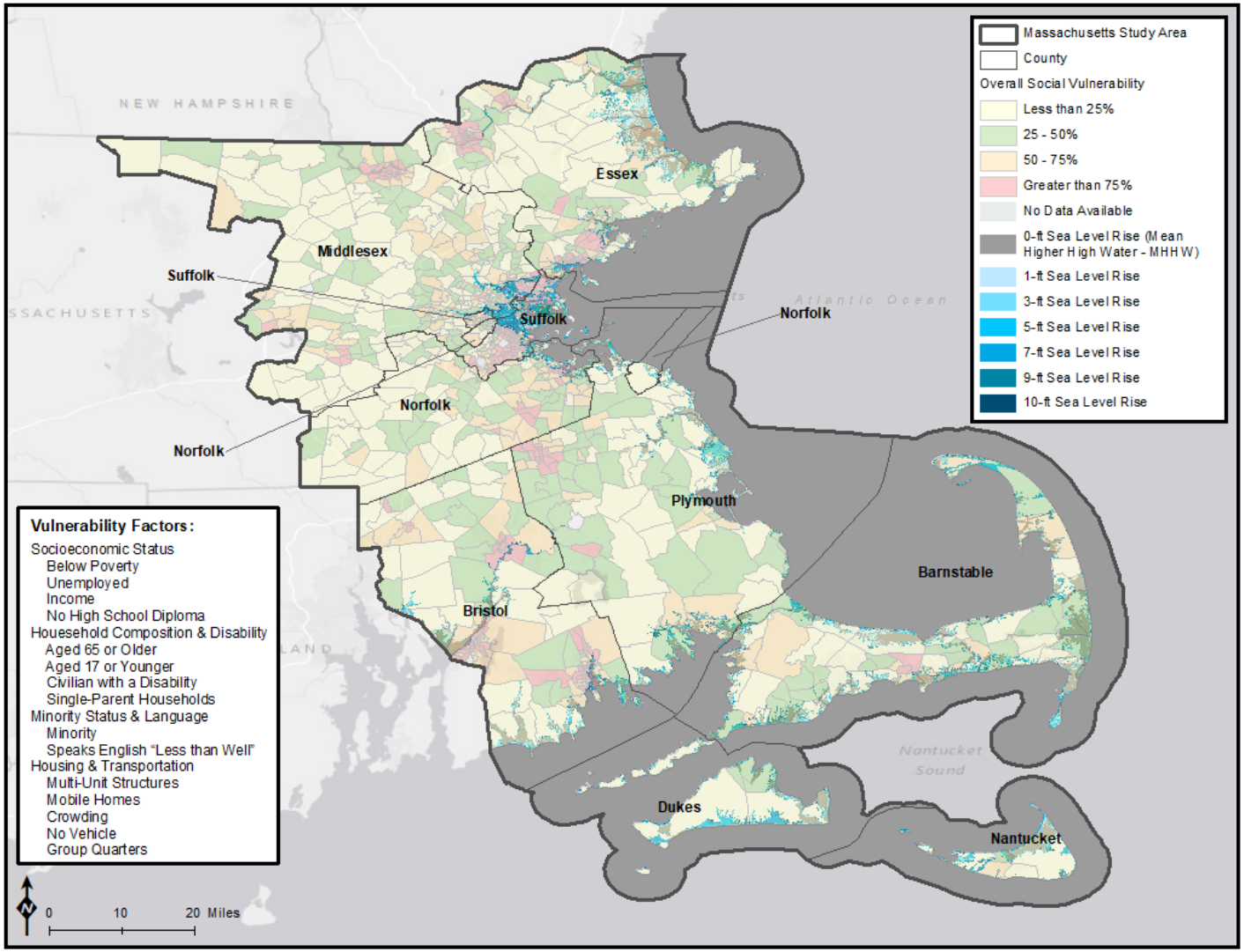
4.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.



Source: CDC 2016, USCB 2017r

Figure 4-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Massachusetts Study Area



Source: CDC 2016, NOAA 2018a

Figure 4-42. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Massachusetts Study Area by Census Tract

4.4.5.3.1 Fishing Communities

There are 30 fishing communities in the Study Area, all of which are located in both demographic regions, as illustrated in Figure 4-43.

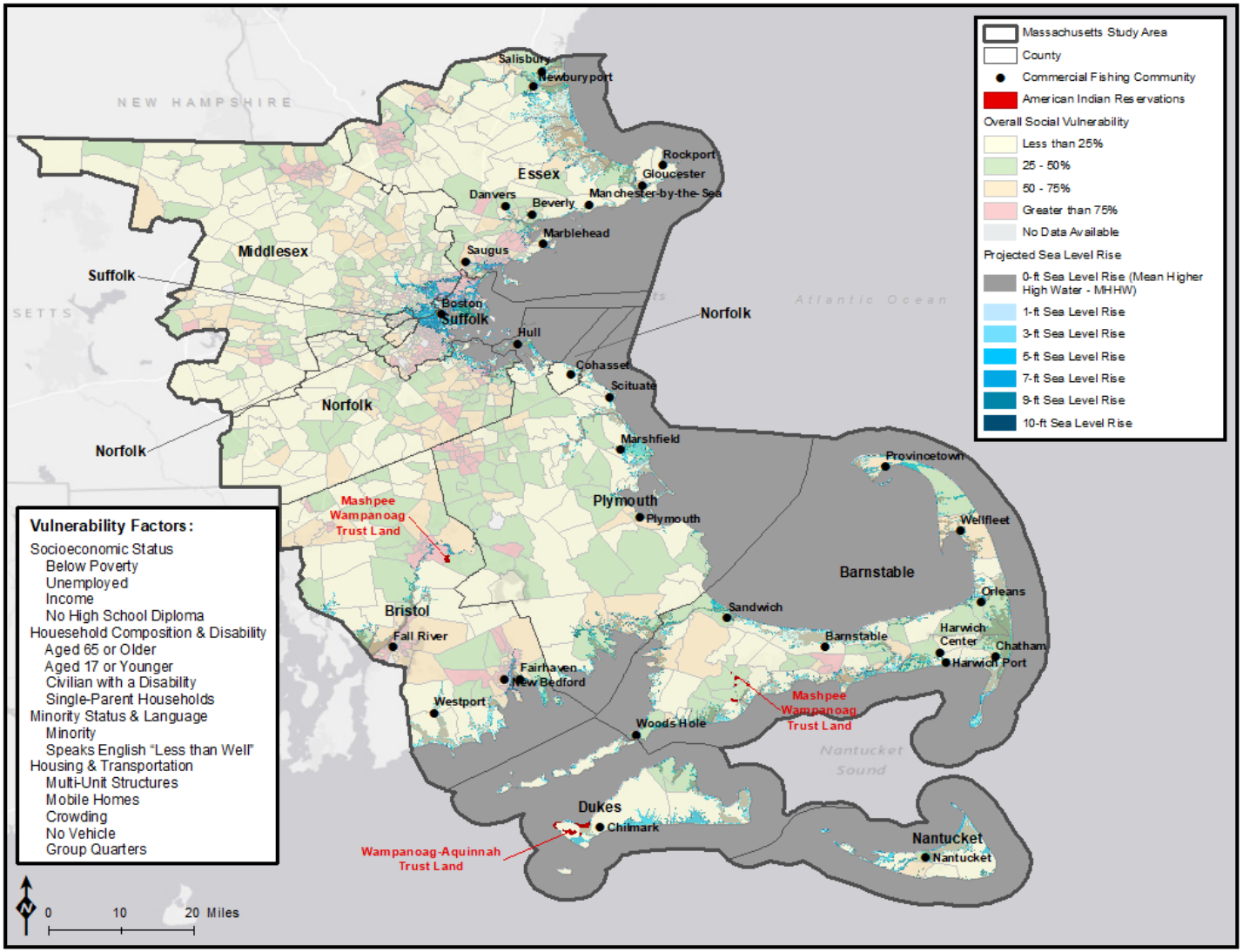
The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Barnstable, Barnstable County
- Beverly, Essex County
- Boston, Suffolk County
- Chatham, Barnstable County
- Chilmark, Dukes County
- Cohasset, Norfolk County
- Danvers, Essex County
- Fairhaven, Bristol County
- Fall River, Bristol County
- Gloucester, Essex County
- Harwich Center, Barnstable County
- Harwich Port, Barnstable County
- Hull, Plymouth County
- Manchester-by-the-Sea, Essex County
- Marblehead, Essex County
- Marshfield, Plymouth County
- Nantucket, Nantucket County
- New Bedford, Bristol County
- Newburyport, Essex County
- Orleans, Barnstable County
- Plymouth, Plymouth County
- Provincetown, Barnstable County
- Rockport, Essex County
- Salisbury, Essex County
- Sandwich, Barnstable County
- Saugus, Essex County
- Scituate, Plymouth County
- Wellfleet, Barnstable County
- Westport, Bristol County
- Woods Hole, Barnstable County

Fishing communities are particularly susceptible to projected sea level rise and storm surge changes and correlate closely with the CDC's vulnerability rankings and minority and low-income populations, particularly in Suffolk County.

As can be seen in Figure 4-43, all 30 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 4.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 4-43. Potential Vulnerable Communities in the Massachusetts Study Area by Census Tract

4.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 4-43). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources, may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

4.4.5.4 Tribes

Massachusetts has six federally recognized tribes that have historical ties to the State, of which two tribes reside in the Study Area in Barnstable County (Mashpee Wampanoag Tribe) and Dukes County (Wampanoag Tribe of Gay Head (Aquinnah)). There are also three State-recognized tribes that live in the Study Area and two State-recognized tribe with historical ties to land in the State (NCSL 2019, HUD 2019b). Table 4-14 lists the federally and State-recognized tribes in Massachusetts, as well as the tribes who have historical ties to the State and/or the Study Area. Federally recognized tribal lands are shown in Figure 4-43. These tribes could constitute socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics.

Table 4-14. Federally and State-Recognized Tribes with Historical Ties to Massachusetts

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes within the Study Area			
Mashpee Wampanoag Tribe	Federal	Yes	Tribal members in Massachusetts currently reside in Barnstable County and have historical ties to all nine counties in the Study Area.
Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts	Federal	Yes	Tribal members in Massachusetts currently reside in Dukes County and have historical ties to eight counties in the Study Area (excluding Norfolk County).
Chappaquiddick Wampanoag Tribe	State	Yes	Tribal members in Massachusetts primary live in Dukes County.
Herring Pond Wampanoag Tribe	State	Yes	Tribal members in Massachusetts primarily live in Plymouth and Barstable Counties.
Pocasset Tribe of The Pokanoket Nation	State	Yes	Tribal members primarily live in Bristol County and in Plymouth County.
Federally and State-Recognized Tribes Outside the Study Area			
Delaware Tribe of Indians	Federal	No	Tribal members currently reside outside Massachusetts, primarily in Oklahoma.
Mohegan Tribe of Indians of Connecticut	Federal	Yes	Tribal members currently reside outside Massachusetts (primarily in Connecticut) but have historical ties to Bristol and Norfolk Counties.
Narragansett Indian Tribe	Federal	Yes	Tribal members currently reside outside Massachusetts, primarily in Rhode Island, but have historical ties to seven counties the Study Area (excluding Essex or Suffolk Counties).
Pocasset Tribe of the Wampanoag Nation of MA and RI	State	Yes	Tribal members live outside of Massachusetts, primarily in Rhode Island, but have historical ties to Bristol County.
Stockbridge Munsee Community, Wisconsin	Federal	No	Tribal members currently reside outside Massachusetts, primarily in Wisconsin.
Nipmuc Nation	State	No	Tribal members in Massachusetts currently reside outside the Study Area in Worchester County.

Sources: NCSL 2019, HUD 2019b, Mashpee Wampanoag Tribe n.d., Wampanoag Tribe of Gay Head (Aquinnah) n.d., Herring Pond Wampanoag Tribe 2020

The Wampanoag Indians are the tribal group occupying the southeast part of Massachusetts and eastern Rhode Island. The Mashpee Wampanoag Tribe is a federally recognized Tribe with approximately 2,600 enrolled citizens today based at the Mashpee River Reservation in Barnstable, Massachusetts. In 1620 colonists established a settlement on Wampanoag land in Plymouth. In 1763 the Plymouth Colony acknowledged Mashpee as a self-governing Indian District. From 1870 to present day, the Mashpee Tribe maintained continuous title to and possession of key tracts of land within the historic Mashpee reservation. Finally, in 2007, the Mashpee Tribe became a federally recognized tribe (Mashpee Wampanoag Tribe n.d.). The Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts is a federally recognized tribe with 1,364 enrolled Tribal members as of 2019 based at the southwest tip of Martha's Vineyard in Dukes, Massachusetts. The ancestors of Wampanoag people have lived for at least 10,000 years at Aquinnah (Gay Head) and throughout the island of Noepe (Martha's Vineyard), pursuing a traditional economy based on fishing and agriculture (Wampanoag Tribe of Gay Head [Aquinnah] n.d.). The Chappaquiddick Wapanoag Tribe had two reservations in Massachusetts until 1869, but the land was eventually absorbed by the town of Edgartown on Martha's Vineyard (Dukes County). They do not have Federal recognition. The Herring Pond Wampanoag Tribe (also known as the Patuxet or Manomet), live

primarily in Plymouth County. Their land was lost, but they are still trying to preserve their historical reservation lands that contained three separate parcels in Plymouth (Plymouth County) and Bourne (Barnstable County): the Great Lot (2,600 acres in Plymouth, the Meetinghouse Lot (200 acres), and the Herring River Lot ("The Valley," 400 acres) (Herring Pond Wampanoag Tribe 2020). The Pocasset Tribe of the Pokanoket Nation live in Rhode Island and Massachusetts (Bristol and Plymouth Counties).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 4-42. Overall social vulnerability for Barnstable County and Plymouth County is primarily less than 25% to 50%, with a few areas that range from 50 to greater than 75%. Overall social vulnerability for Dukes County is less than 25% to 50% (CDC 2016). Also shown in Figure 4-42 is NOAA sea level rise data, indicating that all the counties in which tribal populations are present are subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

4.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 4-15 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 24.6% of the population do not speak English at home. The Greater Boston Region had the highest percentage (27.8%) of this population within the Study Area. Indo European languages are spoken by the majority (480,180 people or 9.8% of the total population) of non-English speakers at home within the Study Area population. Spanish is spoken by 415,453 people (8.5%) of non-English speakers at home within the Study Area population (USCB 2017e).

Table 4-15. People who Speak a Language Other than English at Home in the Massachusetts Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Cape and Islands	Barnstable	205,938	16,935	8.2	3,910	10,517	1,531	977
	Bristol	527,556	110,810	21.0	27,088	74,567	6,445	2,710
	Dukes	16,520	1,650	10.0	90	1,421	47	92
	Nantucket	10,361	1,298	12.5	478	445	287	88
	Plymouth	482,102	61,252	12.7	11,993	43,362	3,187	2,710
	Total Cape and Islands Region	***1,242,477***	***191,945***	***15.4***	***43,559***	***130,312***	***11,497***	***6,577***
Greater Boston	Essex	732,066	187,288	25.6	120,772	41,838	16,878	7,800
	Middlesex	1,495,498	388,589	26.0	88,210	169,393	104,092	26,894
	Norfolk	656,961	137,382	20.9	19,948	55,683	50,722	11,029
	Suffolk	738,013	293,202	39.7	142,964	82,954	48,307	18,977
	Total Greater Boston Region	***3,622,538***	***1,006,461***	***27.8***	***371,894***	***349,868***	***219,999***	***64,700***
	Study Area Total	**4,865,015**	**1,198,406**	**24.6**	**415,453**	**480,180**	**231,496**	**71,277**
	Massachusetts	**6,426,464**	**1,485,497**	**23.1**	**564,401**	**562,877**	**267,678**	**90,541**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 4-44 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Suffolk (39.7%) Middlesex (26.0%), and Essex (25.6%) (USCB 2017e). As shown in Figures 4-40 and 4-42, Suffolk and Essex Counties have large areas ranked as over 75% vulnerable. Suffolk County is particularly impacted by rising sea levels (CDC 2016, NOAA 2018a).

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect the participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

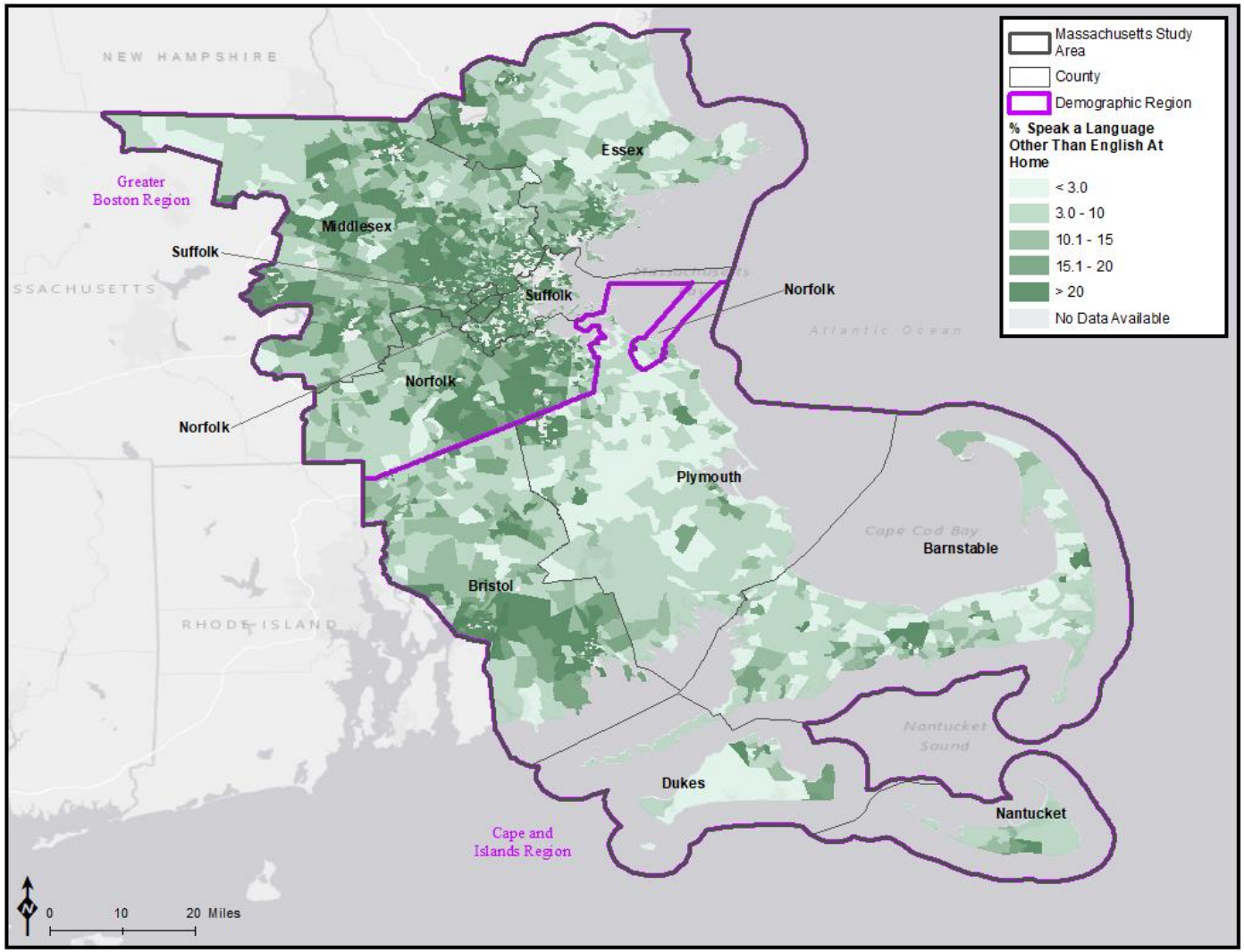
Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

4.4.6 Summary – Demographics and Socioeconomics

Massachusetts's population is growing but at a rate slower than the Nation. Massachusetts grew 3.7% (251,690 people) between 2010 and 2017 to approximately 6.8 million people. During the same period, the U.S. grew 4%. The Commonwealth is affected by the nationwide trend of aging population, as indicated by the declining rate of natural increase during the same period. Population growth in the Commonwealth is also impacted by an out-migration pattern common to other northeastern States. According to USCB 2018 estimates, approximately 25,755 people moved out of Massachusetts in 2017; high percentages moved to New Hampshire, Florida, New York, and Rhode Island (USCB 2019c). Population continues to grow mostly due to international migration, which is strong enough to offset losses due to out-migration to other States (USCB 2019b).

The Study Area is comprised of nine counties and represented 75.7% (5.1 million residents) of the overall State population of 6.8 million, according to 2017 population estimates. Between 2010 and 2017, eight out of nine counties gained population, while one (Barnstable County) lost population. Overall, the population of the Study Area grew 4.4%, faster than the State (3.7%) and the Nation (4.0%), driven by growth in the Greater Boston Region (5.3%). The Cape and Islands Region grew only 1.7% during the same period.(USCB 2017a, USCB 2017d).

Regional disparities exist in the Study Area. The Greater Boston Region contains Massachusetts's major employment and population center. This region attracts people for its coastal location as well as many positive economic drivers that have brought prosperity to the city and communities surrounding metropolitan Boston (Clayton-Matthews and Nakosteen 2017). A thriving university and technology sector attracted high-skilled immigrants as well as millennials within the last decade. As a result, Massachusetts alone accounted for more than half of the population growth in the Northeast U.S. during the decade (Gebeloff 2020). Continued growth is projected for the Study Area by 2035, driven by continued population gains in the Greater Boston Region (10.2%). Slower growth (2.2%) is projected for the Cape and Islands Region during the same period.



Sources: USCB 2017r, USCB 2017e

Figure 4-44. Percent of People Who Speak a Language Other than English at Home in the Massachusetts Study Area by Census Block Group

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. The less populous Cape and Islands Region had a smaller percentage (5.0%) of young children than the Greater Boston Region (5.5%). By 2035, the percentage of young children is projected to decline further in the Cape and Islands Region (4.9%) and the Greater Boston Region (5.1%) (USCB 2017b).

Massachusetts and the Study Area had a greater percentage of elderly (15.5% and 15.4%, respectively) as compared to the Nation (14.9%) in 2017. The population of elderly is projected to rise in all geographic units, fueled by aging baby boomers. By 2035, the population of elderly Americans is projected to increase to 21.3% in the U.S., 23.0% in the Commonwealth, and 22.5% in the Study Area. The less populous Cape and Islands Region is projected to have a larger percentage of elderly (25.8%) in 2035 (UMass 2015a, USCB 2017b, USCB 2018b). This region is dominated by a pattern of aging in place, net domestic out-migration of the area's youth as they leave for college and better job opportunities, increasing mortality rates and resulting in slow population growth. The Greater Boston Region is young relative to other regions in Massachusetts due to its unique age-specific migration pattern driven by the massive in-migration of young adults followed by steady out-migration as they move through the family-building and retirement phases of life (UMass 2015b).

The projected shift in the people "Under Age 5" and "Over Age 65" age components may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. This will affect the number and characteristics of persons in the labor force, in public and private retirement systems, and the allocation of many types of public funds. Population distribution will be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

Homeownership in Massachusetts was 62.4%, lower than the Nation (63.8%) and higher than the Study Area (61.7%). Renters comprised approximately 37.6% and 38.3% of the State and Study Area, respectively, in 2017. The percentage of households in renter-occupied housing units in the Nation was lower (36.2%). The Greater Boston Region had the highest median home value ($431,950) in 2017 (USCB 2017m). Home values in the Boston-Cambridge-Newton and Providence-Warwick metropolitan areas were characterized as "hot" and "very hot," respectively, by Zillow. The Commonwealth, the Study Area, and the Nation continue to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. Home vacancy rates in Massachusetts (9.7%) in 2017 were lower than the Nation (12.2%) and the Study Area (10.0%). Low vacancy rates may drive home prices higher and encourage development in surrounding areas (USCB 2017m).

The Study Area had a total employment of 2.7 million jobs in 2017, representing approximately 76.8% of the total jobs in Massachusetts, and 1.8% of the total jobs in the U.S. Regional disparities with regard to employment opportunities are evident between the Greater Boston Region and the Cape and Islands Region. According to MassBenchmarks, "Inequality of opportunity reduces the economy's potential." The Greater Boston Region has a dynamic, prosperous economy as a result of education-intensive and high-technology industry sectors, while the rest of the State offers a very different, less vibrant industry mix, and subsequently less economic vibrancy and prosperity. Greater Boston area's strength contrasts with more modest economic growth in other parts of the State (Clayton-Matthews and Nakosteen 2017). These disparities challenge the Commonwealth's long-term economic competitiveness, as do other issues such as housing supply and affordability, and the public transit system. Some companies are struggling to attract and retain younger employees or find enough technically trained "middle skills" workers (MassEcon 2017).

The Study Area has a total employment of 2.7 million jobs. Approximately 2.9% of those jobs are maritime related. The greater portion of jobs are located in the Greater Boston Region near the high-density MSA of Boston-Cambridge-Newton. The counties in the Cape and Islands Region have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities. Job distribution is less robust in the relatively low-density Cape and Islands counties, especially rural Dukes and Nantucket Counties. Median household and per capita incomes are higher in the Greater Boston Region. Unemployment rates are lower in the Greater Boston Region (5.6%) as compared to the Cape and Islands Region (6.3% in 2017). These disparities reflect an abundance of economic drivers in the Greater Boston Region (USCB 2017k, USCB 2017n).

In the U.S., 27.7% and 36.9% of working-age population earned only a high school diploma and college degree, respectively. Both the Commonwealth (24.6%) and the Study Area (23.9%) have lower educational attainment with respect to high school diploma. However, both the Commonwealth (46.8%) and the Study Area (47.9%) have significantly higher educational attainment with respect to college and advanced degrees. This may be attributed to the high number of domestic and international workers moving to Massachusetts to work in its thriving education-intensive industry sectors (USCB 2017t).

The Study Area contains minority and low-income populations subject to consideration as potential environmental justice communities of concern. Of the 5,142,008 people living in the Study Area, approximately 1,441,496 (28.0%) are minority. Of the 3,775 block groups in the Study Area, approximately 11.1% (420 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with high percentages of minority and low-income populations. The Cape and Islands Region had a significantly smaller percentage (14.8%) of minority block groups than the Greater Boston Region (23.4%) (USCB 2017f). Within the overall Study Area the largest minority group is Black or African-American (7.3%) followed by Asian (7.1%) and Hispanic or Latino (5.2%) (USCB 2017f).

Approximately 815,279 (16.4%) residents in the Study Area have incomes less than 150 of the poverty level. Of the 3,775 census block groups in the Study Area, approximately 21.2% (800 block groups) are considered low-income populations. The Cape and Islands Region has the highest percentage of low-income population at 12.7%. The Greater Boston Region has similar low-income populations at 10.6% (USCB 2017o).

Minority and low-income status are two of several factors that the CDC and NOAA use to calculate potentially vulnerable populations. The output of the CDC SoVI indicates that Suffolk and Essex Counties (located in the Greater Boston Region) have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees for impacts associated with sea level rise, storm surge, and nuisance tidal flooding (CDC 2016).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. In the Study Area, these groups include fishing communities, tribes, limited-English populations, and subsistence populations. There are 30 fishing communities located in the Study Area. These communities are particularly susceptible to projected sea level rise and storm surge changes and correlate closely with the CDC's vulnerability rankings and minority and low-income populations, particularly in Suffolk County.

Fishing communities may constitute a subsistence population; however, subsistence populations can be difficult to identify. Other than the fishing communities, no subsistence populations were identified during this analysis of the Study Area. There are six federally- and five State-recognized tribes that have historical ties to the State. Two of the federally-recognized and four of the State-recognized tries live within the Study Area.

Limited-English populations are present throughout the Study Area; 24.6% of the population do not speak English at home. The Greater Boston Region had the highest percentage (27.8%) of this population within the Study Area. Indo European languages are spoken by the majority (480,180 people or 9.8%) of non-English speakers at home within the Study Area population. Spanish was spoken at home by 415,453 people (8.5%) of non-English speakers at home within the Study Area population. (USCB 2017e). Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project analysts during their evaluation process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise, storm surge are felt at the local level (by changing drainage, patterns, or land use, etc.)

4.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

4.5.1 Regional Observations

Massachusetts has extensive water resources that shape the topography of the area and provide critical habitat for several species. Sea level rise is variable within the Study Area. The Cape Cod Region is predicted to experience relatively higher rates of sea level rise as a result of land subsidence. Boston is particularly susceptible to the effects of sea level rise because much of its land was created by filling wetlands. Massachusetts is subject to both hurricanes in the summer and “nor’easters” in the winter, both of which can contribute to storm surge issues. Because many Massachusetts beaches are depleted, the winter nor’easters, which persist over longer time periods and thus multiple high tides than do hurricanes, can cause greater erosional damage. These effects could be increased through impacts associated with rising sea level and increasing storm surge. Impacts to the Massachusetts coast from sea level rise and increased storm surges can also include increased erosion of wetlands and beaches and increased damage to the built environment (structures, infrastructure, etc.) from coastal storms. The physical characteristics of the Study Area influence land use and land cover, demographics, and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future projects in the Atlantic Region.

The Study Area is divided into eight MPOs that regulate regional decision making regarding government regulations, community guidelines, transportation, economic plans, building planning, and zoning. Each MPO provides a Regional Policy Plan that acts as a comprehensive plan for the MPO Regions. Additionally, the Commonwealth of Massachusetts has several incentive programs (the EDIP, EOAC, BTC, and REDO in particular) that could attract large companies to the area by reducing the amount of taxes the company would pay annually. The incentive programs’ benefits should be considered against the cost of investing into the Study Area. Massachusetts’ major industries at present are healthcare and social assistance, professional and business services, trade and transportation services, governmental positions, and leisure and hospitality services. The greatest concentrations of industry are found in areas with more developed land cover and land uses.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. Protected areas may serve several different functions and are protected by various parties, laws, and regulations. The history of the Massachusetts area is deeply tied to the history of the U.S. and many cultural sites may have national significance. A wide variety of recreational resources throughout the Study Area overlap

many different types of land use. Potential impacts to these resources and locations will need to be considered during future OCS-related analysis.

Massachusetts' population is growing but at a rate slower than the Nation. Population growth in the Commonwealth is impacted by an out-migration pattern common to other northeastern States. Population continues to grow mostly due to international migration, which is strong enough to offset losses due to out-migration to other States. Regional disparities exist in the Study Area. The Greater Boston Region contains Massachusetts' major employment and population center and experiences the greatest gains in population as compared to other parts of the Study Area. The Greater Boston Region is also young relative to other regions in Massachusetts due to its unique age-specific migration pattern driven by the massive in-migration of young adults followed by steady out-migration as they move through the family-building and retirement phases of life. Whereas the Cape Cod Island Region is experiencing an aging population.

4.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Sea level rise projections in combination with storm surge projections could influence future land use planning and population distribution in Massachusetts. Areas most likely to be impacted include the shoreline, peninsulas, and islands. The most significant effects are likely to occur near Plum Island and the Merrimack River, around Salem, throughout Boston, at Cape Cod Bay, and at the Long Point Wildlife Refuge Beach at Martha's Vineyard. Boston is the fifth most vulnerable coastal city in the U.S. because many areas were developed in the 1800s when industrious residents began filling in tidal flats and marshland with rocks, dirt, and trash to create more buildable space. Sea level rise will alter shoreline processes and can result in increased erosion and loss of wetlands thus affecting coastal ecosystems and defenses against flooding. Therefore, future projects in the area will need to take into account both sea level rise and storm surge particularly once site-specific information is known.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.
- Potential projects will need to be considered with respect to Regional Policy Plans of the Study Area's eight MPOs that regulate regional decision making regarding government regulations, community guidelines, transportation, economic plans, building planning, and zoning. These Regional Policy Plans act as a comprehensive plan for the MPO Regions and will provide valuable information for potential future projects.
- County government systems in New England States are generally not as active compared to other parts of the country. In Massachusetts, towns and cities are grouped into planning regions, but not by county. Therefore, evaluation of the comprehensive plan, master plan, or regional plan of each region of interest will be essential during project analysis.
- Future project planning should include consideration of certain economic incentives (such as the EDIP, EOAC, BTC, and REDO in particular) that could attract large companies to the area by reducing the amount of taxes the company would pay annually.

- Future projects may need to consider the Massachusetts Department of Energy Resources' Massachusetts Comprehensive Energy Plan, which details the State's decreasing needs on fossil fuels, energy efficiency, and a statewide commitment to renewable energy sources. It is possible that proposed projects that diverge from the goals of the plan would receive less support for development.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 5

RHODE ISLAND

5 Rhode Island

5.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Rhode Island to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

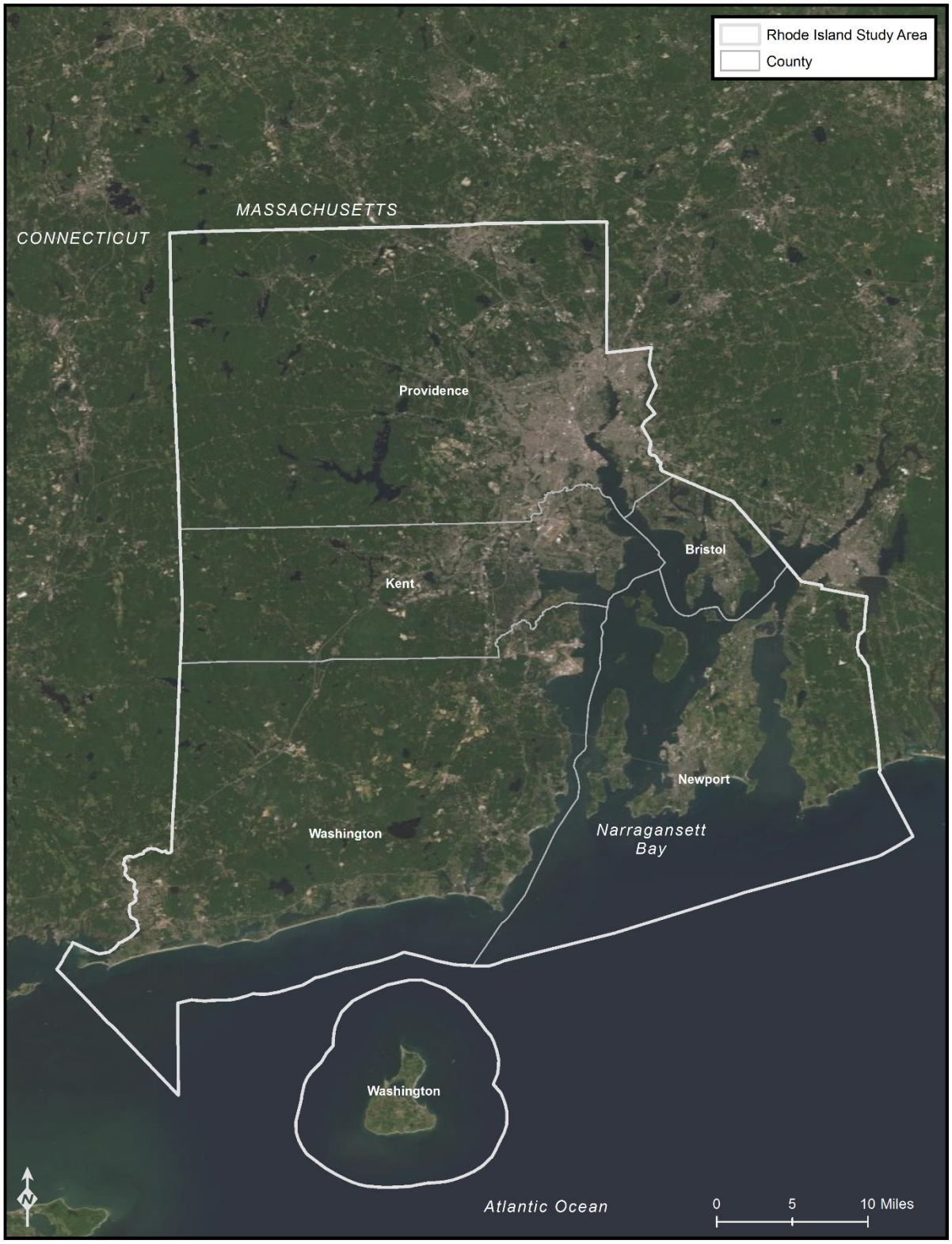
Rhode Island is located near the North Atlantic Planning Area. All five counties within the State of Rhode Island are included within the Rhode Island Study Area (Study Area). Counties range in population size from around 49,000 in Bristol County to 634,000 in Providence County. There is only one city in the Study Area with a population over 100,000; it is Providence with a population of 181,537. There are three cities in the Study Area with populations over 50,000. They are Pawtucket (Providence County) with a population of almost 72,000 and Warwick (Kent County) and Cranston (Providence County), both with populations of over 82,000 (ESRI 2019a). Rhode Island cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Rhode Island's location in the north has geographical commonalities with many of the other Atlantic States with open coastlines protected by barrier islands. The Rhode Island coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes five counties located within the State of Rhode Island. The Study Area is shown in Figure 5-1 and Figure 5-2 and includes the following counties:

- Bristol
- Kent
- Newport
- Providence
- Washington

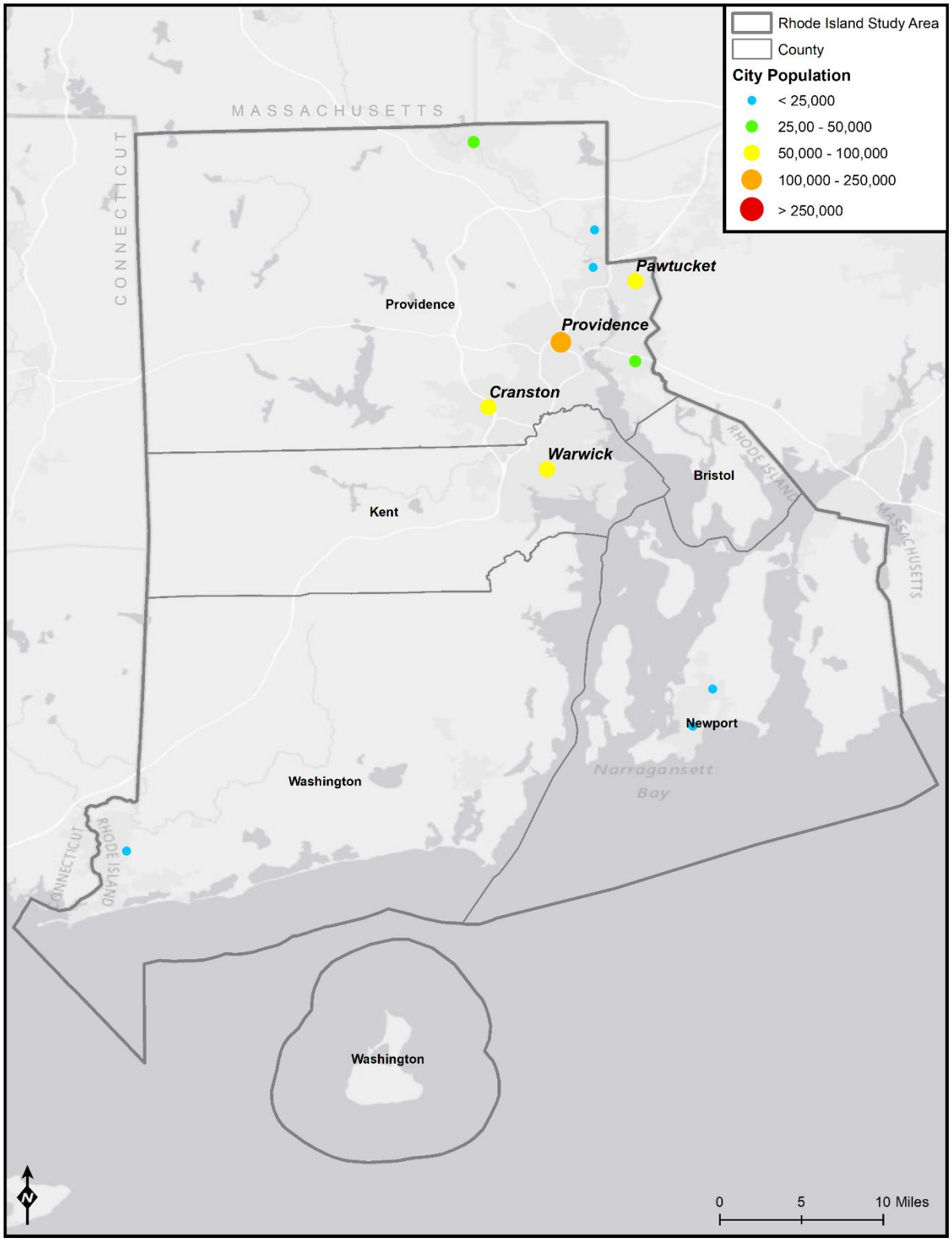
5.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Rhode Island are described below.



Source: ESRI 2019a

Figure 5-1. State of Rhode Island Study Area



Source: ESRI 2019a

Figure 5-2. Cities in the Rhode Island Study Area

After canvasing nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- Rhode Island GIS
- Rhode Island Coastal Resource Management Council
- University of Rhode Island Environmental Data Center
- Rhode Island Department of Transportation
- Rhode Island Department of Environmental Management
- Rhode Island Public Transit Authority

The metadata database for Rhode Island specific State, county, and local data sources is included in Appendix A.

5.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

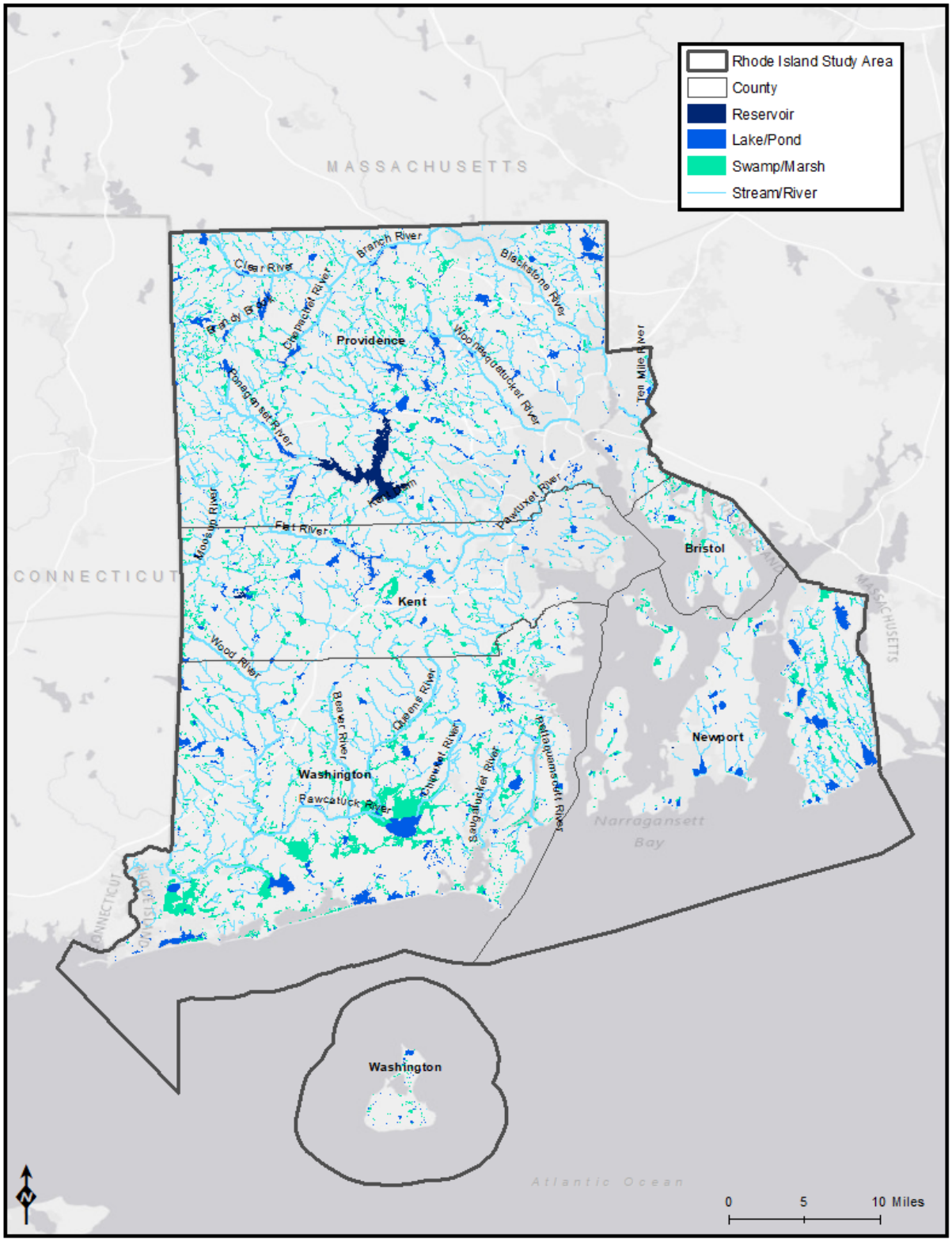
5.2.1 Water Resources

Rhode Island's water resources include the Narragansett Bay, rivers, ponds, lakes, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

5.2.1.1 Narragansett Bay

Narragansett Bay, shown in Figure 5-3, is a central feature of Rhode Island and one of New England's largest estuaries (NBEP 2020). Located in both Massachusetts and Rhode Island, about 60% of the Narragansett Bay watershed is in Massachusetts, while more than 90% of the bay waters are in Rhode Island. Designated an estuary of national significance in 1987, the 196-square mile embayment averages 26 feet in depth overall with the west passage averaging almost 30 feet in depth and the east passage averaging almost 50 feet in depth. The greater depth of the east passage extends to 194 feet near Newport. The third prong of the bay, the tidal Sakonnet River to the east, averages about 26 feet. This bay of drowned rivers exhibits strong diurnal tides averaging 3.6 feet at the mouth to the Atlantic and 4.6 feet at the head. These waters are considered well-mixed with freshwater flow into the bay, averaging 3.9 inches per second and tidal currents reaching up to 30.3 inches per second. Average refresh time is 26 days.

While the southern shoreline of Rhode Island has a wealth of sandy beaches, the 560-mile shoreline of Narragansett Bay National Estuary Research Reserve is primarily narrow cobble beaches with only a few sandy beaches. Protected by land on three sides, the bay nourishes a wealth of estuarine ecosystems that provide rich, diverse habitats along with pollution mitigation and erosion control. Salt marshes are one of the prominent estuarine features in the bay. Salt marsh pools and tidal creeks cover 2,800 acres in Narragansett Bay. Concerns for the health of these systems include pollution along with loss and degradation of habitat (NBEP 2017, NBEP 2020, NBNERR 2009, RIDEM 2016).



Source: USGS 2019e

Figure 5-3. Hydrography in the Rhode Island Study Area

Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Hypoxic zones may result from a confluence of tides and currents along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. Relatively extended periods and zones of hypoxia have occurred in the northern part of the bay and in the Providence River, especially during the summer months. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (RIDEM 2016, NBNERR 2009).

The coastal area of Rhode Island within the Study Area does not include designated critical habitat for Federally listed species (USFWS 2019i, USFWS 2019j).

5.2.1.2 Rivers

Within the Study Area, all major drainage basins ultimately flow into the Atlantic Ocean via Narragansett or Little Narragansett Bays. Figure 5-3 shows the major surface water bodies within the Study Area. Major rivers in the Study Area include the Blackstone, the Providence, the Pawcatuck, and the Sakonnet Rivers (RIDEM 2016, USFWS 2019e, USFWS 2020b).

At the northern edge of the Study Area, the Blackstone River flows southeast from Worcester, Massachusetts entering Rhode Island in Providence County. Continuing in its southeasterly direction until practically reentering Massachusetts, the Blackstone then flows south to empty into the tidal Providence River at the northern extent of Narragansett Bay and the Atlantic Ocean (RIDEM 2016).

South of the Blackstone River, the Providence River is a tidal river at the northern end of Narragansett Bay. Fed primarily by the Blackstone from the north and augmented by the Woonasquatucket River from the northwest and the Pawtuxet River from the west, the tidal Providence River is rich in nutrients. As a result of excess nutrients and cooperating tides, extended areas and occurrences of hypoxia have occurred in the Province River (RIDEM 2016).

South of the Providence in Washington County, the Pawcatuck River flows west from South Kingston, Rhode Island towards Connecticut, turning south to prescribe the border, broadening to form the Pawcatuck Estuary and entering Little Narragansett Bay and the Atlantic Ocean. Important feeders for the Pawcatuck include Worden Pond, Usquepaugh River, and Wood River. While the bay is well mixed, the Pawcatuck estuary is highly stratified (USFWS 2020b).

East of the Pawcatuck River and south of Mount Hope Bay, the tidal Sakonnet River provides the eastern prong of Narragansett Bay. Formed from an ancient, drowned river valley, the Sakonnet is a tidal strait flowing from Mount Hope Bay to Rhode Island Sound and the Atlantic Ocean.

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Rhode Island has approximately 1,392 miles of river, only 110 miles are designated wild and scenic rivers. In the Study Area, 110 miles of the Wood-Pawcatuck Watershed are as a designated wild and scenic river. Designated rivers in this watershed include segments of the Ashaway, Beaver, Chipuxet, Green, Queen, Shunock, Usquepaugh, Wood, and Pawcatuck Rivers (USFWS 2019a). With almost 1,400 miles of rivers and streams, along with nearly 21,000 acres of ponds and reservoirs, water withdrawal in Rhode Island is primarily surface water for thermoelectric use followed by water for public supply. In 2015, Rhode Island water withdrawals for thermoelectric use totaled 224 million gallons per day with water for public supply at 97 million gallons per day. In 2015, Rhode Island withdrew a total of 344 million gallons per day, nearly 90% from surface water, but only 35% of that total 344 million

gallons per day was fresh water. The most productive groundwater aquifers in Rhode Island are the deep glacial deposits of stratified drift covering about one-third of the State (RIDEM 2016, USGS 2015b).

5.2.1.3 Floodplains

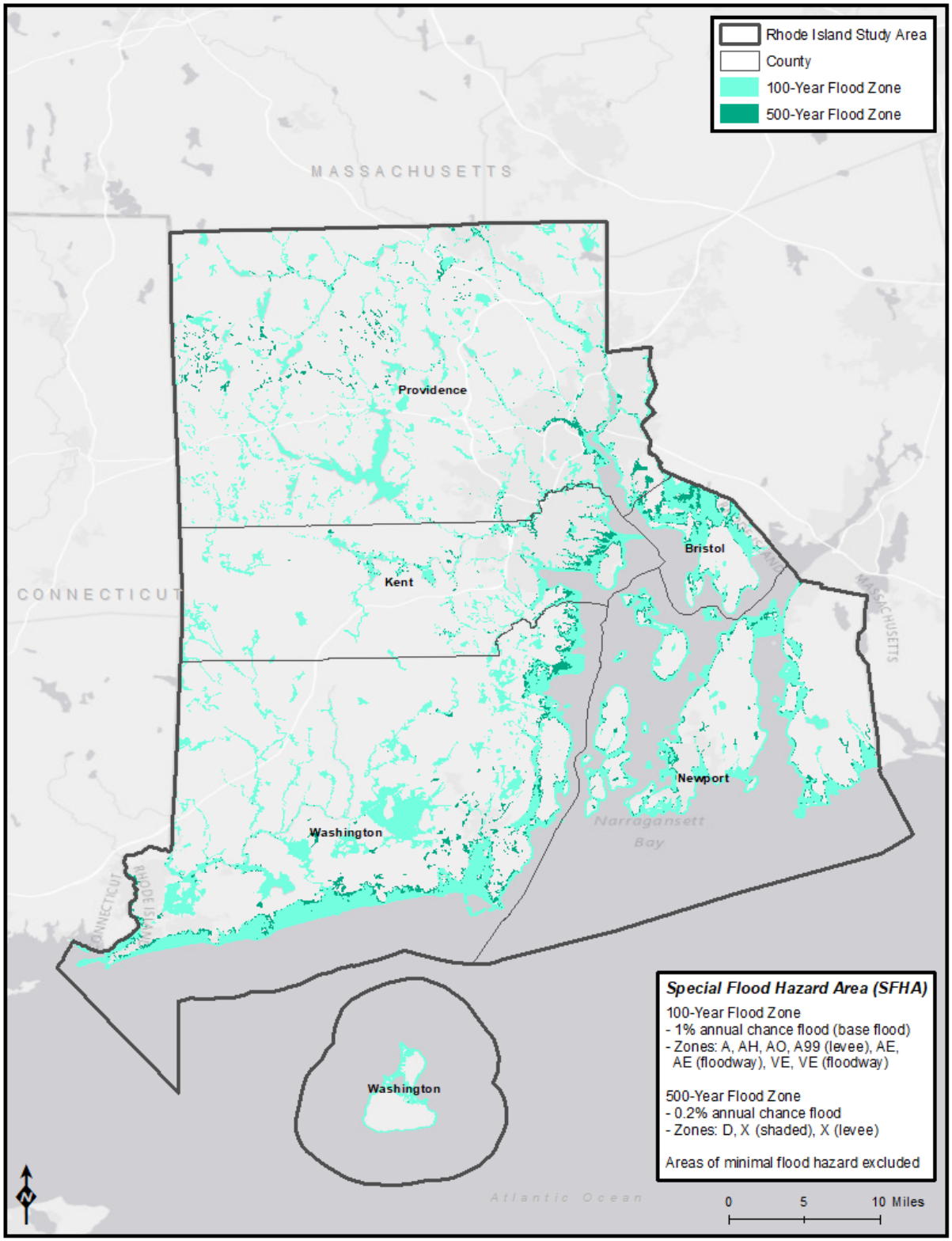
Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 5-4, floodplains comprise a larger portion of land area in Bristol County and a lesser portion of the other counties in the Study Area. Table 5-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 5-1. Floodplains in the Rhode Island Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Bristol	7,417	48.0	2,044	13.2
Kent	11,576	10.7	2,117	2.0
Newport	19,972	30.5	2,745	4.2
Providence	26,059	9.9	3,838	1.5
Washington	46,251	21.9	6,404	3.0
Study Area Total	**111,276**	16.8	**17,149**	2.6

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: FEMA 2019b

Figure 5-4. Floodplains of the Rhode Island Study Area

5.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 5-5, wetlands are a large part of the land area in many of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 5-2 details the wetland acreage in the Study Area along with other water resources. Wetlands comprise about 30% of the Study Area with higher, more inland counties like Providence and Kent having fewer wetland areas (6% and 10%, respectively) while counties with a large expanse of coastline like Washington, Bristol, and Newport are filled with wetland areas (41%, 46%, and 67%, respectively) (USFWS 2018a).

In addition to estuaries along Narragansett Bay, unique estuary systems in Rhode Island include the bays, lagoons, and river outlets along the southern extent of the State, including Block Island Sound and Rhode Island Sound, along with 3,800-acres of salt marshes and 6,583-acres of coastal lagoons called salt ponds. Separated from the Atlantic by a barrier spit, these salt ponds are shallow, productive ecosystems with eelgrass beds, oyster reefs, and softbottom sediments providing important fish and shellfish nursery and habitat. Including the Great Salt Pond on Block Island, Rhode Island has 12 salt ponds along its southern coast. And found along the shores of salt ponds and estuarine rivers, salt marshes provide habitat for fish, shellfish, mammals, and birds with 2,500 acres of salt marshes in the Narragansett Bay alone (USFWS 2019i, USFWS 2019j, RIDEM 2016).

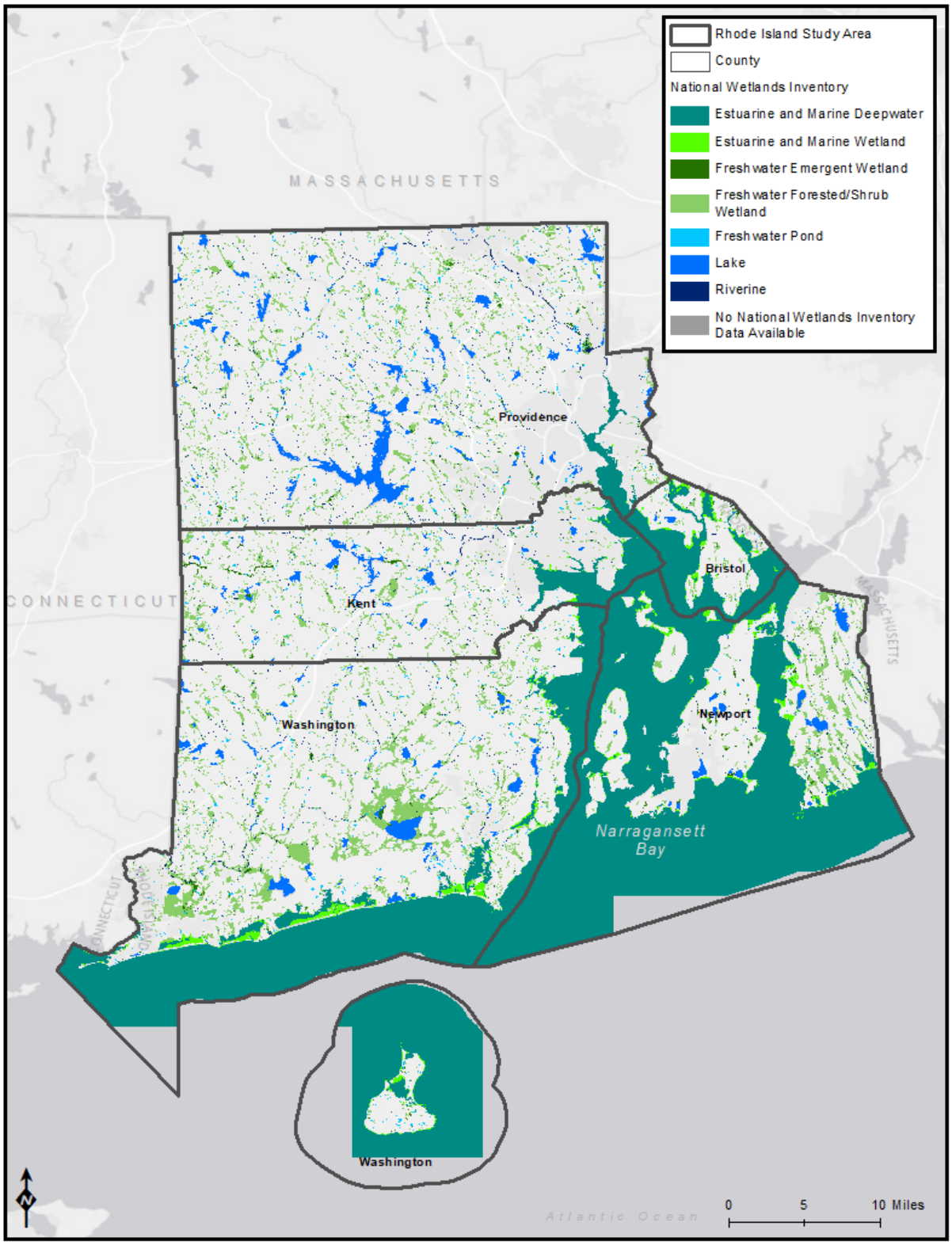
With a rich mix of fresh and salt water, Rhode Island estuaries include a wealth of wetlands providing health, recreational, and economic benefits from diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as salt marsh restoration and fish passage restoration (NBEP 2017, NBEP 2020, NBNERR 2009, RIDEM 2016). As such, this is an important natural and cultural resource within the Study Area.

5.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

5.2.2.1 Sea Level Rise

Figure 5-6 shows NOAA's results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.



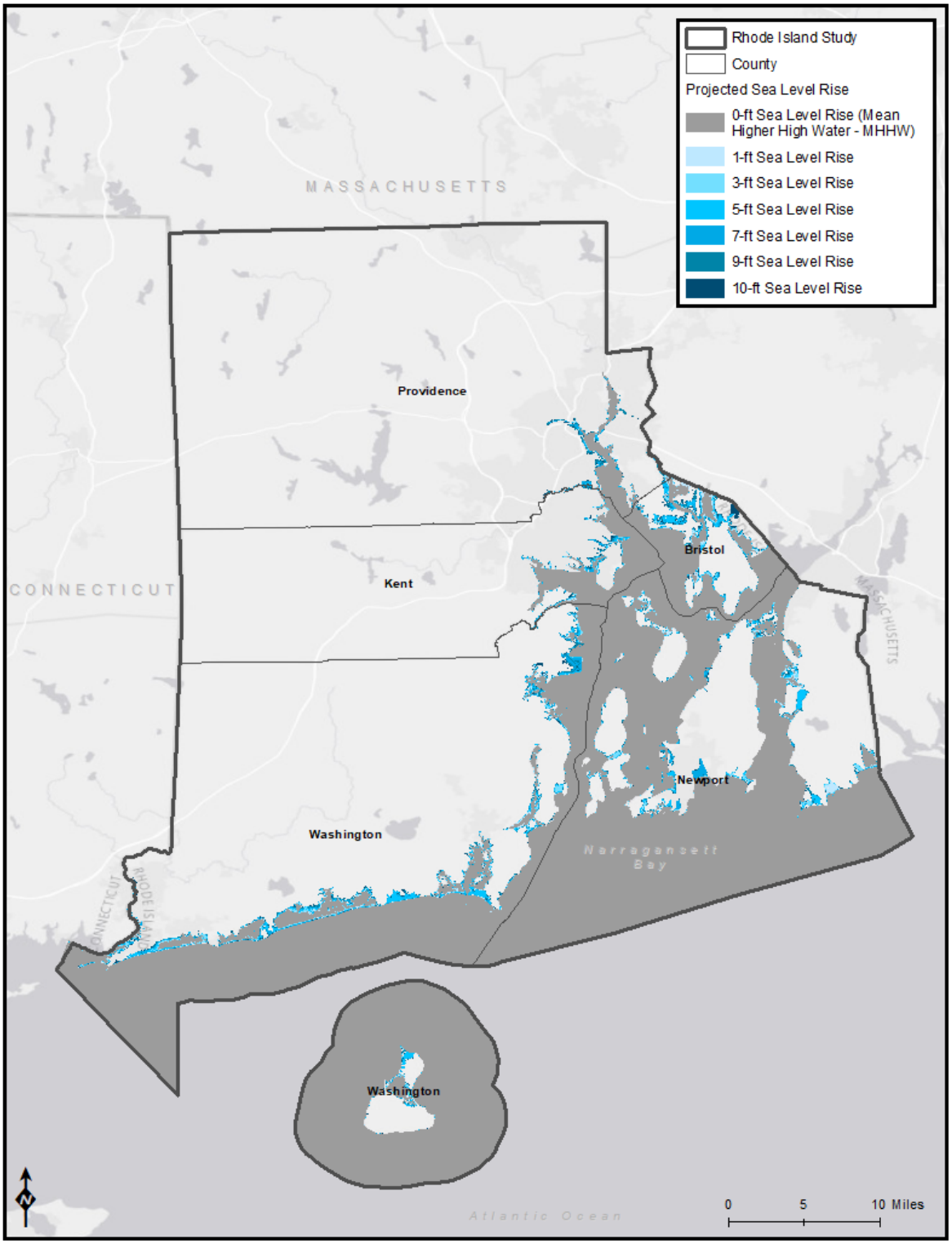
Source: USFWS 2018a

Figure 5-5. Wetlands in the Rhode Island Study Area

Table 5-2. Wetlands in Rhode Island Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Bristol	15,116	1,202	110	863	12,651	153	66	71
Kent	21,006	393	559	7,150	8,912	2,372	748	873
Newport	136,609	2,622	472	6,324	124,604	1,902	291	394
Providence	35,823	88	855	16,502	3,760	10,082	2,014	2,521
Washington	146,891	3,886	955	23,207	110,742	5,007	1,702	1,392
Study Area Total	**355,445**	**8,190**	**2,950**	**54,046**	**260,669**	**19,515**	**4,821**	**5,252**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.



Source: NOAA 2018a

Figure 5-6. Projected Sea Level Rise throughout the Rhode Island Study Area

The historic rate of sea level rise at the Newport tide gauge, measured from 1930 to 2017, is 0.11 inches a year. This is equivalent to a change of 10.8 inches in 100 years (RICRMC 2018a). As shown in Figure 5-6, sea level rise within the Study Area will primarily impact areas along the immediate coast, adjacent to Narragansett Bay, and especially in Bristol County.

Within the last decade, the speed at which Rhode Island's sea level is rising has increased and is now rising by as much as 1 inch every 8 years. Around Providence, it took around 40 years for the sea level to rise around 6 inches. Scientists now forecast that in just the next 16 years, the sea will rise by another 6 inches, which would be an average rise of 0.375 inches a year (SeaLevelRise.org, 2019). In 2017, NOAA projected up to 9.6 feet of sea level rise in Rhode Island by 2100, based on a "high" curve from the sea level rise scenarios. NOAA's worst-case scenario projected up to 11.7 feet of sea level rise by 2100 (RICRMC 2018a). According to NOAA's measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Rhode Island Study Area is 0.10 inches/year (NOAA 2019b). The Rhode Island Coastal Resources Management Council has adopted the U.S. Army Corp of Engineer's online Sea Level Change Curve Calculator to be used as a tool for State and local decisionmakers, available at http://www.corpsclimate.us/ccaceslcurves.cfm (RICRMC 2018a).

The two major contributors of sea level rise in Rhode Island are ice melt and land sinkage (subsidence). Because of subsidence, Rhode Island is particularly vulnerable to an increased rate of sea level rise in the future, higher than the global average (RICRMC 2018a, SeaLevelRise.org 2019). Subsidence in New England is primarily due to the Earth's crust rebounding from the last Ice Age, although it not as pronounced as in the mid-Atlantic (Wright 2019). There are already over 7,000 properties at risk from tidal flooding in Rhode Island. Flooding events without a major storm or nuisance flooding has increased by 380% in some areas of Rhode Island since 2000 (SeaLevelRise.org 2019).

Rhode Island Statewide Planning Program (RISPP) analyzed impacts from sea level rise of 1, 3, and 5 feet to transportation infrastructure on Rhode Island in 2014 (RI MPO 2019). The results indicate that every coastal Rhode Island community will experience impacts to their transportation infrastructure due to sea level rise. Over 2 miles of roadway are expected to flood at high tide under 1 foot of sea level rise, 28 miles at 3 feet of sea level rise, and up to 85 miles at 5 feet of sea level rise. In addition, numerous coastal bridges, rail segments, bike infrastructure, ports and harbors, airports, and public transportation routes will flood in these three sea level rise scenarios (RISPP 2015). Communities at the greatest risk are those surrounding Narragansett Bay and on Block Island, in particular, the East Bay communities of Barrington, Bristol, and Warren (Bristol County) (RISPP 2015). These sea level rise scenarios are based on current conditions and do not include projections of erosion, storm surge, or precipitation. Maps of the results are available at http://www.planning.ri.gov/geodeminfo/data/slr.php (RISPP 2015). Major infrastructure and major population areas may have some flood protection infrastructure; minor infrastructure facilities and dispersed settlement along the coast are at major risk of exposure, which could have major economic and social ramifications for those affected, their communities, and the State as a whole (RI MPO 2019).

In the Study Area, sea level rise is predicted to force a rise in coastal groundwater. As a result, wastewater systems and potable water sources may be compromised. In Rhode Island, many coastal properties rely on onsite wastewater treatment systems, or septic systems, for wastewater disposal and private wells for drinking water. Research at the University of Rhode Island suggests that as coastal groundwater rises, the change in relative volumes between soil and water will allow for septic contaminants to enter the water table. University research teams are currently studying sea level rise and saltwater intrusion in coastal aquifers and private drinking water well systems along Rhode Island's coast (RICRMC 2018b).

5.2.2.2 Storm Surge

Figure 5-7 shows NOAA's projections for storm surge associated with a Category 4 hurricane throughout the Study Area. This figure presents the worst-case scenario for storm surge that was available in the current data. Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the Rhode Island coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. Storm surge will impact the Study Area primarily along the immediate coast, adjacent to Narragansett Bay, and especially in Bristol County.

The coast of Rhode Island experiences seasonal storms, both hurricanes in the summer and nor'easters in the winter; these storm systems are described in greater detail in Chapter 1.4.2.2. Coastal flooding due to waves, storm surge, and rainfall occurs during these storms. In 2012, Hurricane Sandy hit Rhode Island, washing away large sections of Cliff Walk in Newport, and caused $11 million in damages to the State (SeaLevelRise.org 2019). The highest tides in Rhode Island occur during nor'easters. In places like Providence, these tides are typically over 1½ feet higher than normal hightides (SeaLevelRise.org 2019).

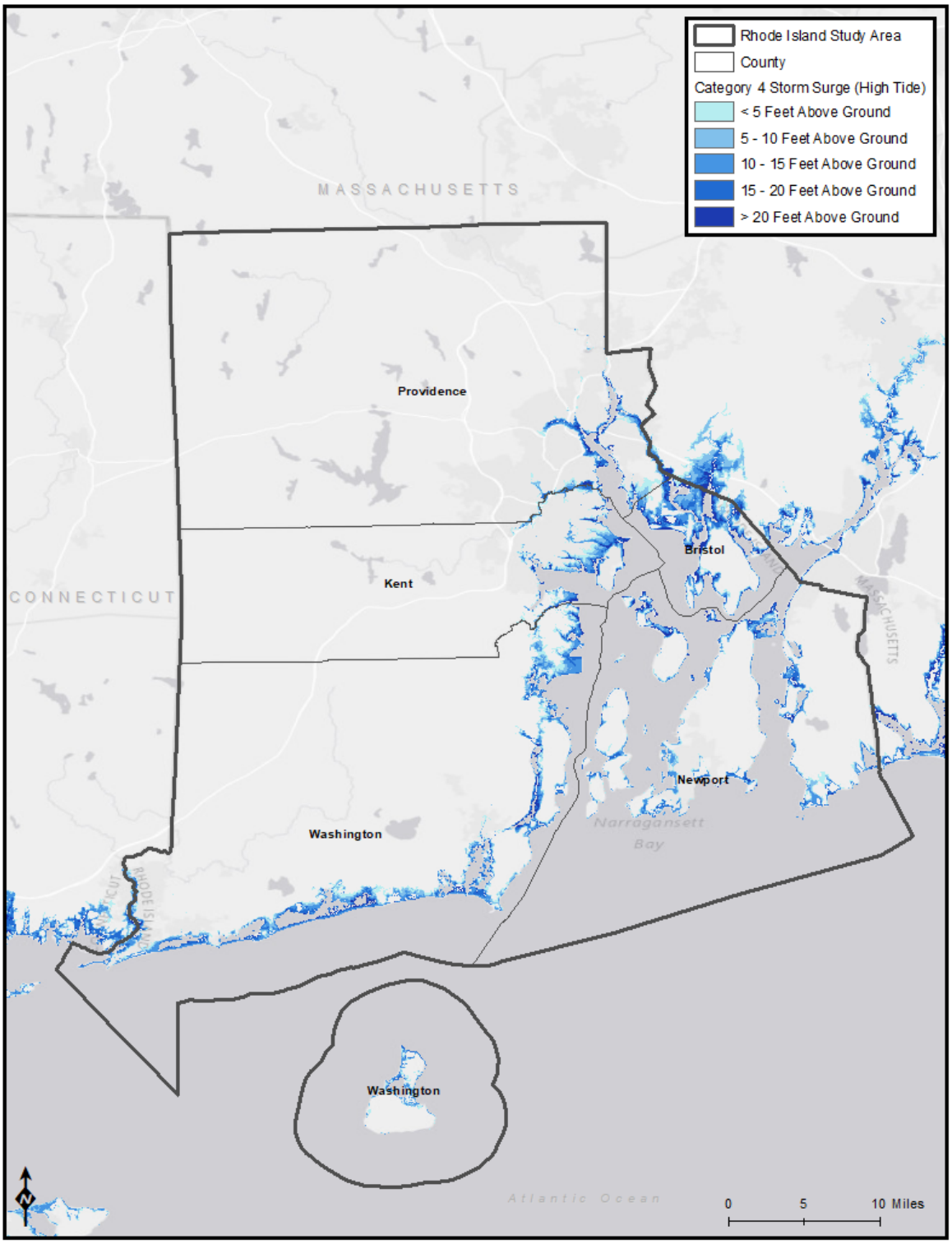
In Rhode Island, coastal erosion is of particular concern, especially on Rhode Island's south shore. Coastal erosion in Rhode Island is not a gradual process but rather the result of abrupt changes due to storms. The shoreline of Rhode Island experiences an average annualized rate of shoreline change of 1.9 feet per year, although annualized rates should be used with caution. Highest rates of change occur along the Matunuck Headline, where the annualized rate of change exceeds 4.7 feet per year, and total erosion since 1951 has approached 300 feet (RICRMC 2018a).

5.2.3 Summary – Physical Characteristics

Rhode Island's Narragansett Bay is an estuary of national significance. Wetlands, salt marshes, and salt ponds are an important part of the estuary system. The riverine, estuarine, and wetland systems are vital parts of Rhode Island's ecosystem, are protected areas, and also offer various recreational opportunities.

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. The historic rate of sea level rise within the Study Area is comparable to global rates; however, scientists predict average sea level rise of 0.375 inches per year at the Newport tide gauge within the next 16 years. Sea level rise within the Study Area will primarily impact areas along the immediate coast, adjacent to Narragansett Bay, and especially in Bristol County. NOAA's worst-case scenario projects up to 11.7 feet of sea level rise by 2100 (RICRMC 2018a). There are already over 7,000 properties at risk from tidal flooding in Rhode Island, and nuisance flooding has increased by 380% in some areas of Rhode Island since 2000 (SeaLevelRise.org 2019). Transportation infrastructure is also at risk, especially in communities surrounding Narragansett Bay and on Block Island, in particular, the East Bay communities of Barrington, Bristol, and Warren (Bristol County) (RISPP 2015). Sea level rise in the Study Area may cause coastal groundwater to rise, compromising septic systems and potable water wells.

Storm surges are exacerbated by rising sea level. Storm surges in the Study Area are possible in the summer from hurricanes but are most common in the winter during nor'easters, primarily because of the long duration of nor'easters over multiple tidal cycles. High tides during nor'easters can be over a 1½ feet higher than normal hightides. The greatest impact of concern due to storm surge is coastal erosion, especially on Rhode Island's south shore. Coastal erosion in Rhode Island is most pronounced along the Matunuck Headline (Washington County), where total erosion since 1951 has approached 300 feet.



Source: NOAA 2020a

Figure 5-7. Projected Storm Surge throughout the Rhode Island Study Area for a Category 4 Hurricane

Analysis of potential future OCS-related activities within these areas will need to consider the projected changes in sea level and storm surge and ways to mitigate or minimize impacts from the project to these areas and potential impacts to planned project activities from such occurrences.

5.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

5.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The 2016 NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

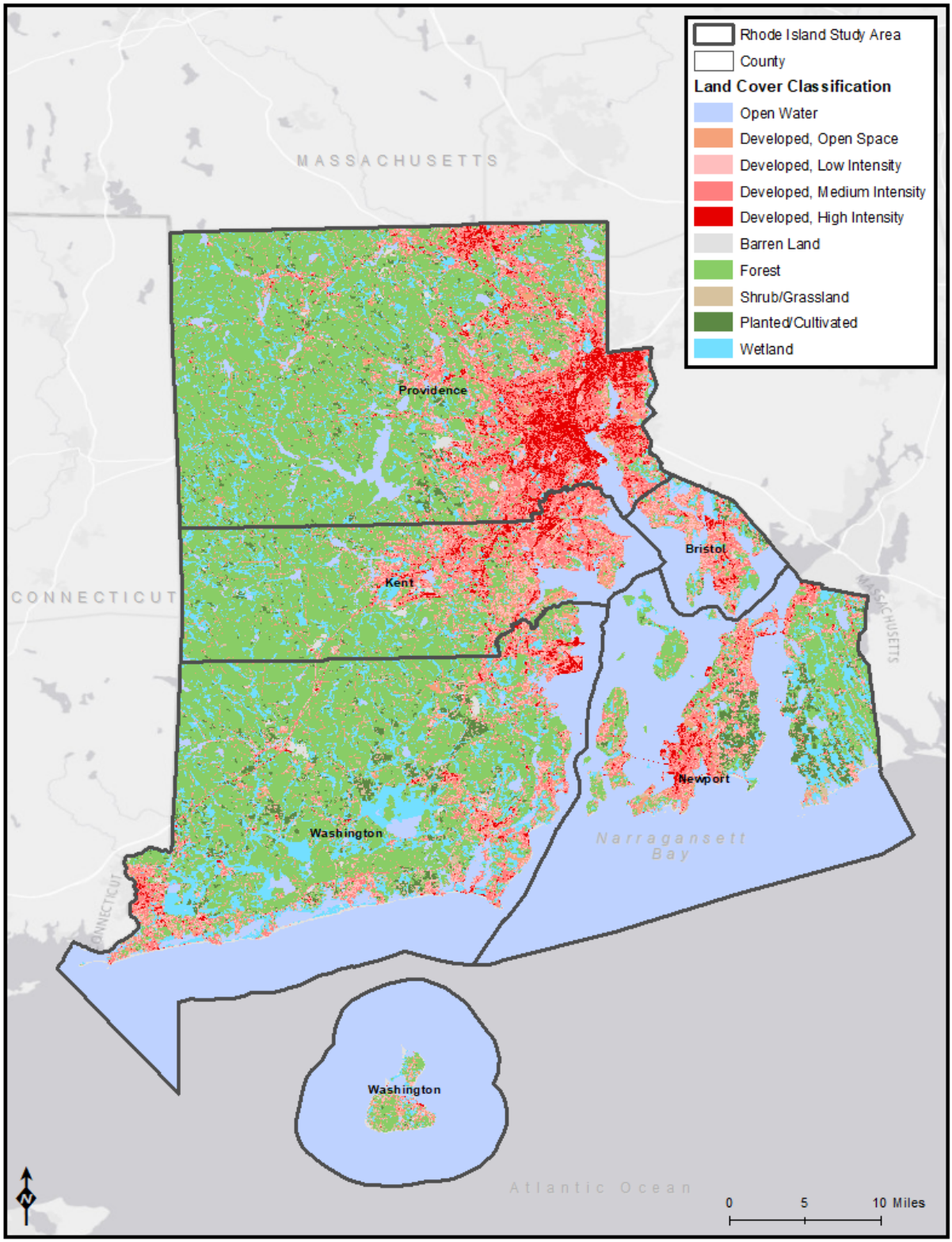
Figure 5-8 displays the NLCD data for the Study Area based on the 2016 data release. Table 5-3 presents the NLCD data for the counties within the Study Area by acreage. Table 5-4 presents the NLCD data for each county within the Study Area by percentage and presents a summary of the overall land cover for each geographic unit. Although Table 5-3 includes data for open-water land use, open water was ignored in Table 5-4 because this land cover would not be considered for future industrial development. Each county was then categorized based on its land cover trend as shown in Table 5-4 and Figure 5-8. The following section discusses the summary of this analysis.

Table 5-4 presents an assessment of the general land cover for the counties in the Study Area based on the majority of the land cover within that geographic unit. Based on the assessment presented in Table 5-4, Figure 5-8 shows the majority land cover type within each county in the Study Area.

As shown in Table 5-4, the Study Area overall has a predominant land cover of forested area and developed area at 50.1% and 29.8%, respectively. Bristol County has the highest percentage of developed land cover at 64.7% while Providence County has the highest proportion of forested land cover at 54.6%.

Most of the developed land cover in the Study Area is along the coast and the eastern regions of Providence County, Kent County, and Washington County. A majority of the western portion of Newport County also has a developed land cover.

It is important to note that, because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serve as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of Rhode Island may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of “forest” is very broad.



Source: NLCD 2016a

Figure 5-8. National Land Cover in the Rhode Island Study Area

Table 5-3. Acres of Land Cover by NLCD Classifications in Rhode Island Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Bristol	28,630	2,320	3,414	3,714	761	10,209	87	2,169	535	505	2,279	12,845
Kent	120,408	8,723	10,277	13,920	4,108	37,027	885	56,440	1,611	1,504	11,385	11,556
Newport	200,696	5,392	6,871	8,501	2,122	22,886	1,206	20,241	3,899	6,613	11,286	134,566
Providence	278,839	16,851	18,902	32,041	17,172	84,966	1,796	144,320	3,340	5,822	24,180	14,414
Washington	360,142	12,507	15,385	12,971	2,804	43,667	3,690	111,704	6,645	8,714	38,196	147,525
Study Area Total	988,715	45,793	54,850	71,147	26,967	198,756	7,665	334,875	16,030	23,158	87,325	320,906

Source: NLCD 2016a

Table 5-4. Percentage of Land Cover by NLCD Classification (excluding open waters) and Predominant Classification for Counties/Cities in the Rhode Island Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Bristol	14.7	21.6	23.5	4.8	64.7	0.6	13.7	3.4	3.2	14.4	Developed
Kent	8.0	9.4	12.8	3.8	34.0	0.8	51.9	1.5	1.4	10.5	Developed/Forest
Newport	8.2	10.4	12.9	3.2	34.6	1.8	30.6	5.9	10.0	17.1	Developed/Forest
Providence	6.4	7.1	12.1	6.5	32.1	0.7	54.6	1.3	2.2	9.1	Developed/Forest
Washington	5.9	7.2	6.1	1.3	20.5	1.7	52.5	3.1	4.1	18.0	Forest
Study Area Total	6.9	8.2	10.7	4.0	29.8	1.1	50.1	2.4	3.5	13.1	Developed/Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In Rhode Island, 2.6% of the land cover in the Study Area changed at least once. Figure 5-9 and Table 5-5 show the land cover change within the Study Area from 2001 to 2016. Kent County experienced the most significant land cover change at 3.8% followed closely by Providence County at 3.6%. These were largely changes from or to any one of the developed land cover types. As these counties include some of the State's larger cities, it can be presumed the land cover change was driven by urban or suburban changes. Newport County experienced the least land cover change at 1.6%, followed closely by Washington and Bristol Counties at 1.9% and 2.3%, respectively. The changes in these counties do not appear attributable to a specific action (MRLC 2016).

Table 5-5. Land Cover Change in the Rhode Island Study Area

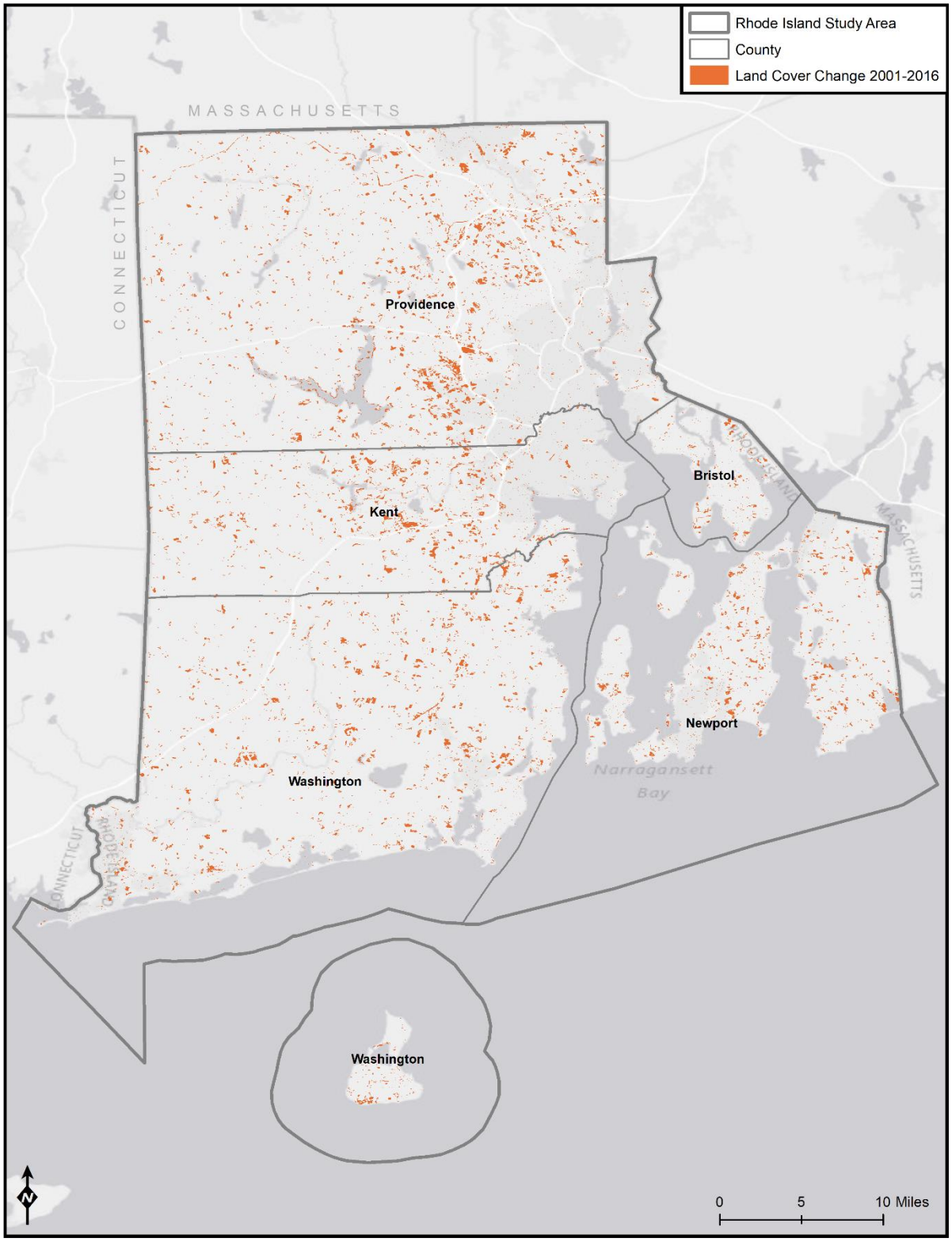
Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Bristol	28,630	647	2.3
Kent	120,408	4,555	3.8
Newport	200,732	3,113	1.6
Providence	278,839	10,011	3.6
Washington	360,181	6,934	1.9
Study Area Total	**988,790**	**25,259**	**2.6**

Source: NLCD 2001-2016

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including Providence, Kent, and Bristol would be the most suitable counties to accommodate future industrial coastal projects.

5.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.



Source: NLCD 2001-2016

Figure 5-9. Land Cover Change in the Rhode Island Study Area

5.3.2.1 Existing and Future Land Use

The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 5-10 presents locations of infrastructures at the broad scale of the Study Area. Figure 5-11 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 5.3.1, and the specific identified infrastructures and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

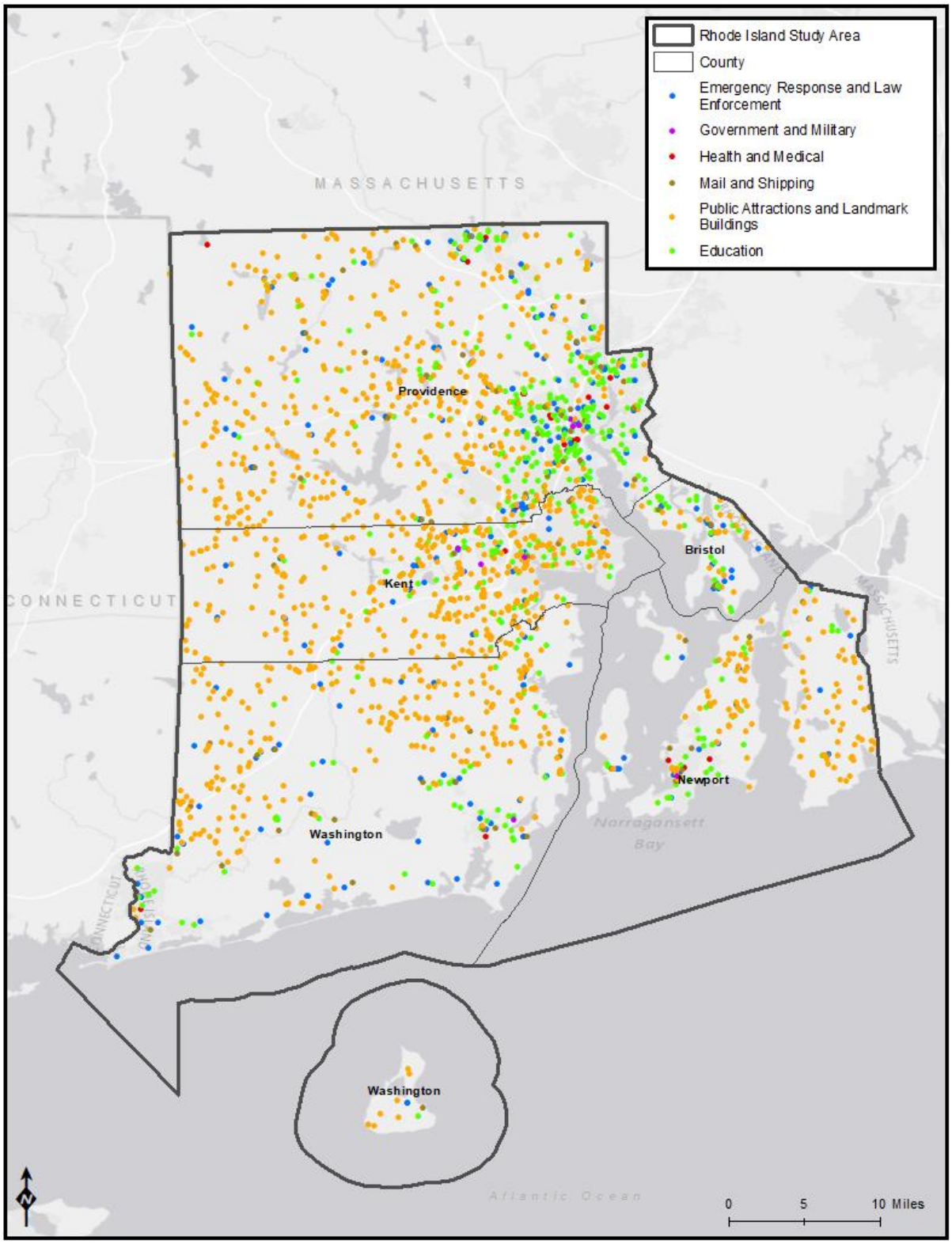
The State Workforce Board determined that the State of Rhode Island itself is a "region" comprised of two local areas. This determination was based on (1) geographic boundaries, (2) labor market area analysis and (3) Federal and non-Federal resources. Based on the above-mentioned observations, the State of Rhode Island is considered a single planning region. Accordingly, the State Plan also serves as the Regional Plan (Governor's Workforce Board 2017). Land use planning in the State of Rhode Island has been set up as a reciprocal system, where State goals and policies are reflected in local plans, and local plans have the ability to guide State actions. Therefore, the Comprehensive Planning and Land Use Act requires that adopted comprehensive plans be submitted to the Division of Planning for Review and that the Division of Planning review adopted comprehensive plans for consistency with the goals and intent of the Act and the State Guide Plan (RISPC 2018). Appendix B includes links to relevant planning documents. Future OCS-related project analysis should include consideration of these plans.

As determined in the land cover analysis in Chapter 5.3.1, most of the land cover in the Study Area is forested. The land use maps in Figure 5-10 and Figure 5-11 indicate that a moderate portion of the land in the Study Area is centered around public attractions/landmark buildings use, with clusters of education located within impervious areas, and impervious surfaces are positively correlated to areas with a larger population density.

The existing land use maps for the Study Area indicate that impervious surfaces are associated with urban land use and transportation corridors, and public attractions and landmark buildings are associated with urban land use or impervious surfaces. Existing land use data show that the density of public attractions and buildings is mostly clustered in Strafford County.

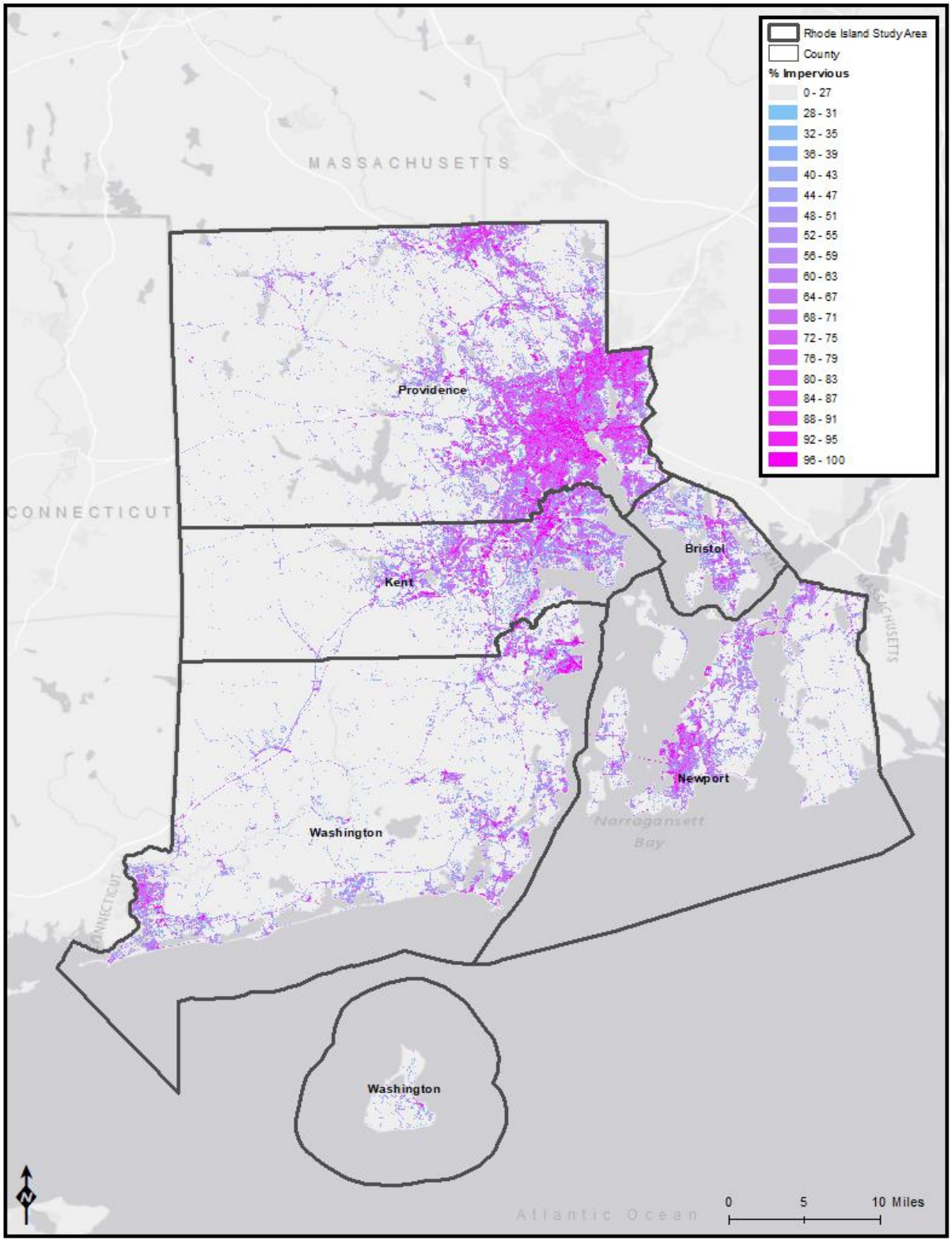
The land use data show the influence of the regional population density (discussed in Chapter 5.4.1) on the distribution and concentration of various land uses. Regions with higher population densities tend to coincide with the more concentrated land uses, which is consistent with the economic development regions that host larger transportation networks, more industries, and greater recreational resources.

Rhode Island is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. Rhode Island's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 25 census tracts in 15 municipalities (Rhode Island Commerce 2018b). An interactive map of opportunity zones is located at https://commerceri.com/site-selection/opportunity-zones/.



Source: USGS 2017

Figure 5-10. Select Existing Land Uses within the Rhode Island Study Area



Source: NLCD 2016b

Figure 5-11. Impervious Surfaces within the Rhode Island Study Area

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). Counties and municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

5.3.2.2 Zoning

In Rhode Island, local planning is governed by State laws that allow communities to plan and regulate their built environment (RI MPO 2020a). Rhode Island has prepared a legislative handbook titled "Rhode Island General Laws Related to Land Use and Planning" that includes all of the laws related to zoning and land management, including the Rhode Island Comprehensive Planning and Regulation Act, Land Development and Subdivision Review Enabling Act, Zoning Enabling Act, and Historical Area Zoning. These laws are important because land development and subdivision regulations must be in accordance with zoning ordinances and because municipal zoning ordinances and maps must be consistent with the comprehensive planning and land use planning. An interactive version of the handbook is available online at http://www.planning.ri.gov/documents/local/RIGeneral_Laws_Land_Use%20_Planning.pdf.

Another related document that should be considered is the State Guide Plan, which is a centralized and integrated long-range planning document that contains 18 elements of planning grouped into nine functional areas such as economic development, energy, land use, and natural resources. The State Guide Plan provides standards by which specific projects or proposals are evaluated for consistency with State goals, objectives, and policies (RI MPO 2020b).

Every community in the Study Area has a comprehensive plan, zoning ordinance, and set of land development regulations. In 2001, the Statewide Planning Program, which is the central planning agency for State government, published a technical paper that compiles data on selected provisions of zoning ordinances and land development/subdivision review regulations of Rhode Island's 39 municipalities. For each community, the paper presents data on natural resource protection provisions, open space zoning districts, agricultural zoning districts, and planned residential and mixed-use development provisions (Rhode Island 2001). According to Chapter 45-24 of the Rhode Island General Law, printed copies of the zoning ordinances and maps of a city or town shall be available to the general public and revised to include all amendments. Upon publication, copies are sent to the State law library but can also be requested at a reasonable charge for costs of printing and distribution.

Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

5.3.2.3 Industrial Incentives

Rhode Island offers few employment and training tax credit programs that could potentially benefit businesses associated with OCS-related activities. While businesses associated with OCS-related

activities typically do not qualify for many State-sponsored incentives, the following are financial and business incentives offered by the State of Rhode Island's Department of Labor and Training Business Workforce Center.

The Work Opportunity Tax Credit provides cash incentives for each new or long-term family assistance recipient hire over a two year period (RIDLT 2019). Employers that hire individuals that belong to specific target groups may be eligible to receive this tax credit. These target groups include veterans, Temporary Assistance to Needy Family recipients, recipients of vocational rehabilitation services, and qualified ex-felons (RIDLT 2019).

The Job Growth Act is a general, public law passed that would offer companies with 100 or more employees tax exemptions on half of any bonus they acquire. In order to qualify for the exemption, employee's must be paid 125% of the State's average wage (RIDLT 2019).

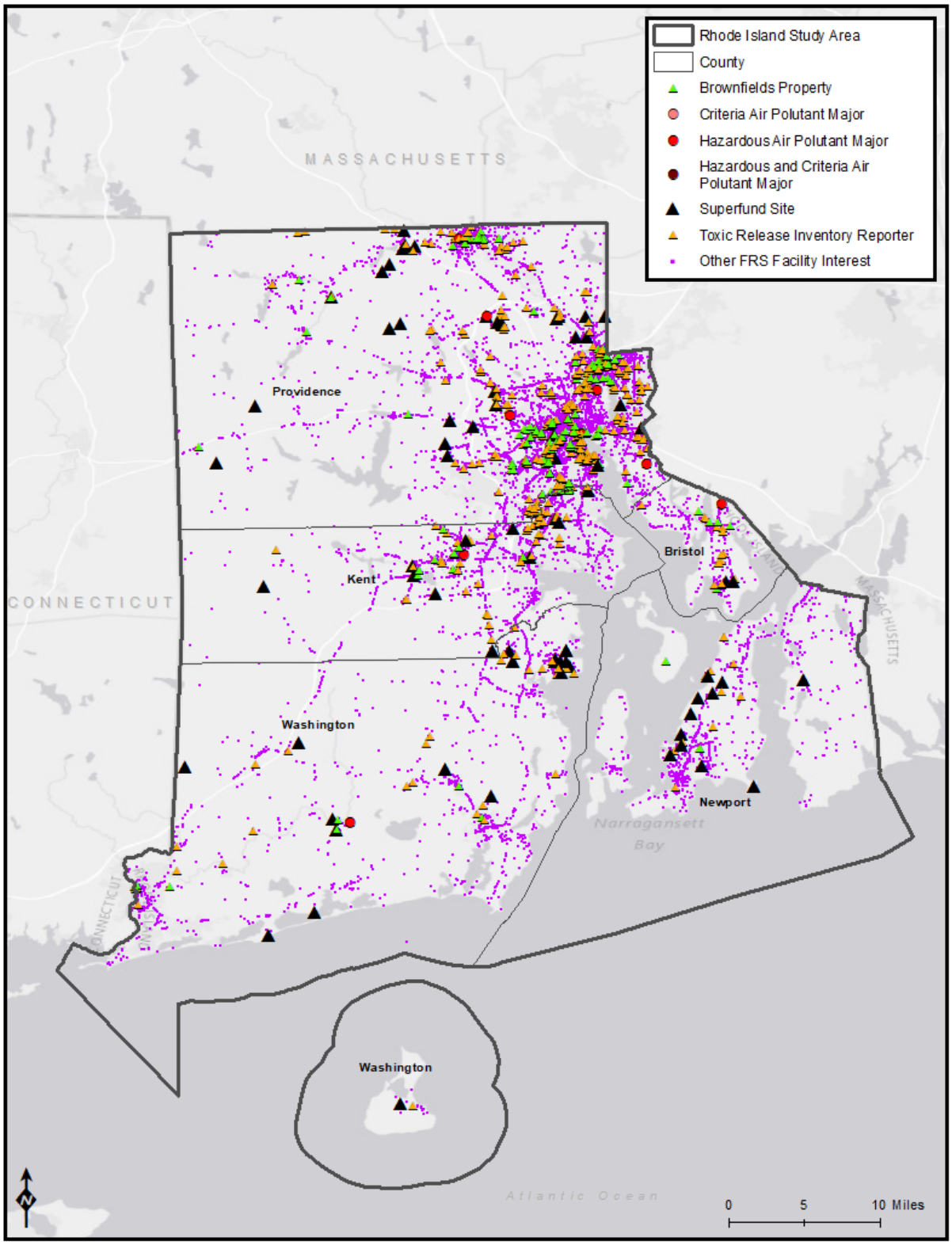
Rhode Island Commerce Corporation is an agency that is jointly public and private to work with and support public, private, and non-profit partners to create a beneficial business climate for all businesses across all industries and sectors. Rhode Island Commerce assists companies with property searches, tax credits and incentives, work force addition, and the general economic development between the State and the company (Rhode Island Commerce 2018a).

5.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 5-12 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 5-12, industry is concentrated in the major urban center of Providence. This urban center occupies southeast Providence County, northwest Kent County, and Bristol County. Other areas of industry include Newport County and northeast Washington County. Chapter 5.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 5-12. USEPA Facility Register Service Record for the Rhode Island Study Area

5.3.2.5 Protected Areas

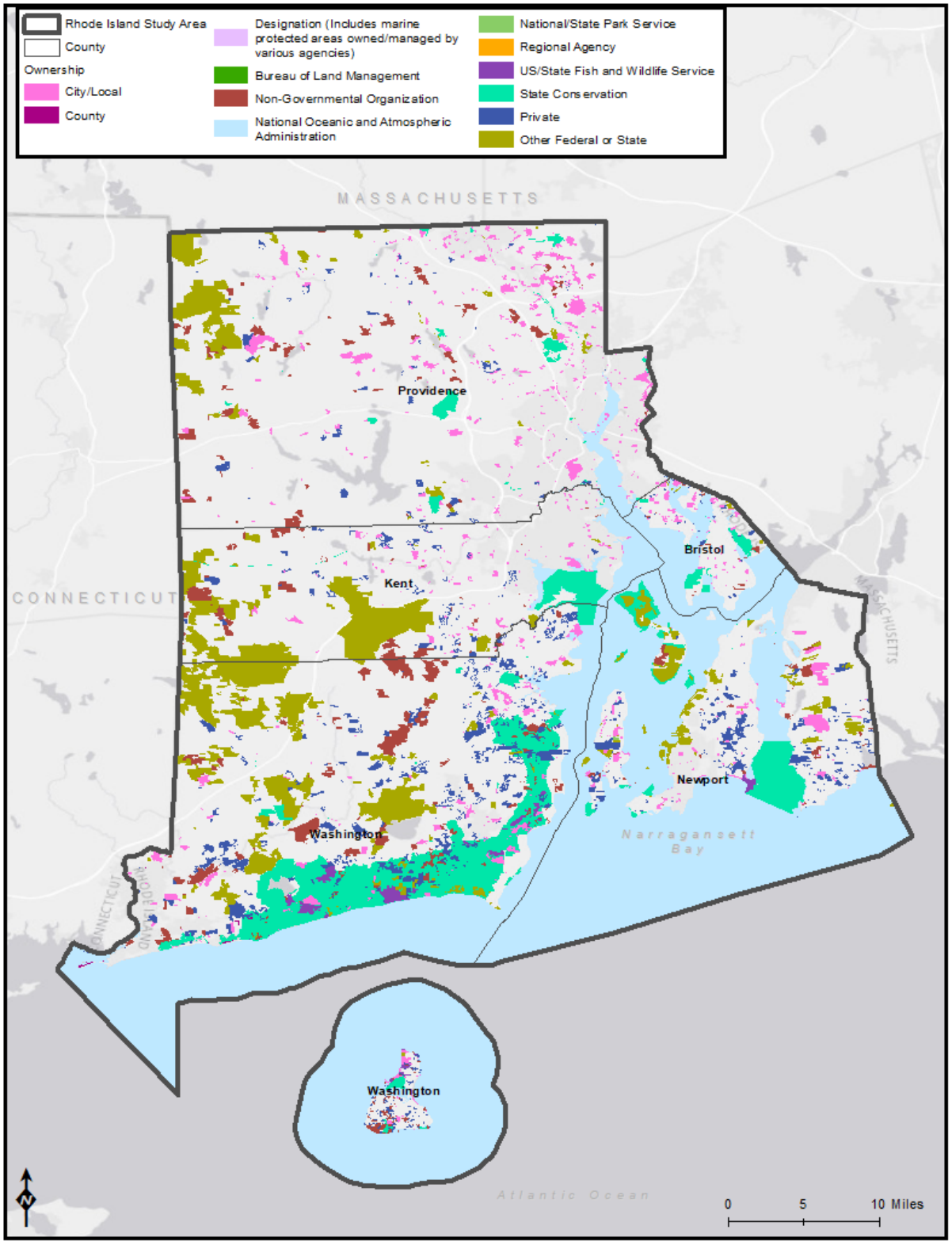
The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of fauna and flora within the ecosystem, as well as recreational activities and any other use of the land through "legal or other effective means." The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands (USGS 2019f). The goal is to make accurate land use planning and acquisition planning easier, as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time.

Figure 5-13 shows the protected areas within the Study Area. There are somewhat larger areas of protected lands in the southern and western parts of the Study Area, primarily because of the many Federal or State-owned protected areas, along with State Conservation areas. The "designation" category in the PAD-US includes marine protected areas that are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS. All of the protected areas can be viewed via interactive map with data taken from the PAD-US (protectedlands.net 2019). Overall, large portions of Kent and Washington Counties are covered in protected lands that could prohibit development. Providence and Bristol Counties have fewer protected lands. Protected areas and potential impacts to these areas need to be included in future OCS-related project analysis once site-specific information is known. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance. Protected lands in the Study Area include those owned and/or managed by the city/local area, Federal or State, USFWS, State conservation, and non-governmental organizations.

5.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Rhode Island, resided in the area long before the era of European exploration. They were nomadic hunter and gatherers that eventually settled in tribes of sedentary farmers throughout the area. Indigenous peoples including the Narragansett, Wampanoag, Nipmuc, and Pequot lived throughout the Rhode Island Region (Rhode Island 2020). Changes in the natural environment, population size, culture and organization of these early societies shaped the structures, ceremonies, and activities of the various tribes. Historically, Narragansett people had two homes; a winter home and a summer home. The winter home (long house) would support 20 families throughout the cold season. The summer home (Wigwams or Wetus) would be constructed along the shore as temporary shelter (Ferguson 2019, Narragansett Indian Tribe 2018).



Source: USGS 2019f

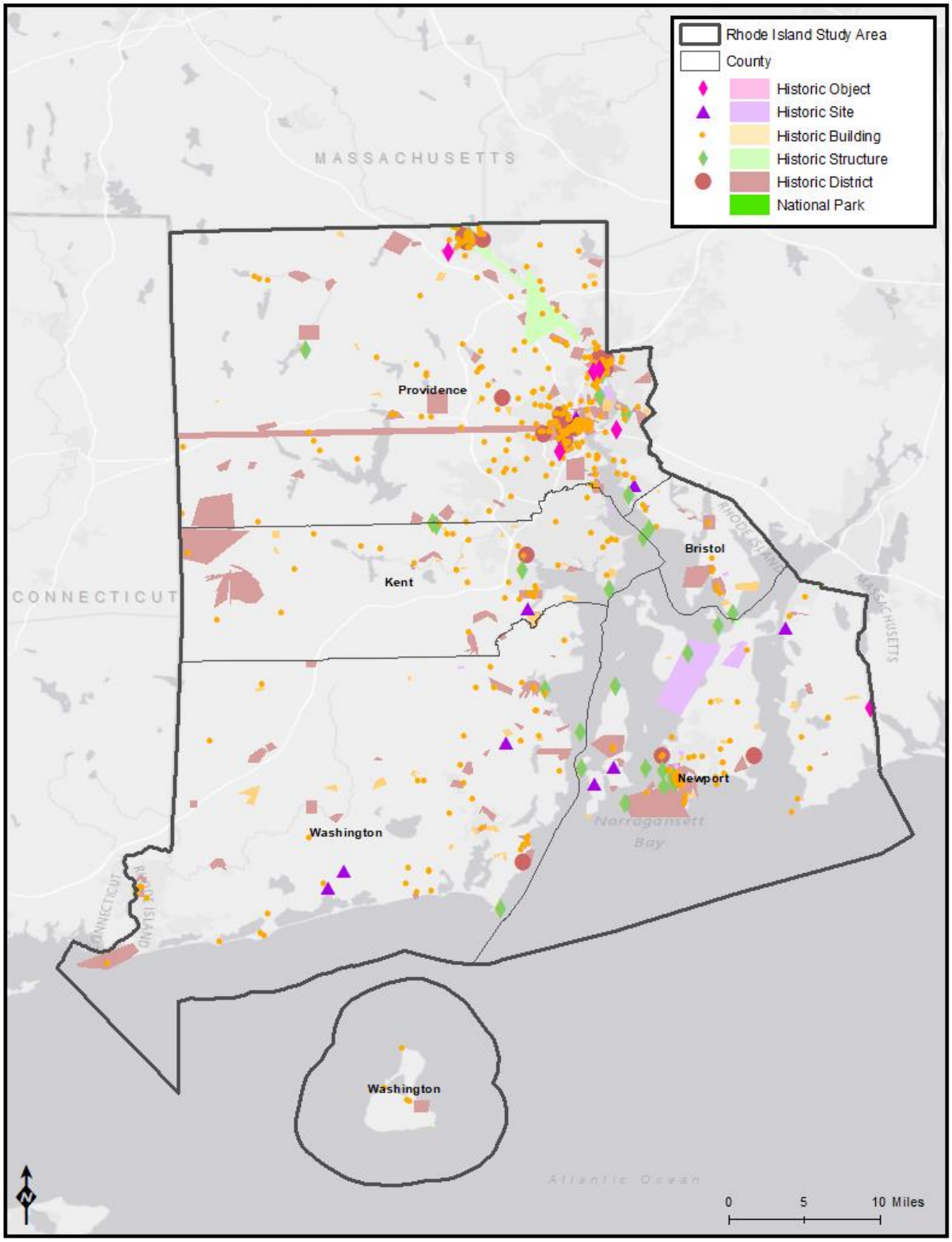
Figure 5-13. Protected Areas within the Rhode Island Study Area

In 1636, Roger Williams, was banished from Massachusetts because he believed in the separation of church and State. As a refugee from the Massachusetts Bay colony, he was welcomed by the Narragansett and founded Providence (Providence County). In 1638, Williams founded the first Baptist church in America and helped Anne Hutchinson and her followers purchase Adequidneck Island where they founded Portsmouth. In 1639, William Coddington left Portsmouth and founded Newport (Newport County). However, famine and diseases brought by the new settlers greatly reduced the number of native people in the area. Therefore, King Philip's War, also known as the Great Nargansett War or Metacom's Rebellion, took place between 1675 and 1676 as the natives tried to stop English settlement on their lands. In 1676, the killing of Metacom (the Wampanoag chief) by an Indian allied with white settlers, ended the worst of the conflicts between European settlers and native people (History 2019a). By the end of the 1600s, most of the Narragansett population had been killed or displaced. In 1640, the Common Burial Ground in Newport was established. Today, this cemetery the largest number of colonial era headstones, including the oldest and largest number of colonial enslaved and free African American headstones (Colonial Cemetery n.d.). By the end of the 1700s, Rhode Island had also established the oldest lending library (Redwood Library founded in 1747 in Newport), the oldest synagogue (Touro Synagogue built in 1763 in Newport), and the State's first college (Brown University founded in 1854 in Warren) (Rhode Island 2020).

In 1793, the first water-powered textile mill in Pawtucket (Providence County) marked the beginning of the American Industrial Revolution. In 1824, to protest long hours and reduced wages, women workers in Pawtucket organized the first factory strike in America. In 1895, construction of a new Rhode Island State House began, and it became one of the first major public buildings in the U.S. to have electricity (Rhode Island 2020).

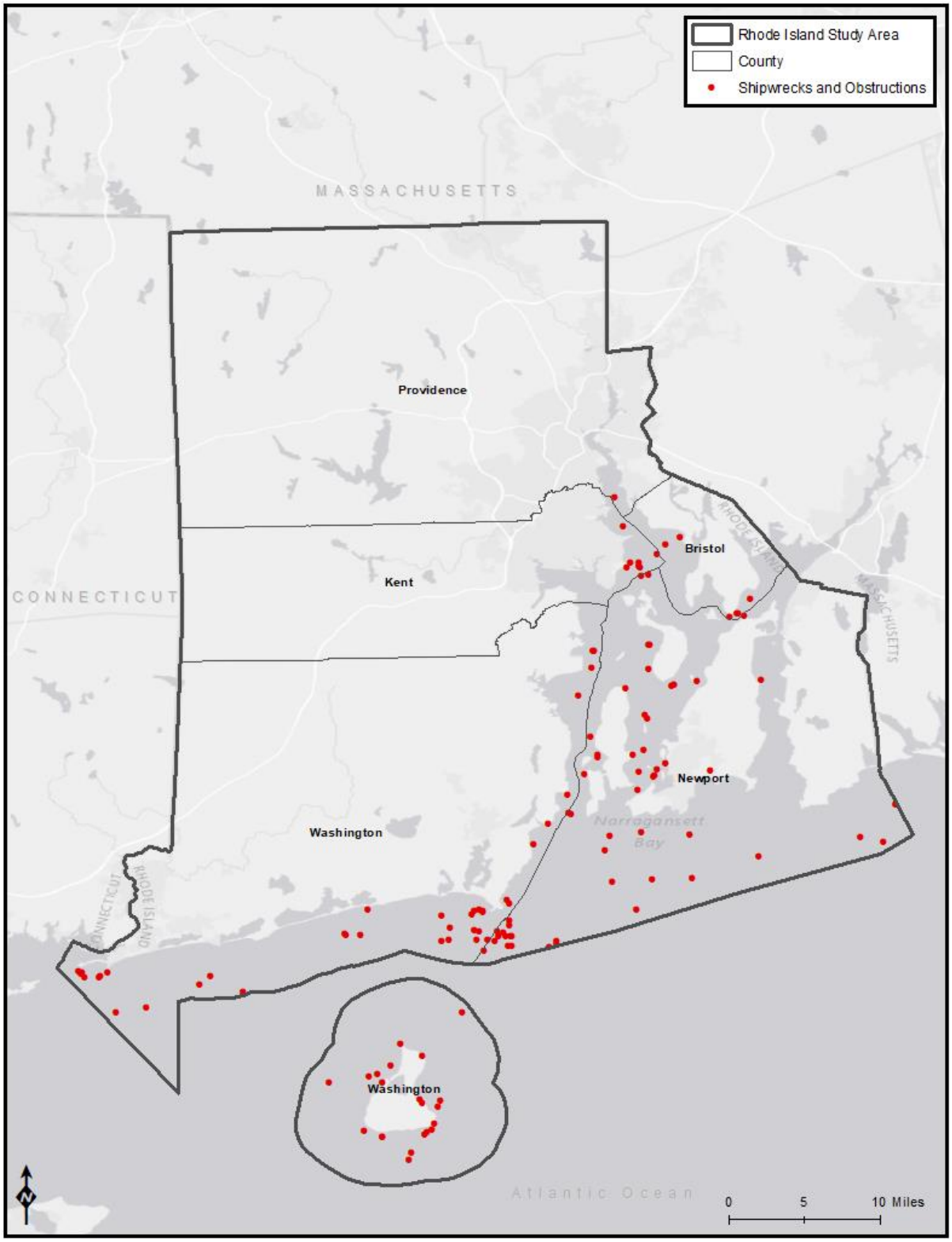
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with Native Americans, colonial settlements, the American Revolution, the War of 1812, and the American Civil War, slavery and the abolitionist movement, the Underground Railroad, World Wars I and II, and the Civil Rights Movement. Rhode Island's economy was historically based overwhelmingly on industry, with agriculture, mining, forestry, and fishing making only small contributions. The State's leading manufactured products were jewelry, silverware, machinery, primary metals, textiles, and rubber products (Encyclopedia.com 2019). Figure 5-14 and Figure 5-15 present a summary of many of these historic locations, including maritime sites and shipwrecks in the Narragansett Bay or the Atlantic Ocean.

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Rhode Island) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.



Source: NPS 2014

Figure 5-14. Cultural and Historic Sites within the Rhode Island Study Area



Source: NOAA 2016a

Figure 5-15. Shipwrecks and Obstructions in the Rhode Island Study Area

In summary, many cultural sites in the Study Area are identified in Figure 5-14 and Figure 5-15; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Rhode Island's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

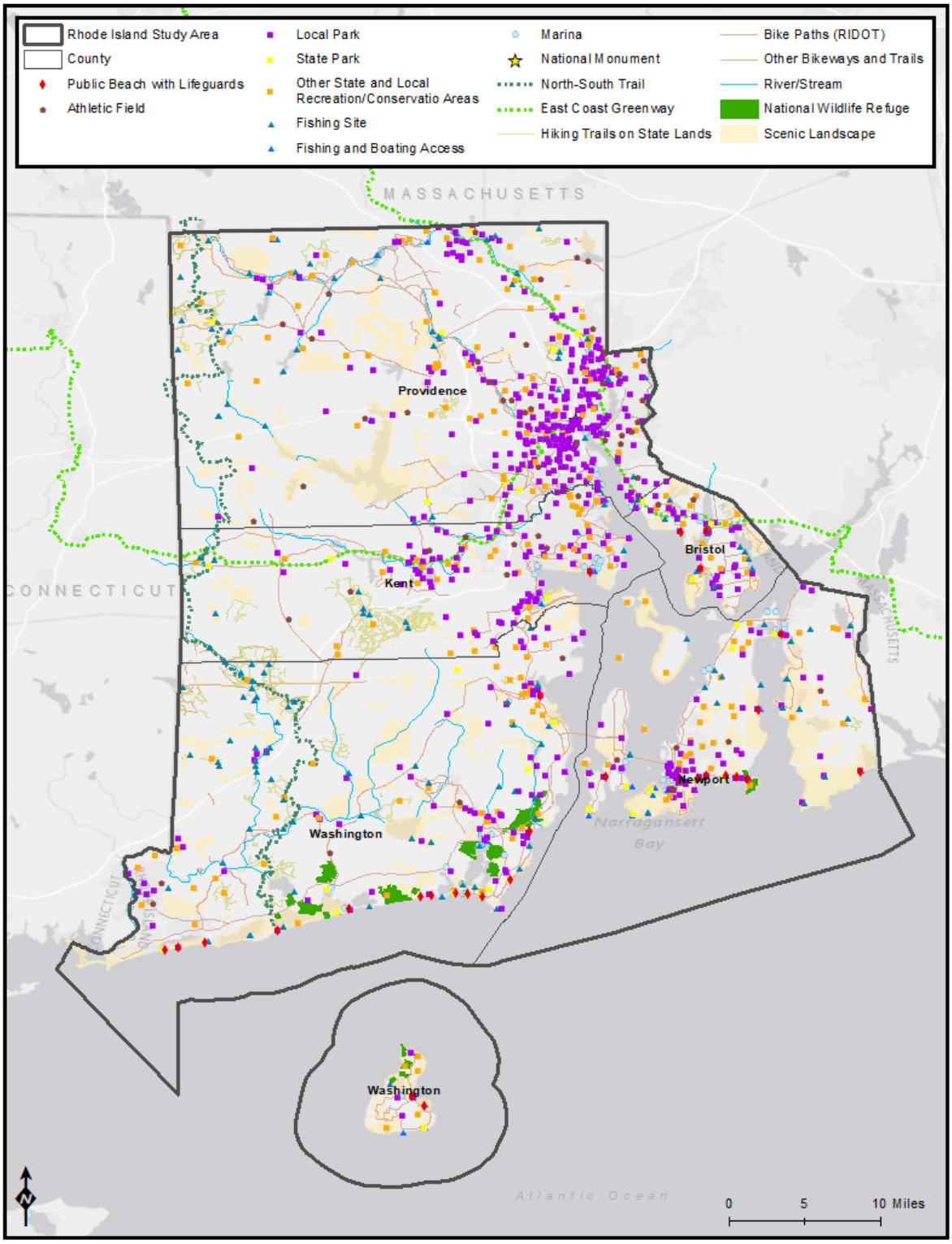
5.3.2.7 Recreation

The Study Area has diverse recreational opportunities including beaches and water activities, local parks, State parks, State forests, wildlife management areas, historic sites, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 5-16. The cultural and historic resources shown in Figure 5-14 and Figure 5-15 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 5-13. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 5.3.2.6), transportation (Chapter 5.3.2.8), tourism employment (included in Chapter 5.4.4), and rental housing (included in Chapter 5.4.3).

In 2017, 24.8 million people visited the Study Area, resulting in a visitor spending of almost $4.4 billion and supporting approximately 37,400 jobs. It was also noted that the travel economy grew by 23% between 2012 and 2017 (Tourism Economics 2018).

Rhode Island Cities

One popular tourist destination in the Study Area is Providence in Providence County. Providence is also the largest city in Rhode Island, with many recreational activities including museums, theaters, galleries, shops and restaurants, universities, and historical houses (PMCVB 2015). Newport is also a popular travel destination, with tourists spending approximately $919 million in direct travel expenditure in 2018, which supported 8,031 jobs (Tourism Economics 2019c). Recreational activities in Newport include walking along the Cliff Walk Trail, a 3.5-mile walkway along the shoreline; walking along Thames Street, a shopping/commercial district; and visiting historic landmarks and mansions (e.g., Fort Adams, The Breakers, Rough Point, and Marble House) (U.S. News 2020). Other attractions include visiting the International Tennis Hall of Fame and Newport Art Museum, and going to beaches, boating, sailing, and fishing (Discover Newport 2020, Lauro 2018).



Sources: RIGIS 2017a, RIGIS 2017b, RIGIS 2018a, RIGIS 2018b, RIGIS 2018c, RIGIS 2018d, RIGIS 2018e, RIGIS 2019a, NPS 2014, USFS 2019b

Figure 5-16. Select Recreational Resources within the Rhode Island Study Area

Rhode Island National Parks, Memorials, and Wildlife Refuges

The Study Area has one national historical park (Blackstone River Valley), one National historic site (Touro Synagogue), and one national memorial (NPS 2020a). In 2018, 60,709 people visited Roger Williams National Memorial in Providence, spending $3.6 million and supporting 48 jobs (NPS 2019). There are also several beaches, campgrounds, and State parks in the Study Area, which can be found on Rhode Island's State Parks website (RI State Parks 2020). In 2016, 9.4 million people visited Rhode Island's beach facilities, parks, campgrounds, and green spaces, spending $311.9 million and supporting 3,709 jobs (RI DEM 2018) Another attraction is the Rhode Island NWR Complex, which is made up of five refuges, of which one is located in Newport County and four that are located on the southern coast and island of Washington County (USFWS 2009). These refuges are popular with approximately 65,000 annual visitors at Sachuest Point NWR (Newport County) and almost 200,000 annual visitors at Ninigret NWR (Washington County) (Inspirock 2020, USFWS 2011).

Rhode Island Events

Some of the notable annual events in the Study Area include fishing tournaments (RISAA 2020), the Providence Boat Show (January), Rhode Island Spring Flower and Garden Show (February), and Rhode Island International Film Festival in Providence (August); the Winter Festival (February), Folk Festival (July-August), Jazz Festival (August), and International Boat Show in Newport (September); and the Gaspee Days in Warwick (May-June) (Top Events USA 2020b).

In summary, there are many recreational activities within the Study Area found in areas along the coast, as well as inland, natural settings, urban settings, parks/greenspaces, and built attractions. Activities in the northern region tend to be related to local parks, museums, and dining and shopping around the City of Providence (Providence County). There are also several attractions such as local parks, State parks, and public beaches in the southern region of the Study Area surrounding the City of Newport (Newport County) and southern coastline of Washington County. Summer is peak season for tourism in the Study Area because of the beaches and water-related activities. Therefore, travel costs will be higher during the summer months. Also, there are several annual festivals and events that occur through the Study Area, especially in Newport and Providence. Because many of the recreational attractions are also protected lands and historical landmarks, there will likely be limitations for development near these areas. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages.

5.3.2.8 Transportation Resources

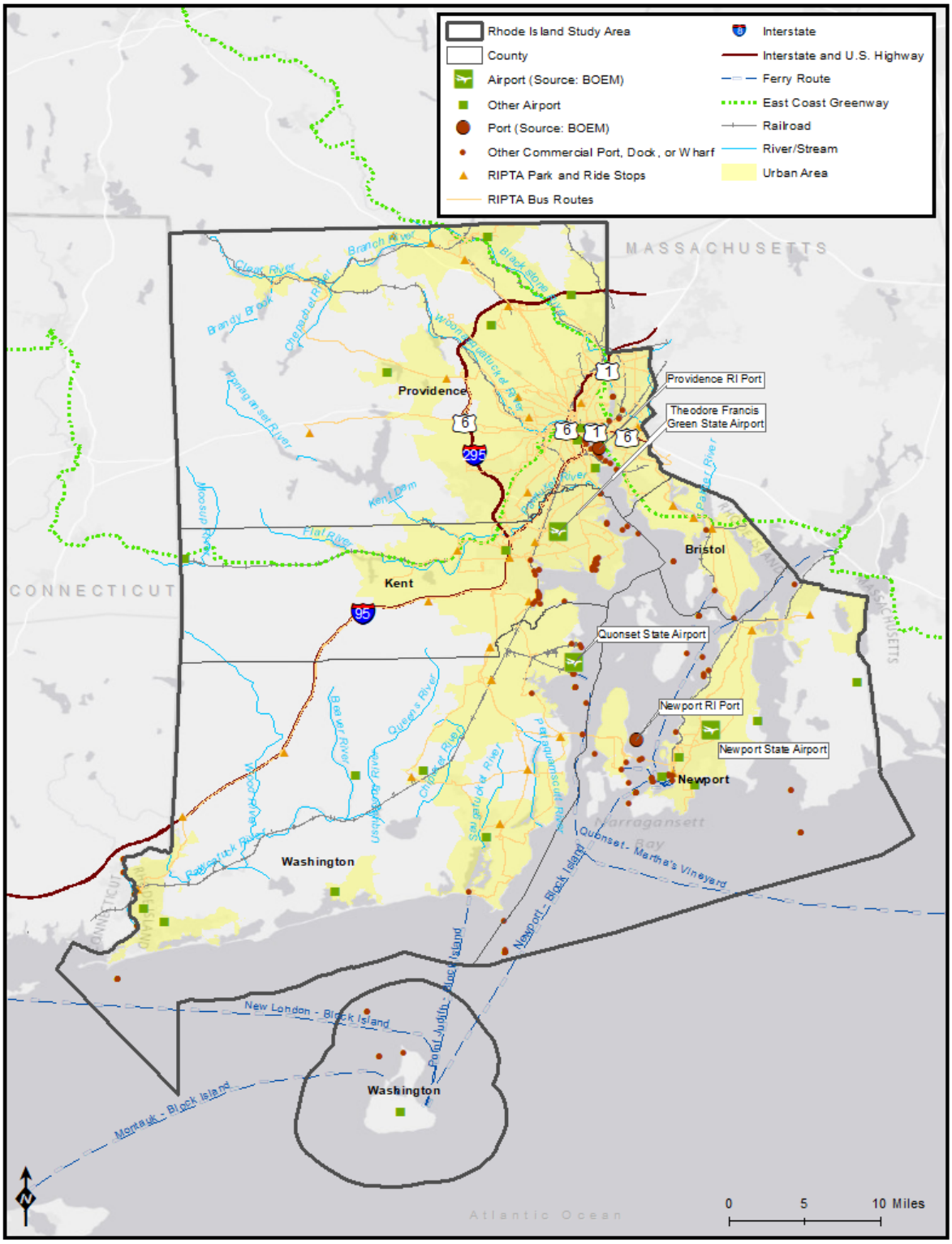
Rhode Island is in the heavily populated region between Washington, DC, New York, and Boston, which has influenced its marine, road, and rail transportation. Today, Rhode Island's transportation system is part of a larger system serving New England and the northeastern U.S Region. The State is part of the Amtrak Northeast Corridor and the I-95 highway corridor. Rhode Island's transportation infrastructure and other routes serve as a conduit for traffic between New York, Boston, and Cape Cod. Many Rhode Island residents commute by rail to Boston and New York for work (RISPP 2014). A regional analysis conducted by the Rhode Island Economic Policy Council documented the importance of regional transportation linkages to Rhode Island's future economic strength, identifying the State's location along the major highway, high speed rail, and proximity to international shipping lanes as a strategic asset. Stronger economic and transportation linkages within the region have also affected commuting patterns, with many of the State's residents commuting to jobs in the metropolitan Boston area and in southeastern Connecticut (RISPP 2017).

Figure 5-17 shows the transportation resources throughout the Study Area. In Rhode Island, most of the freight corridors run north to south. The main freight corridors for trucks include I-95, I-295, Route 4, and Route 146. The main freight rail corridor is the Amtrak Northeast Corridor. The marine shipping corridor is Narragansett Bay via the Port of Davisville within the Quonset Business Park and the Port of Providence. East-west freight corridors are primarily limited to truck freight on I-195, Route 6, and Route 44. In addition, rail connects Rhode Island to the national and Canadian rail networks through interchanges in Massachusetts, Connecticut, and New York (RISPP 2014b). The Rhode Island Division of Statewide Planning completed the Rhode Island Statewide Freight and Goods Movement Plan in 2016 to evaluate goods movement via air, rail, truck, and marine transport (RI DOA 2017). According to a study by CNBC in 2019, Rhode Island's roads and bridges are in poor condition. Governor Raimondo introduced a program called RhodeWorks to address infrastructure deficiencies (Cohn 2019).

The Rhode Island State Airport system is composed of six airports currently owned by the Rhode Island Department of Transportation with the Rhode Island Airport Corporation assuming all management and operating responsibilities. Rhode Island Airport Corporation was created in 1982 as a quasi-public corporation of the State of Rhode Island to develop the State aviation system in an efficient and effective manner. In addition to operating and maintaining the State-owned airports, Rhode Island Airport Corporation is responsible for the planning, design, and construction of airport improvements. The Division of Planning, together with the Rhode Island Airport Corporation , completed the Airport System Plan in 2011 (RISPP 2011). It provides system planning to develop goals and future needs for the six State airports operated by the Rhode Island Airport Corporation .

Potential transportation constraints within the Study Area are associated with vulnerabilities (see Chapter 5.2.2) primarily from recurrent flooding and projected congestion. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in sea level and an increase in the frequency and intensity of large storm systems). Rhode Island as a coastal State has a long history of major and minor flooding events during which water inundates or covers land area that is currently, on average, dry. Overall, Warwick, Narragansett, Newport, Barrington, and Providence are the top five Rhode Island municipalities most vulnerable to sea level rise and storm surge from climate change. The Rhode Island Division of Statewide Planning has completed studies to evaluate the vulnerability of transportation assets to sea level rise and storm surge (RI MPO 2019).

Because Rhode Island is the second most densely populated State in the Nation, it suffers from congestion as do most medium and large metropolitan areas. Until recently, transportation planners have been primarily concerned with highway congestion; however, more recently, certain public transit routes have also become congested. Rhode Island has developed a congestion management process that is an integral part of metropolitan planning in Rhode Island. The congestion management process identifies, analyzes, and evaluates the causes of congestion within the major travel corridors of Rhode Island and includes all modes of travel. More information on the Rhode Island Congestion Management Process is available in Appendix A of the Long-Range Transportation Plan (RISP 2014a, RISPP 2017). Congestion management will be particularly important as there is job growth in suburban areas resulting from larger private industry, and educational and health employers outside the urban core which will continue to result in new loads on the existing transportation network.



Sources: RIGIS 2017c, RIGIS 2017d, RIGIS 2017e, RIGIS 2019b, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 5-17. Transportation Resources within the Rhode Island Study Area

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Transportation needs will need to be considered during the analysis of potential future OCS-related projects. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Available maritime ports are large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

5.3.3 Summary – Land Cover and Land Use

Rhode Island's overall land covers are predominantly forested and developed areas. Most of the urban development is along the coast.

In Rhode Island, local planning is governed by State laws (RI MPO 2020a). Rhode Island has prepared a legislative handbook titled "Rhode Island General Laws Related to Land Use and Planning" that includes all of the laws related to zoning and land management, including the Rhode Island Comprehensive Planning and Regulation Act, Land Development and Subdivision Review Enabling Act, Zoning Enabling Act, and Historical Area Zoning. These laws are important because land development and subdivision regulations must be in accordance with zoning ordinances and because municipal zoning ordinances and maps must be consistent with the comprehensive planning and land use planning. Another related document that should be considered is the State Guide Plan, which is a centralized and integrated long-range planning document that contains 18 elements of planning grouped into nine functional areas such as economic development, energy, land use, and natural resources. The State Guide Plan provides standards by which specific projects or proposals are evaluated for consistency with State goals, objectives, and policies (RI MPO 2020b). Every community in the Study Area has a comprehensive plan, zoning ordinance, and set of land development regulations. Several communities have Opportunity Zones which are targeted for future development.

The State of Rhode Island offers several business and financial incentives. However, many State-sponsored incentives may not apply to businesses associated with OCS-related activities. Analysis of future OCS-related projects may wish to include consultation with the Rhode Island Commerce Corporation and the Rhode Island Department of Labor and Training for additional information.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. Protected lands provide essential ecosystem services. Cultural resources and recreational areas may overlap with protected areas, and additionally, these specific land uses tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Future analysis will need to carefully assess the nature of sites that are potentially impacted by future OCS-related projects and consider whether alternatives sites may have lesser impacts to these areas.

Because Rhode Island is the second most densely populated State in the Nation, it suffers from transportation related congestion as do most medium and large metropolitan areas. Congestion is an issue both on highways and certain public transit routes. Rhode Island has developed a congestion management process that is an integral part of metropolitan planning in Rhode Island (RISPP 2017).

5.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

5.4.1 Population

Rhode Island's population is increasing but at a rate slower than the Nation. According to the USCB, Rhode Island's estimated population was 1.1 million in 2017. As shown in Table 5-6, the population of Rhode Island grew 0.3% since the 2010 Census, having added approximately 3,571 people. During the same period, the population of the U.S. grew 4.0% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). Rhode Island has grown the slowest of the six New England States (Maine, New Hampshire, Vermont, Massachusetts, Connecticut). Measuring 1,033 square miles, it is also the smallest of the 50 States in terms of area (World Population Review 2020).

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). This nationwide trend is also contributing to Rhode Island's declining growth rate. Between 2010 and 2018 natural increase continued to contribute to population growth. However, the majority of the State's growth is from net migration. According to 2018 estimates, the State gained 745 people from natural increase and 116 people from net migration. International migration of 2,755 people offset population loss due to the out-migration of 2,639 people, resulting in a small gain of 829 people (USCB 2019b). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). Much of the slowdown in the State's population growth is a result of domestic out-migration, as more people are moving out of Rhode Island than into the State. Census Bureau 2018 estimates indicate that the most popular States that people are moving to are Massachusetts, Florida, Connecticut, Virginia, and South Carolina (USCB 2019c). This is consistent with demographer William H. Frey's assertion of a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt" (Frey 2019). A recent article cited low job opportunities, high taxes, and high cost of living as reasons for out-migration (Trattner 2019).

5.4.1.1 Study Area Trends

There are five counties (Bristol, Kent, Newport, Providence, and Washington) in the State of Rhode Island, which also comprise the Study Area. The Study Area represented 100% of the State's 2017 population of 1.1 million. The counties have not been delineated into regions due to the small number of counties and the size of the State.

Table 5-6. 2010 and 2017 Total Population and Population Projections Through 2040 in the Rhode Island Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Bristol	49,875	49,028	48,978	49,210	48,424	-1.7	-1.2
Kent	166,158	164,012	164,522	166,678	165,353	-1.3	0.8
Newport	82,888	83,204	79,344	77,834	74,823	0.4	-10.1
Providence	626,667	633,704	624,009	636,564	635,860	1.1	0.3
Washington	126,979	126,190	132,324	140,391	145,644	-0.6	15.4
Study Area/ Rhode Island	**1,052,567**	**1,056,138**	**1,049,177**	**1,070,677**	**1,070,104**	**0.3**	**1.3**
United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**373,528,000**[4]	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - RISPP 2013; 4 - USCB 2018b

Table 5-6 shows population growth and decline in the Study Area counties. Between 2010 and 2017, two out of five counties gained population, while three counties lost population. During the same period, the population of the Study Area grew just 0.3%, much slower than the Nation (4.0%) (USCB 2017a, USCB 2017d). Growth in Rhode Island lags behind other New England States (RISPP 2014a). Between 2010 and 2017, Providence County grew the most, at 1.1%; Bristol County decreased the most, at 1.7% (USCB 2017a, USCB 2017d).

Figure 5-18 shows population counts in census block groups within the five counties located in the Study Area. The figure illustrates higher populations near and within the city of Providence and adjacent urban areas along Narragansett Bay. According to the RISPP, minority populations are growing rapidly in urban areas, notably Providence, Newport, and Cranston (RISPP 2014a).

There is one MSA, Providence-Warwick, RI-MA, in the Study Area, as illustrated in Figure 5-19. An MSA is defined as a region containing at least one urban area with a population of 50,000 *(Federal Register* 2010). The MSA comprises the entire Study Area (Data.gov 2017).

Figure 5-20 illustrates population per square mile in the Study Area. Population densities are higher inland than on the coast. The figure illustrates high-density concentrations within the major urban areas but also in adjacent suburbs, as population growth occurred outside the urban core in a low-density sprawl pattern of 500.1-1,000 persons per square mile category. Contiguous low-density areas comprising the "less than 100 and 101 to 500 persons per square mile" categories are evident on the western side of the State. As shown in Figure 5-20, the population density of the Study Area was 1,022 persons per square mile in 2017, greater than the Nation (90 persons per square mile). Population densities in the Study Area ranged from 383 persons per square mile in Washington County to 2,031 persons per square mile in Bristol County (the county seat, located near the city of Providence) (USCB 2017d, USCB 2017c).

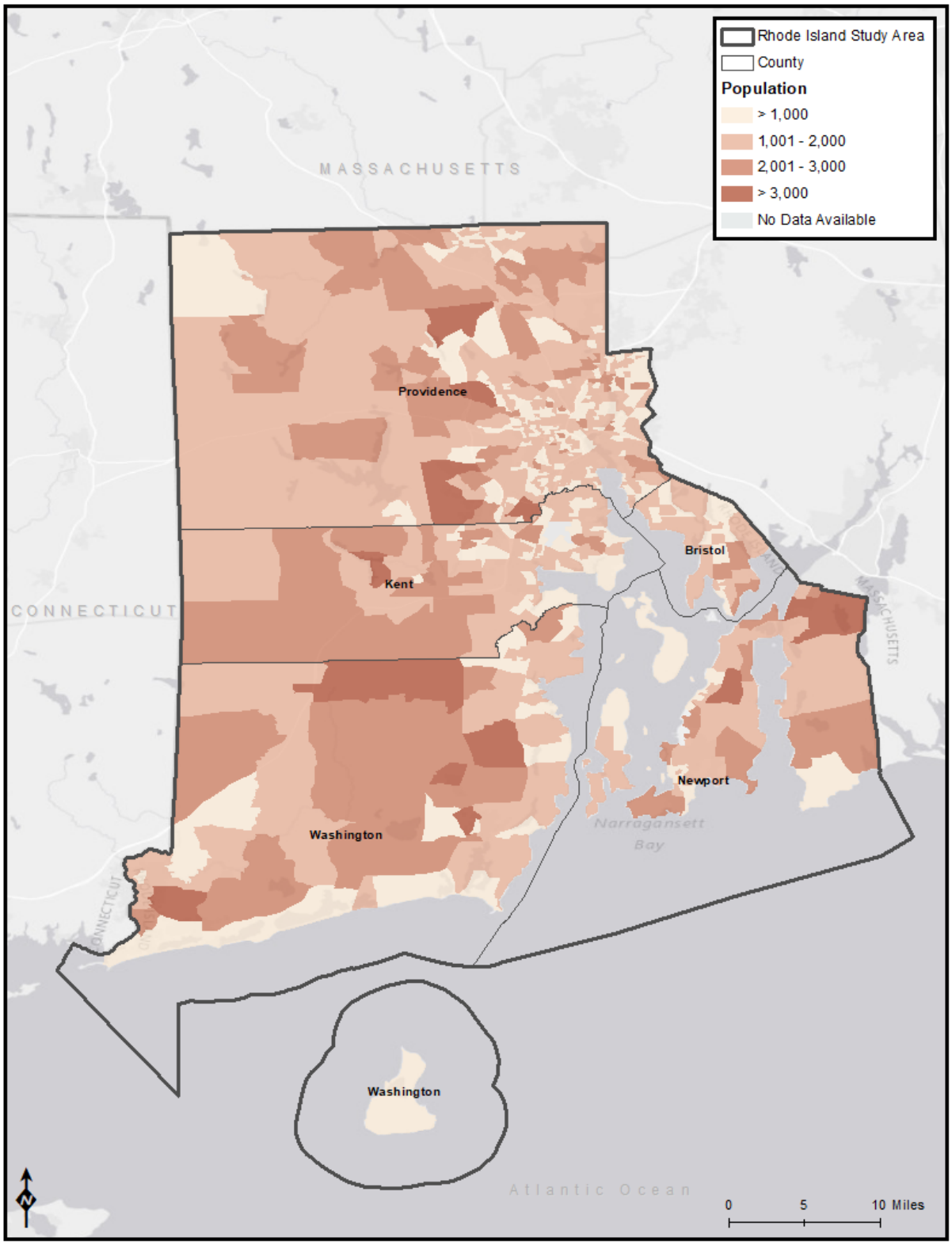
5.4.1.2 Population Projections

According to the RISPP, the State's population is projected to grow only 1.3% (1.1 million residents) by 2040. The Nation's population is projected to grow 16.4% (373.5 million), significantly more than the Study Area during the same period. Table 5-7 provides details of the projected population for the U.S. and the Study Area from 2017 to 2040 (USCB 2017c, USCB 2018b, USCB 2017d, RISPP 2013). Figure 5-21 shows the overall projected percent change in population in each county during the same period.

Table 5-7. 2017 and 2040 Population Density in the Rhode Island Study Area

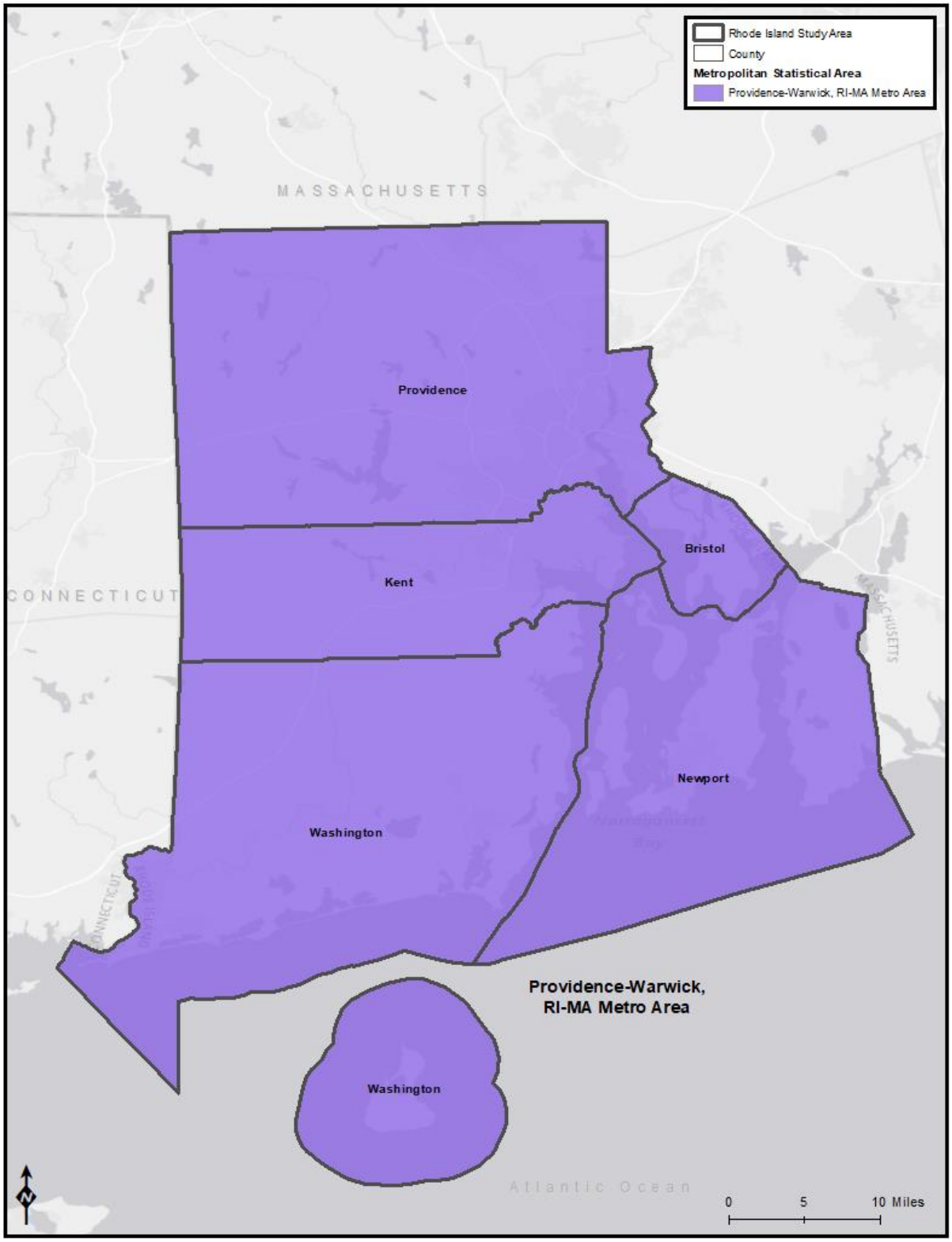
Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Bristol	49,028	48,424	24	2,031.3	2,006.2
Kent	164,012	165,353	169	973.0	981.0
Newport	83,204	74,823	102	812.2	730.4
Providence	633,704	635,860	409	1,547.6	1,552.8
Washington	126,190	145,644	329	383.2	442.3
Study Area/ Rhode Island	**1,056,138**	**1,070,104**	**1034**	**1,021.4**	**1,034.9**
United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: RISPP 2013, USCB 2017c, USCB 2017d, USCB 2018b



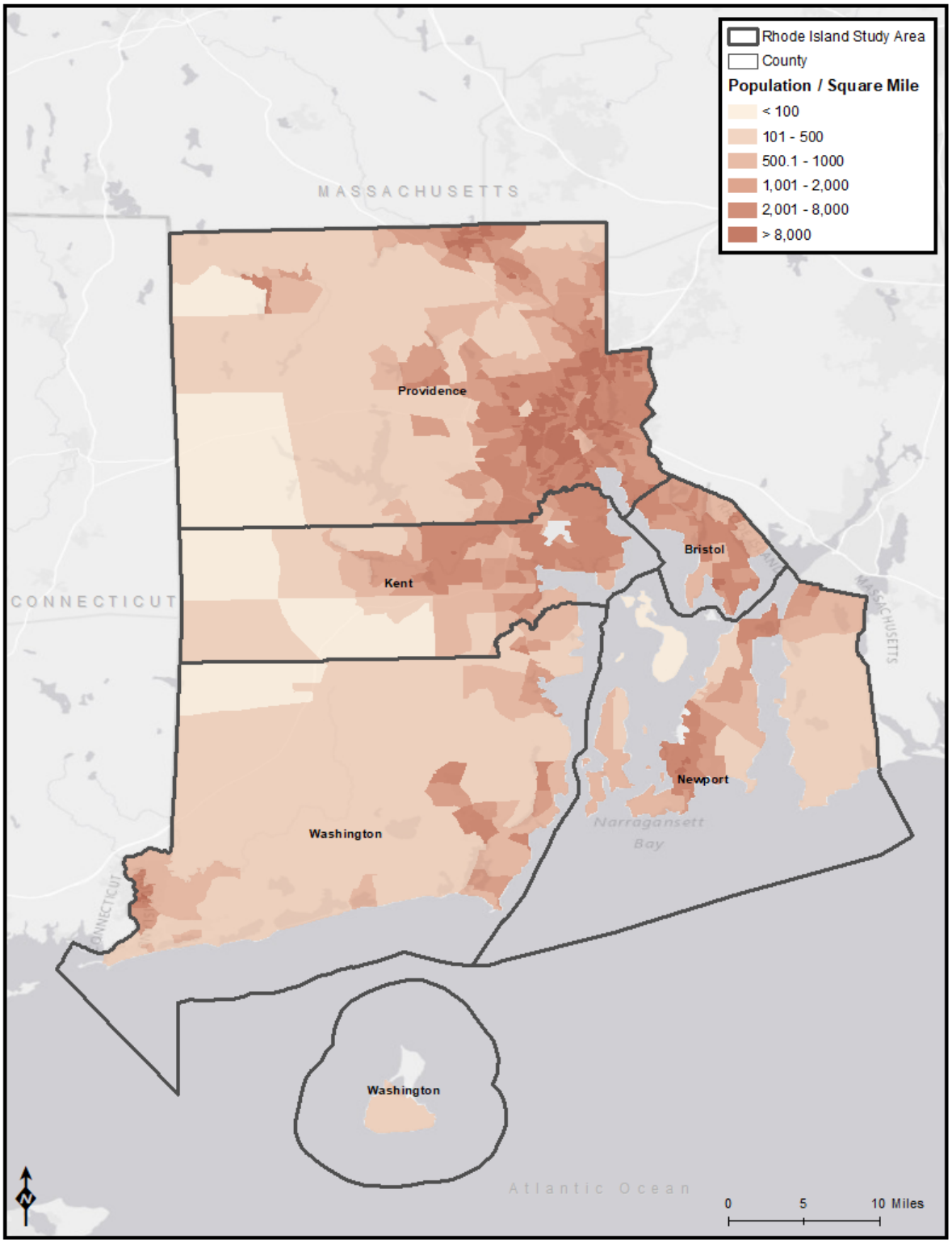
Source: USCB 2017r

Figure 5-18. Population in the Rhode Island Study Area Counties by Census Block Group



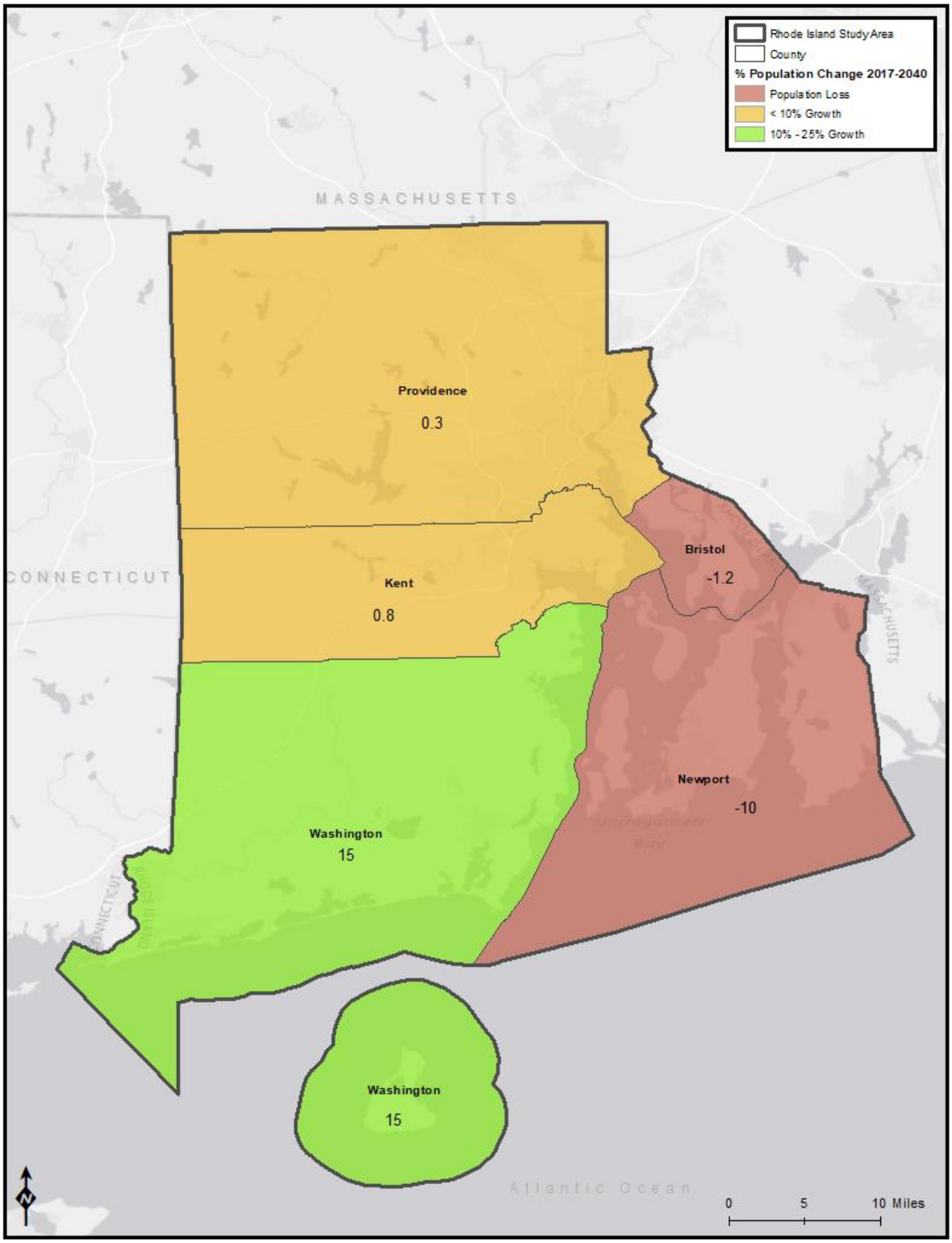
Source: USCB 2017s

Figure 5-19. Metropolitan Statistical Areas Located within the Rhode Island Study Area



Source: USCB 2017r

Figure 5-20. Population Density in the Rhode Island Study Area Counties by Census Block Group



Source: RISPP 2013

Figure 5-21. Overall Projected Population Change from 2017-2040 in the Rhode Island Study Area by County

As shown in Table 5-7, growth will not be uniform across the Study Area. Strong growth trends are expected to continue in Washington County, projected to be 15.4% between 2017 and 2040. Newport County is expected to decline in population by 10.1%, likely due to the confluence of several factors: aging of the population, suburban sprawl, major military cutbacks, and a slow recovery from the Great Recession (which lasted from 2007 to 2009) (RISPP 2014a). In early 2020, a new economic development report, Rhode Island Innovates 2.0 was released which indicates that between 2016 and the time of publication of the report, Rhode Island's economy had seen significant improvement, particularly with regard to unemployment (Rhode Island Council 2020). Unfortunately, the current impacts of the COVID-19 pandemic are creating new economic challenges and have once again resulted in an increase in unemployment. The full effects of the pandemic on the Rhode Island economy and job rates are not yet known.

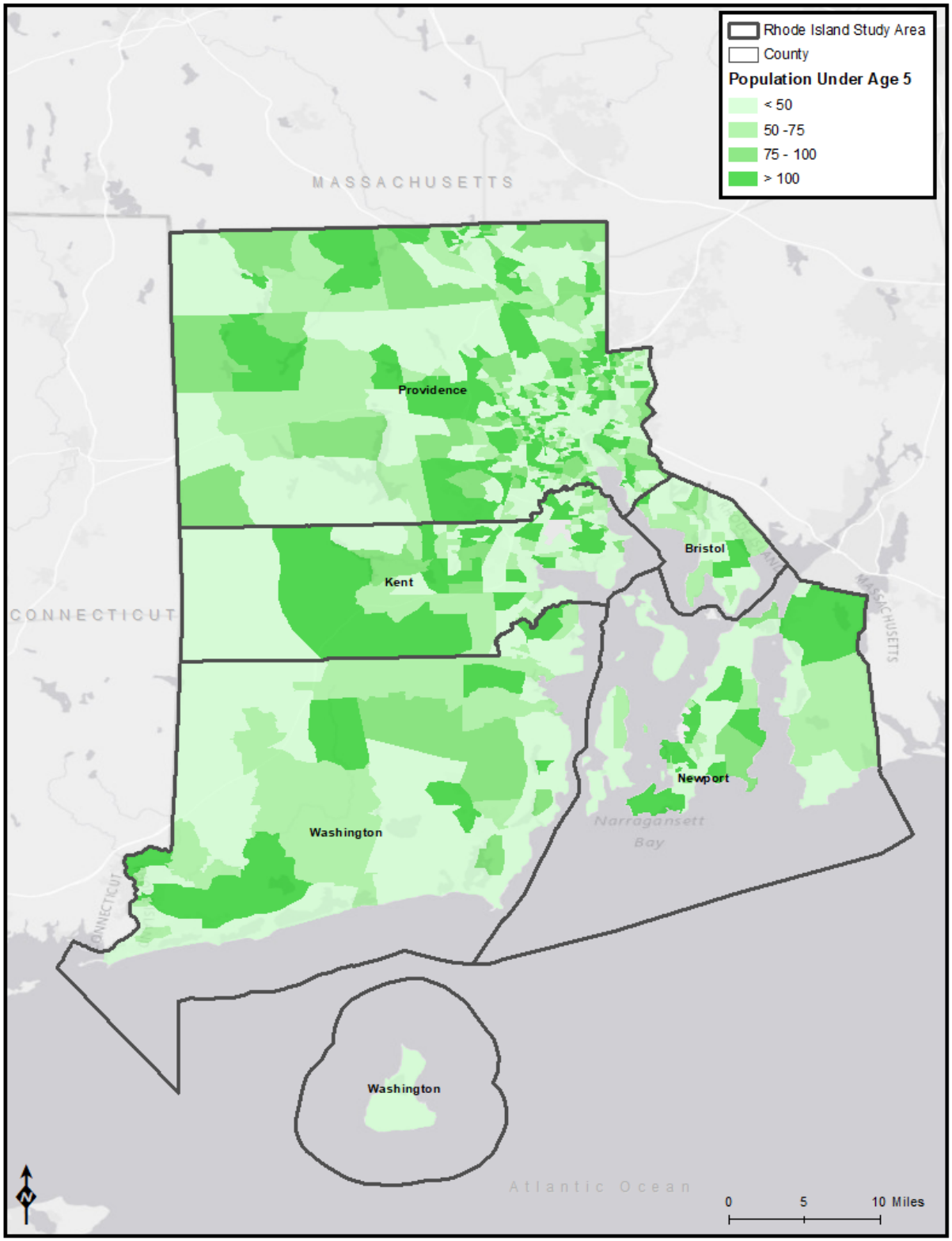
According to RISPP, minority populations are growing rapidly in urban areas. Minority population in Providence County is projected to be greater than 50% by 2040 (RISPP 2014a).

5.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Rhode Island and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 5-22 and Figure 5-23 show the 2017 estimated population Under Age 5 and Over Age 65, respectively. County projections with a breakdown by age are not available. Table 5-8 shows age distribution by region for these groups for the 2017 estimated population in the U.S., Rhode Island, and the Study Area, and the 2040 estimated population for the Nation and the State (Brookings Institute 2018, USCB 2017b, RISPP 2013). Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) are present in the Study Area.

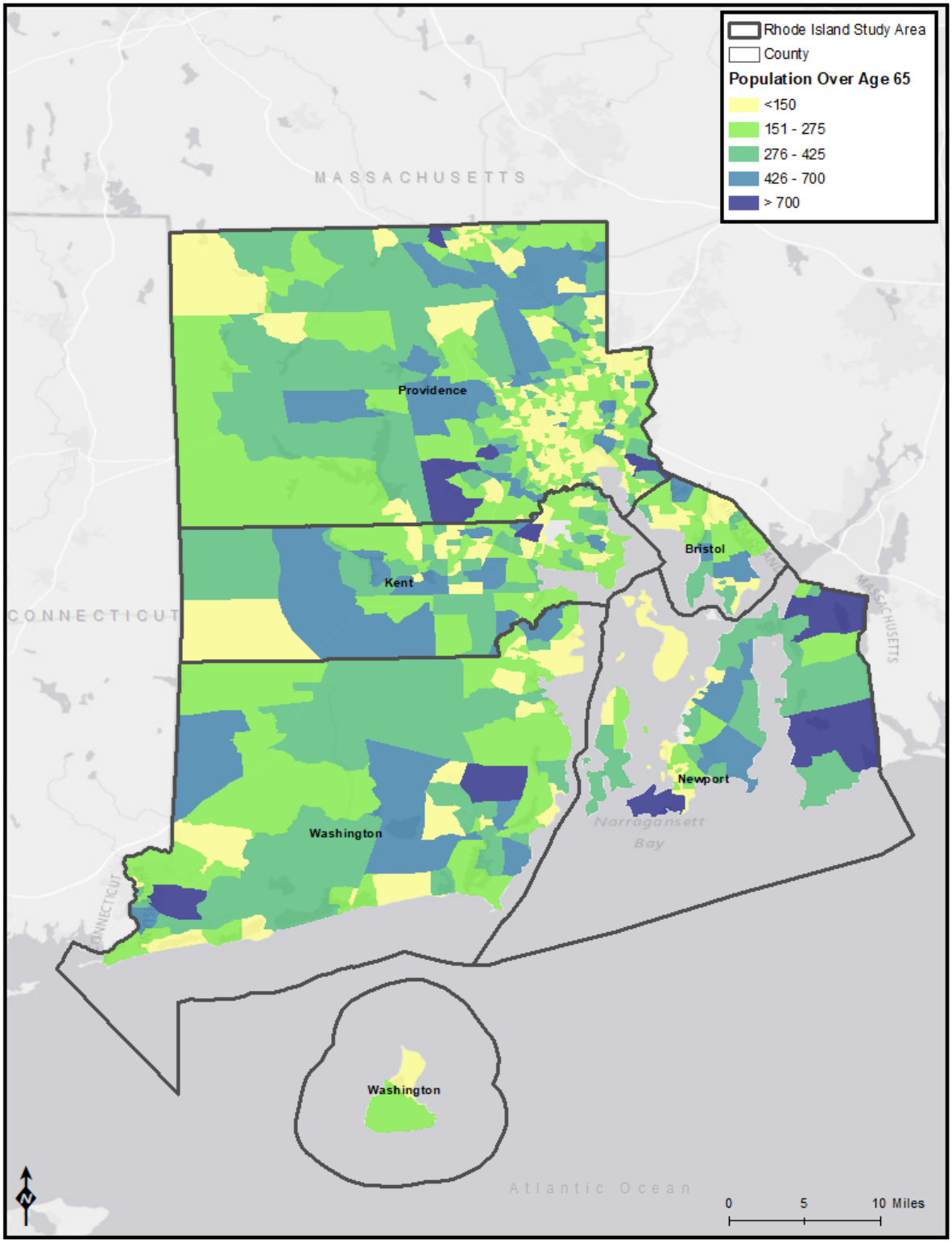
According to 2017 estimates, the population of young children represented 6.2% of the U.S. population and 5.2% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 5-8 shows the breakdown by demographic region for 2017. Providence County had the highest (5.7%) percentage of young children in 2017. Bristol County had the smallest percentage (3.9%). Projections for the year 2040 indicate this group's decline to 5.7% in the Nation and the Study Area (4.9%). County-level projections are not available for age categories (USCB 2017b, USCB 2018b, RISPP 2013).

According to 2017 estimates shown in Table 5-8, the elderly represented 14.9% and 16.1% of the national and Study Area population, respectively. The number and proportion of elderly to the overall population are projected to rise, fueled by aging baby boomers. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. Newport County had the highest (20.1%) percentage of elderly in 2017. Providence County had the smallest percentage (14.5%). By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S. and 24.7% in the Study Area. County-level projections are not available for age categories (USCB 2017b, USCB 2018b, RISPP 2013).



Source: USCB 2017r

Figure 5-22. Population Under Age 5 in the Rhode Island Study Area by Census Block Group



Source: USCB 2017r

Figure 5-23. Population Over Age 65 in the Rhode Island Study Area by Census Block Group

Table 5-8. Population Under Age 5 and Over Age 65 in the Rhode Island Study Area

Geographic Unit	2017 Estimates					Data Unavailable at County Level				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2038)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Bristol	49,028	1,927	3.9	9,358	19.1	48,424	0	0.0	0	0.0
Kent	164,012	8,016	4.9	28,858	17.6	165,353	0	0.0	0	0.0
Newport	83,204	3,658	4.4	16,758	20.1	74,823	0	0.0	0	0.0
Providence	633,704	36,260	5.7	91,772	14.5	635,860	0	0.0	0	0.0
Washington	126,190	4,710	3.7	23,398	18.5	145,644	0	0.0	0	0.0
Study Area/ Rhode Island	**1,056,138**	**54,571**	**5.2**	**170,144**	**16.1**	**1,070,104**	**52,738**	**4.9**	**264,238**	**24.7**
United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: RISPP 2013, USCB 2017b, USCB 2018b
Note: County-level projections were not available for age categories.

5.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area, are presented in Table 5-9.

As shown in Table 5-9, in 2017 homeownership in Study Area was 60.0%, lower than the Nation (63.8%). Renters comprised approximately 40.0% of the State population in 2017 (USCB 2017m).

Figure 5-24 illustrates median home values in the Study Area, indicating higher values near the coasts. Median home values were higher in the Study Area ($242,200) than the Nation ($193,500). As shown in Table 5-9, Newport County has the highest median home value ($362,800); Kent County had the lowest ($212,600) (USCB 2017l).

Home values in the State increased 2.7% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Zillow.com 2019j). The market temperature of the State is characterized as "very hot" which indicates market conditions favorable to the seller (Zillow 2019a). During the same period, home values in the Providence-Warwick RI-MA metropolitan area increased 2.8% and was also characterized as "very hot" (Zillow.com 2019j). Prices of multifamily homes surged between 2017 and 2018, indicating the value of the rental properties as a real estate investment (RISPP 2014a).

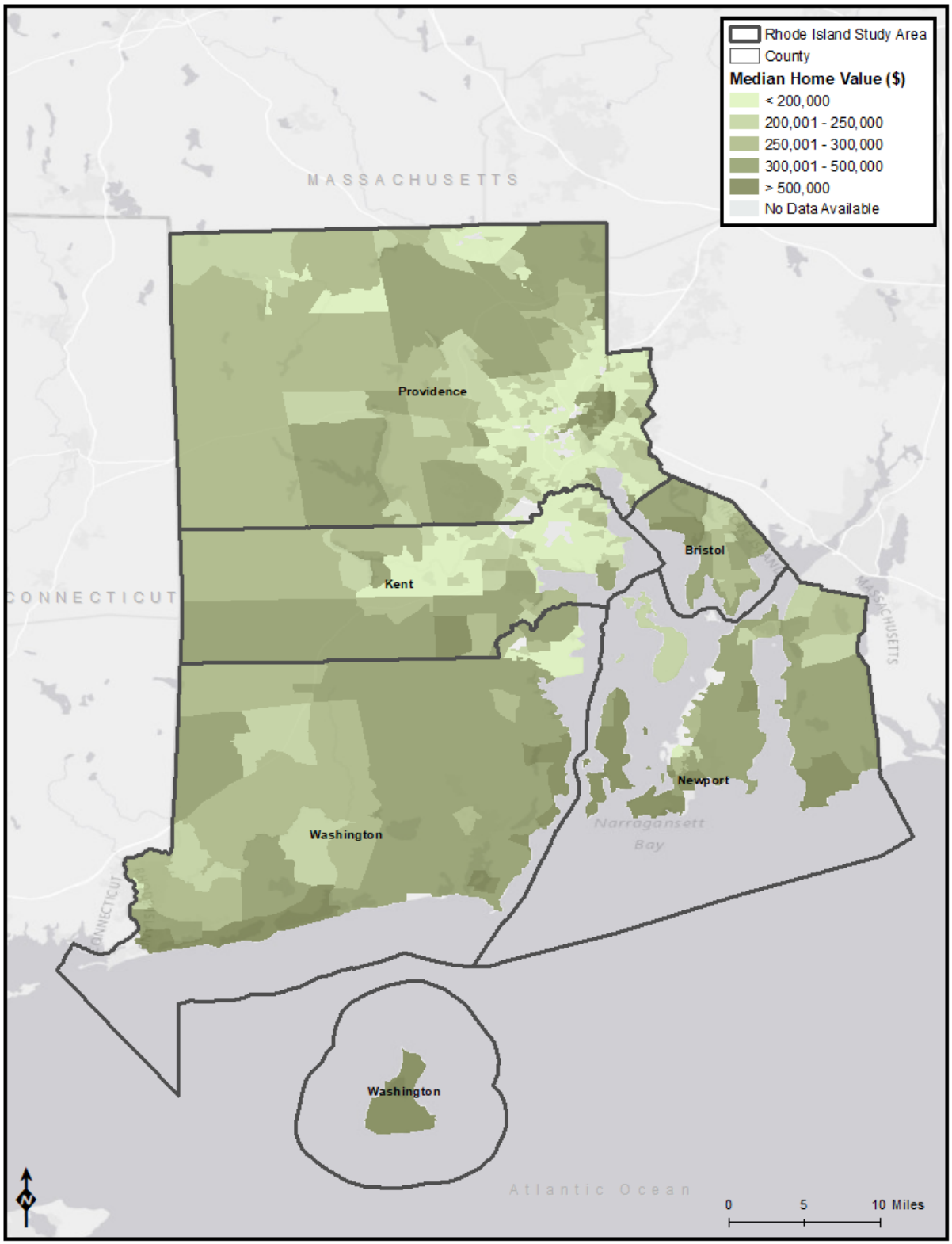
The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Figure 5-25 illustrates median gross rent, indicating high rental costs in coastal areas of Newport and Washington Counties. According to the National Low Income Housing Coalition, as of 2019, fair market rent for a two-bedroom rental unit in the State is $1,085. In these conditions, a minimum wage worker would have to work approximately 79 hours a week in order to afford a two-bedroom fair market rate home. Rhode Island has a shortage of approximately 22,806 rental homes affordable and available to extremely low-income households. Approximately 49,430 (31%) of renter households in Rhode Island are considered extremely low income; approximately 26,692 (54%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (29%), single caregivers (37%), and disabled (27%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a).

Table 5-9. Housing Utilization and Vacancy Rates in the Rhode Island Study Area

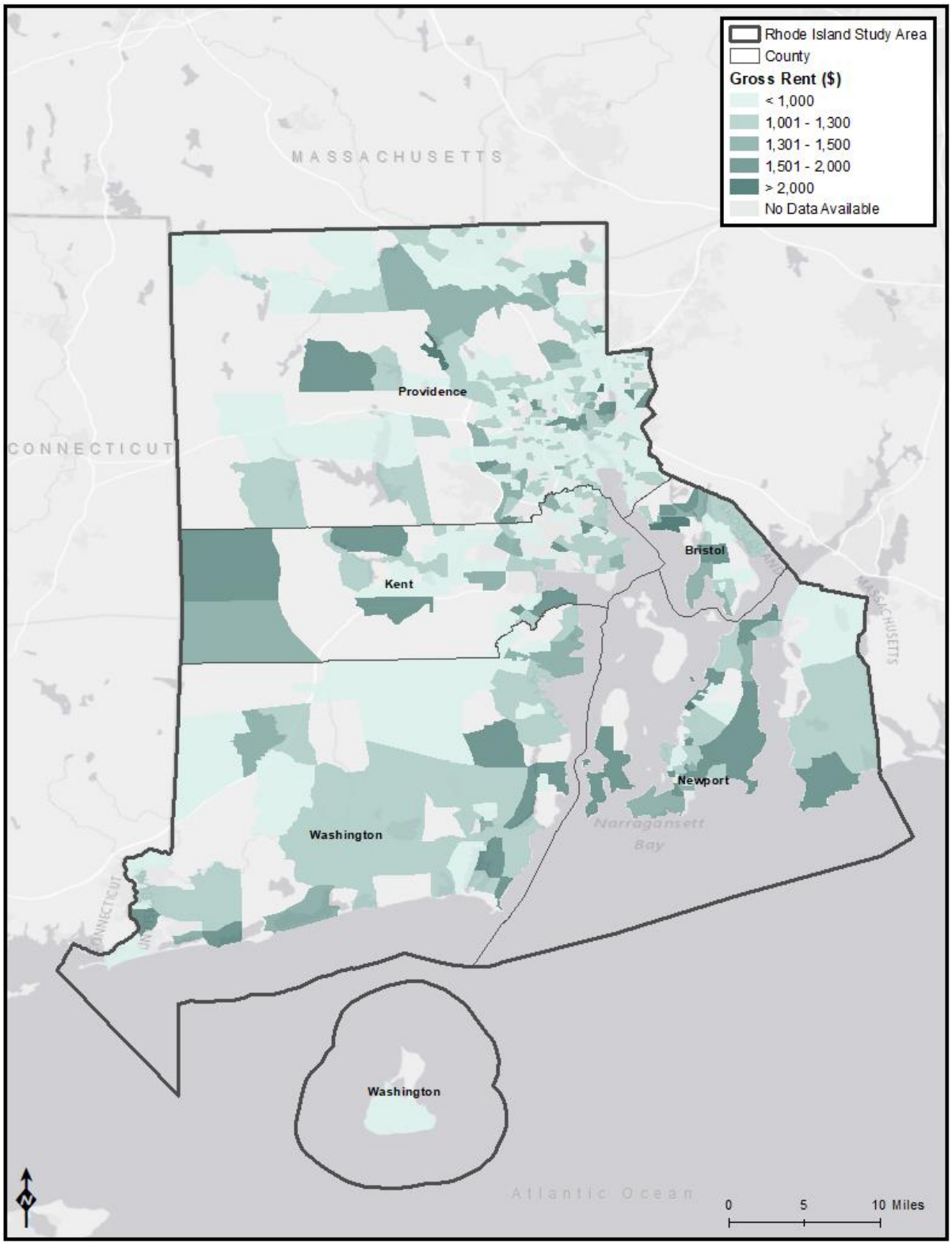
Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Bristol	20,964	19,521	1,443	6.9	13,466	69.0	6,055	31.0	$341,300	$1,021
Kent	74,158	69,013	5,145	6.9	48,648	70.5	20,365	29.5	$212,600	$986
Newport	42,291	35,421	6,870	16.2	21,973	62.0	13,448	38.0	$362,800	$1,193
Providence	265,807	238,465	27,342	10.3	126,847	53.2	111,618	46.8	$214,400	$923
Washington	63,450	49,608	13,842	21.8	36,357	73.3	13,251	26.7	$320,600	$1,086
Study Area/ Rhode Island	**466,670**	**412,028**	**54,642**	**11.7**	**247,291**	**60.0**	**164,737**	**40.0**	**$242,200**	**$957**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 5-24. Median Home Value in the Rhode Island Study Area by Census Block Group



Source: USCB 2017r

Figure 5-25. Median Gross Rent in the Rhode Island Study Area by Census Block Group

Rhode Island affordable housing resources include the HOME Investment Partnership Program and Housing Trust Fund, which are programs that provide capital necessary to build affordable housing. Unlike other New England States, it does not support the funding of operating expenses or rental subsidies necessary to keep rents low. Six out of 39 Rhode Island communities have at least 10% of its housing stock as qualified low and moderate income housing, per Rhode Island State Law 45-5342. Those communities are (RISPP 2014a):

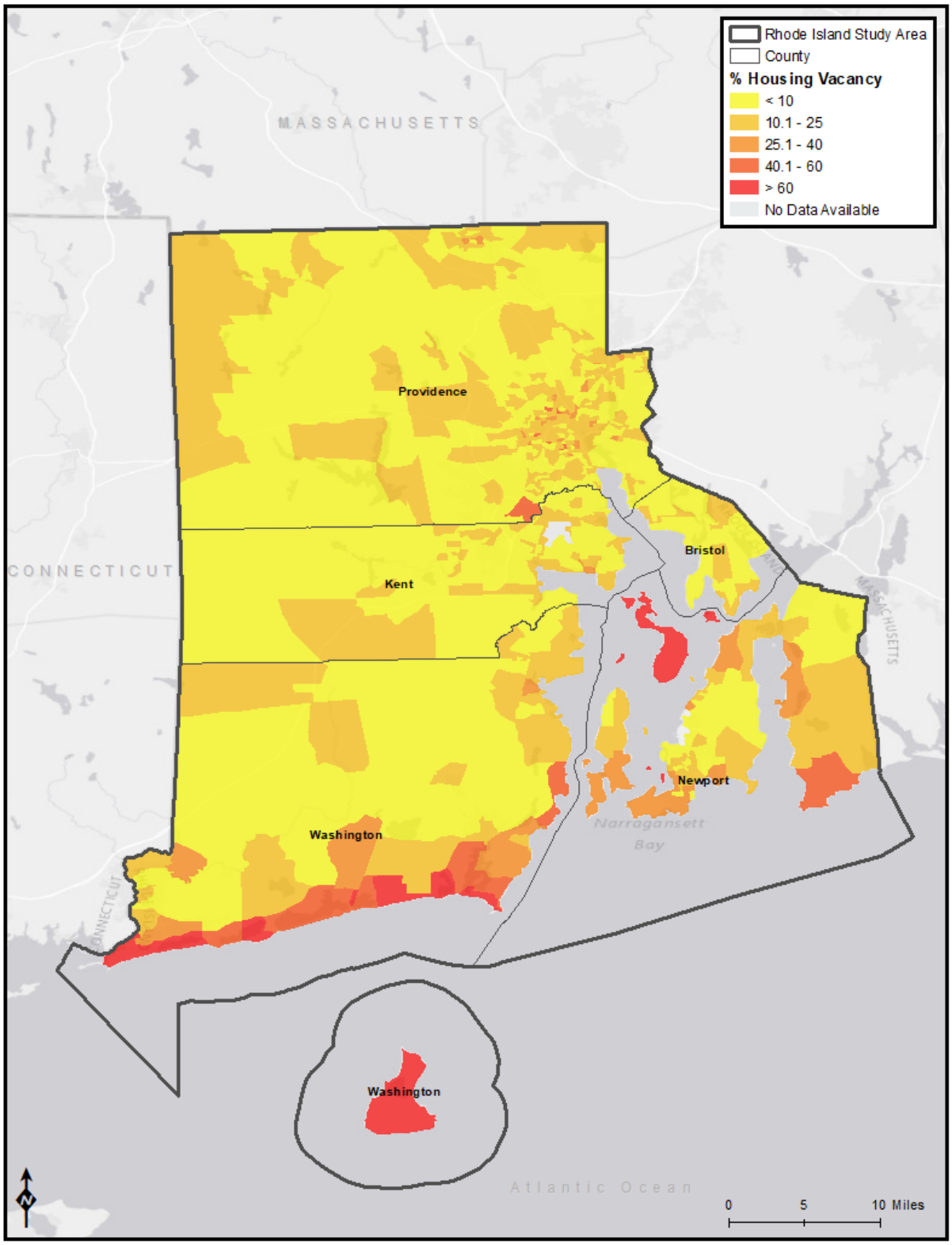
- Burrillville, Central Falls, Providence, Woonsocket (Providence County)
- Newport (Newport County)
- New Shoreham (Washington County)

As shown in Table 5-9, home vacancy rates in Rhode Island (11.7%) in 2017 were lower than the Nation (12.2%). Figure 5-26 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates in popular coastal tourist destination counties of Washington (21.8%) and Newport (16.2%). Bristol and Kent Counties (both at 6.9%) have the lowest vacancy rates (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. According to an Airbnb press release, short-term rentals businesses are growing in Rhode Island. Statewide, Airbnb hosts earned a combined $24.1 million in income generated from approximately 111,700 guests between Memorial and Labor Day 2019. The most popular destinations were located in Washington and Newport Counties (Gomes 2019). The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb “landlords” who own multiple area properties (CityLab 2019).

5.4.4 Employment

5.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 5-10. In 2017, the Study Area had a total employment of approximately 526,000 jobs, representing 0.4% of the total jobs in the U.S. (USCB 2017p). Rhode Island’s 2018 annual gross domestic product was $60.5 billion, which represented 0.3% of the Nation’s gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 5-26. Housing Vacancy Rates in the Rhode Island Study Area by Census Block Group

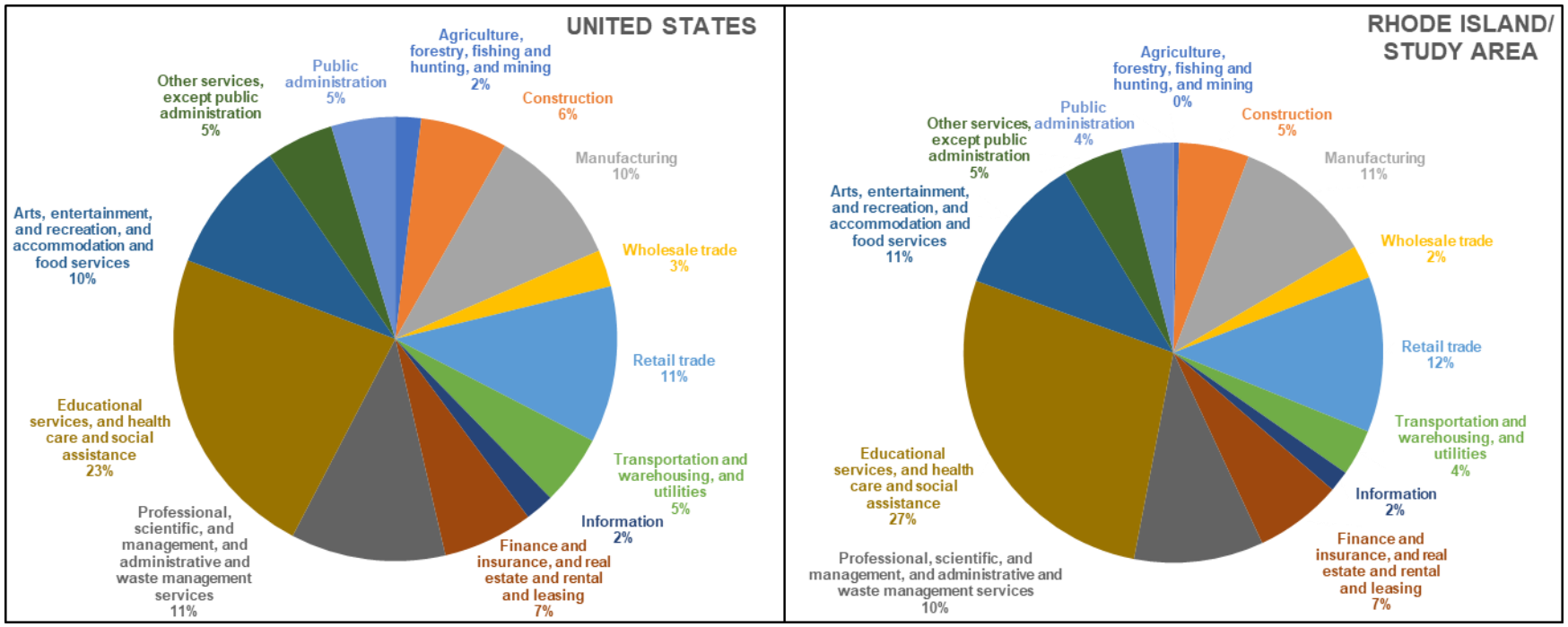
Table 5-10. Census Bureau Labor and Industry Statistics for the U.S. and the Rhode Island Study Area (number of jobs)

Industry	United States	Percent (%)	Rhode Island/ Study Area	Percent (%)
TOTAL	150,599,165		526,071	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	2,285	0.4
Construction	9,564,541	6.4	28,458	5.4
Manufacturing	15,477,389	10.3	56,576	10.8
Wholesale trade	4,042,867	2.7	13,460	2.6
Retail trade	17,167,000	11.4	62,939	12.0
Transportation and warehousing, and utilities	7,681,579	5.1	18,747	3.6
Information	3,173,300	2.1	8,555	1.6
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	35,391	6.7
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	52,522	10.0
Educational services, and health care and social assistance	34,781,348	23.1	144,854	27.5
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	56,875	10.8
Other services, except public administration	7,371,226	4.9	24,287	4.6
Public administration	7,025,870	4.7	21,122	4.0

Source: USCB 2017p

Table 5-10 and Figure 5-27 show the number of jobs each major industry sector for the U.S., Rhode Island, and the Study Area. Per the Census Bureau, the dominant industry sectors in the Study Area are educational services, and health care and social assistance (27.5%); retail trade (12.0%); manufacturing (10.8%); and arts, entertainment, and recreation, and accommodation and food services (10.8%). The Study Area and the State are the same; therefore, the dominant industries are also the same (USCB 2017p).

According to the U.S. Bureau of Labor Statistics, the majority of industries in Rhode Island are (1) education and health services, (2) trade, transportation, and utilities, (3) professional and business services, (4) leisure and hospitality, and (5) manufacturing (BLS 2020c). The government sector is also a large employer of Rhode Island's workforce, but government-related jobs are not usually considered in discussions of industry. Out of 50 States, Rhode Island finished last in CNBC's 2019 rankings for business due to sluggish economic growth, unfavorable tax and regulatory climate, and deficient bridges, roads, and transportation infrastructure (Cohn 2019). The State entered a recession before the Great Recession, as the State's manufacturing sector lost approximately 20,000 jobs between 2000 and 2010. However, the sector is beginning to recover with new manufacturing opportunities. New job growth in the State has been in high and low wage jobs, while losing middle wage jobs (RISPP 2014a).



Source: (USCB 2017p)

Figure 5-27. Number of Jobs by Industry Sector for the U.S. and the Rhode Island Study Area

According to RISPP, "Minority populations are underrepresented in the workforce, having greater difficulty accessing middle-wage jobs, attributable to educational performance (language barriers, lack of training, or lack of support in the K-12 educational system). As communities of color continue to grow, greater participation of people of color in the workforce will be essential for the State to remain economically competitive" (RISPP 2014a).

Figure 5-28 shows the location of jobs within the Study Area. The greater portion of jobs are located in the eastern half of the State near the urban areas in the cities of Providence and Pawtucket, located in Providence County. According to a RISPP report, there is job growth in suburban areas resulting from larger private industry, and educational and health employers outside the urban core (RISPP 2014a).

Rhode Island residents are within commuting distance from Boston and New York, where high paying jobs are more plentiful. The State's regional transit network allows for commuting by rail (RISPP 2014a).

5.4.4.2 Rhode Island's Ocean Economy

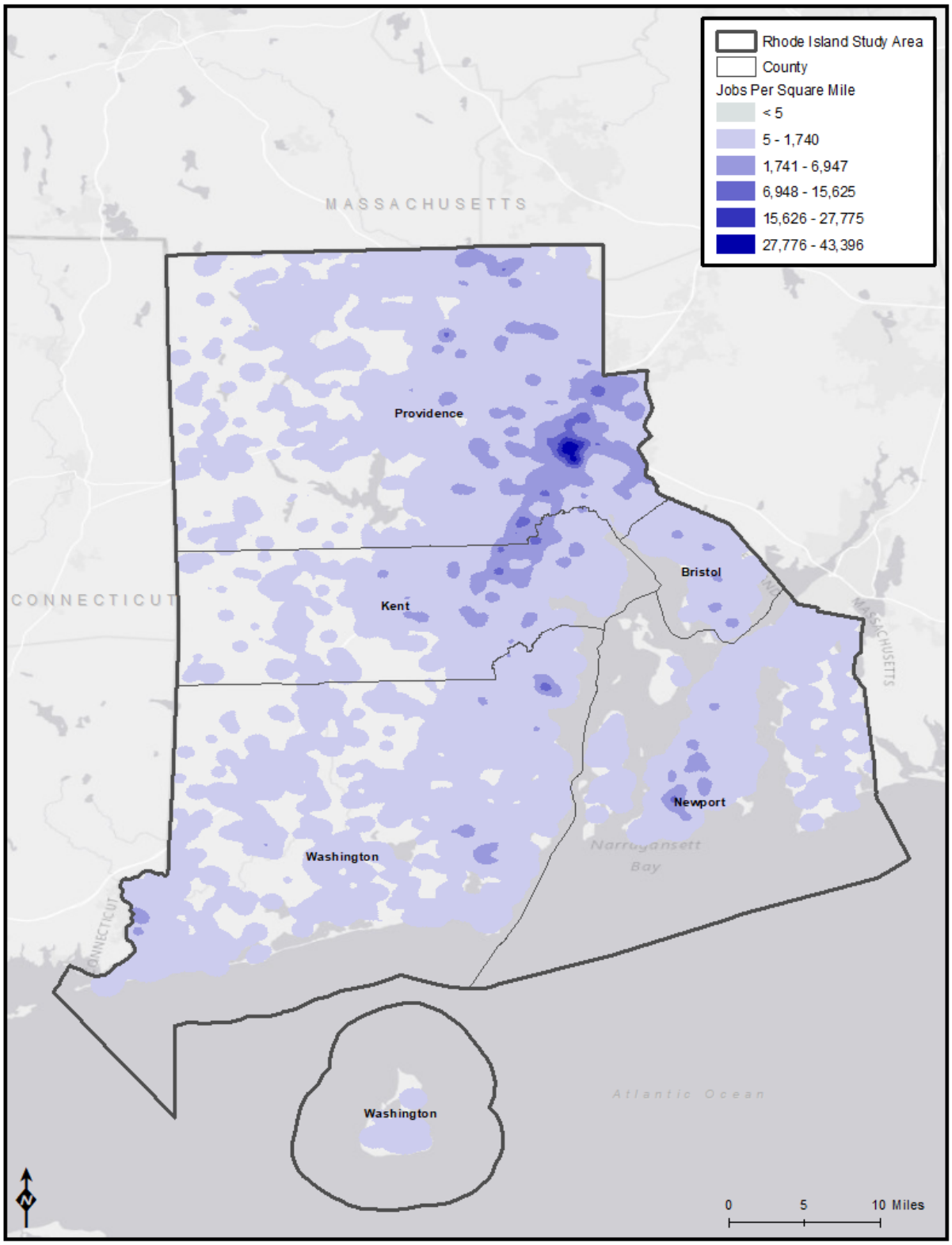
Overall, Rhode Island's ocean economy ranked 22nd in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 5-11, Rhode Island's ocean economy accounted for 45,496 maritime jobs in 2016, accounting for 9.8% of Rhode Island's employment (NOAA 2016b, USCB 2017i). Within the State, tourism and recreation was the dominant sector, accounting for 82.4% (36,366) of maritime jobs. The tourism and recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 45,491 maritime jobs, representing 100% of total maritime jobs in the State. Providence County had the greatest number of maritime jobs (15,969), representing 35.1% of maritime jobs in the Study Area. The highest percentage of maritime jobs to overall county jobs were in Newport (25.2%), Washington (21.5%), and Bristol (17.9%) Counties, reflecting their proximity to the ocean and maritime employment opportunities (USCB 2017i, NOAA 2016b). Figure 5-29 shows the percent of maritime-related jobs to total jobs in each county in the Study Area.

5.4.4.3 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 5-11, in 2017 Rhode Island had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, Rhode Island had a median income of $74,630 (29.4% higher than the Nation's median income) and a per capita income of $38,343 (23.0% higher than the Nation's per capita income) (USCB 2017k, USCB 2017n).

As shown in Table 5-11, in 2017 median household income in the counties comprising the Study Area ranged from an average of $52,530 (Providence County) to an average of $77,862 (Washington County). In 2017, per capita income ranged from an average of $29,025 (Providence County) to an average of $43,603 (Newport County). Figure 5-30 and Figure 5-31 show median household and per capita income in the Study Area. The figures portray high median household and per capita income in areas away from the city of Providence (USCB 2017k, USCB 2017n).



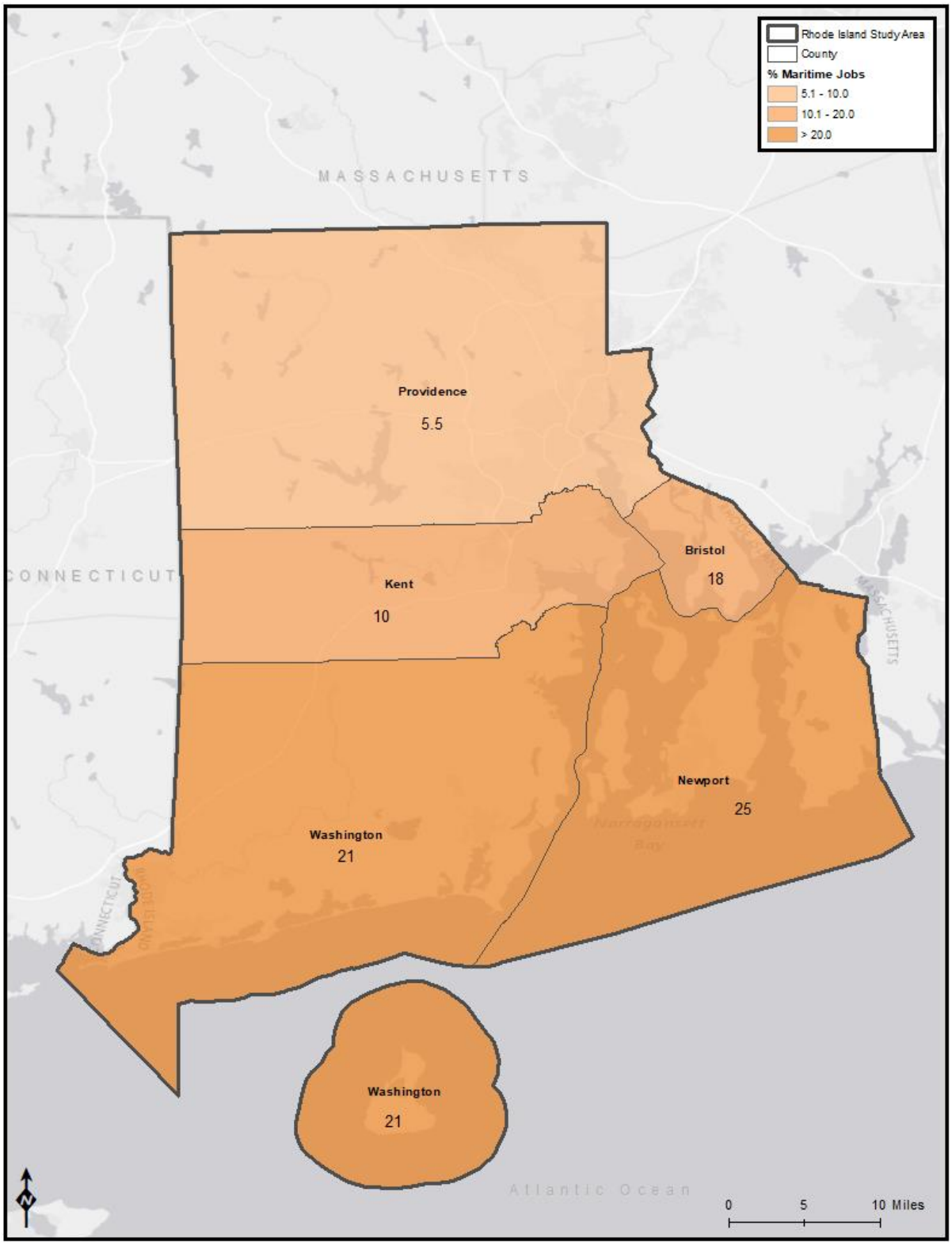
Source: USCB 2017r

Figure 5-28. Jobs Per Square Mile in the Rhode Island Study Area by Census Block Group

Table 5-11. Employment Data in the Rhode Island Study Area (from the Longitudinal Employer-Household Dynamics dataset)

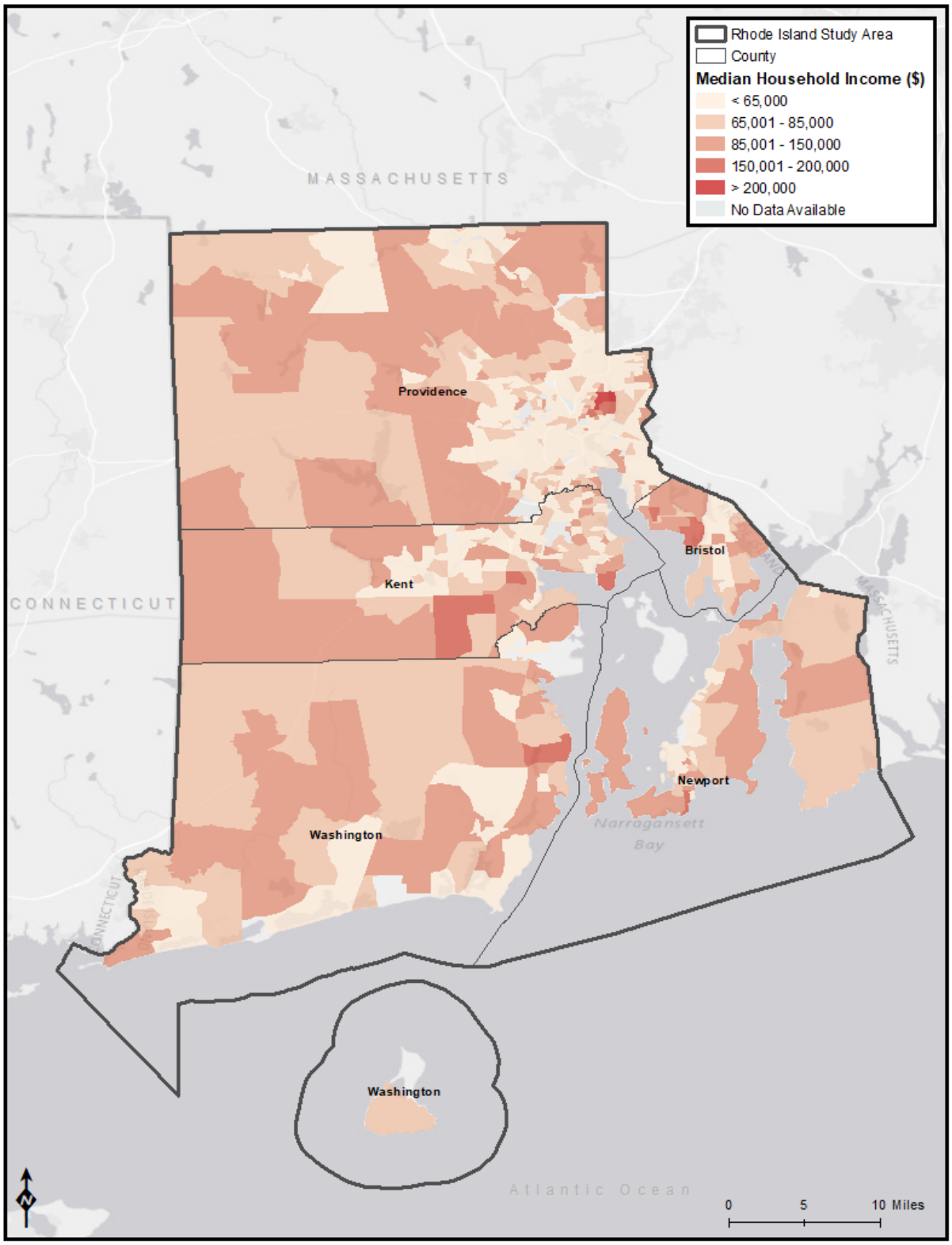
Geographic Unit	Total Labor Force (civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (civilian labor force) [1]	Unemployed (civilian labor force) [1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Bristol	26,186	26,132	25,027	1,105	4.2	13,763	2,458	17.9	$74,630	$42,360
Kent	93,683	93,565	87,822	5,743	6.1	77,599	7,879	10.2	$69,047	$37,157
Newport	46,525	43,820	41,471	2,349	5.4	33,381	8,425	25.2	$75,463	$43,603
Providence	332,779	332,470	307,175	25,295	7.6	290,838	15,969	5.5	$52,530	$29,025
Washington	68,847	68,718	64,576	4,142	6.0	50,141	10,760	21.5	$77,862	$39,568
Study Area/ Rhode Island	568,020	564,705	526,071	38,634	6.8	465,722	45,491	9.8	$74,630	$38,343
United States	162,184,325	161,159,470	150,599,165	10,560,305	6.6	140,240,825	3,389,551	2.4	$57,652	$31,177

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



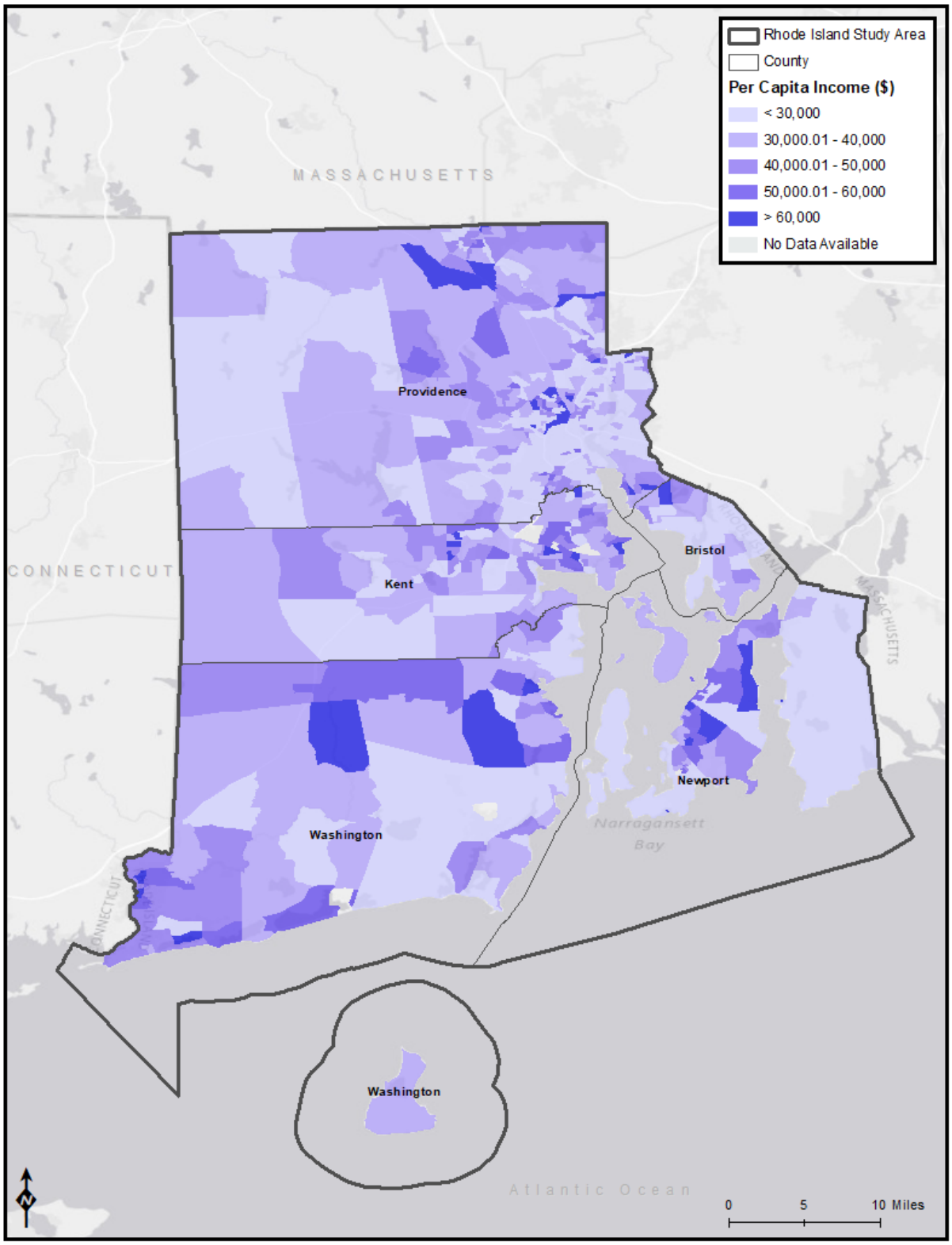
Source: NOAA 2017b

Figure 5-29. Maritime Jobs in the Rhode Island Study Area by County



Source: USCB 2017r

Figure 5-30. Median Household Income in the Rhode Island Study Area by Census Block Group



Source: USCB 2017r

Figure 5-31. Per Capita Income in the Rhode Island Study Area by Census Block Group

According to RISPP, income stagnation is a particular problem in Rhode Island as the State has yet to recover from the Great Recession. Income disparities among age, gender, and race exist. High wage jobs have experienced income growth, while low and middle wage jobs have not. New job growth in the State has been in high and low wage jobs, while losing middle wage jobs (RISPP 2014a).

5.4.4.4 Unemployment Rates

Figure 5-32 shows the 2017 unemployment rates in the Study Area by census block group. Table 5-11 presents unemployment rates for each county in the Study Area. The average unemployment rate in the Rhode Island Study Area was 6.8%, similar to the Nation (6.6%). Within the Study Area, unemployment rates ranged from 4.2% in Bristol County to 7.6% in Providence County in 2017 (USCB 2017h). The closing of various industry and the Great Recession as discussed above may be a contributing factor to the unemployment rate.

5.4.4.5 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 5-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate’s degree, bachelor's degree, and graduate degree in the counties comprising the Study Area and the Nation (USCB 2017t).

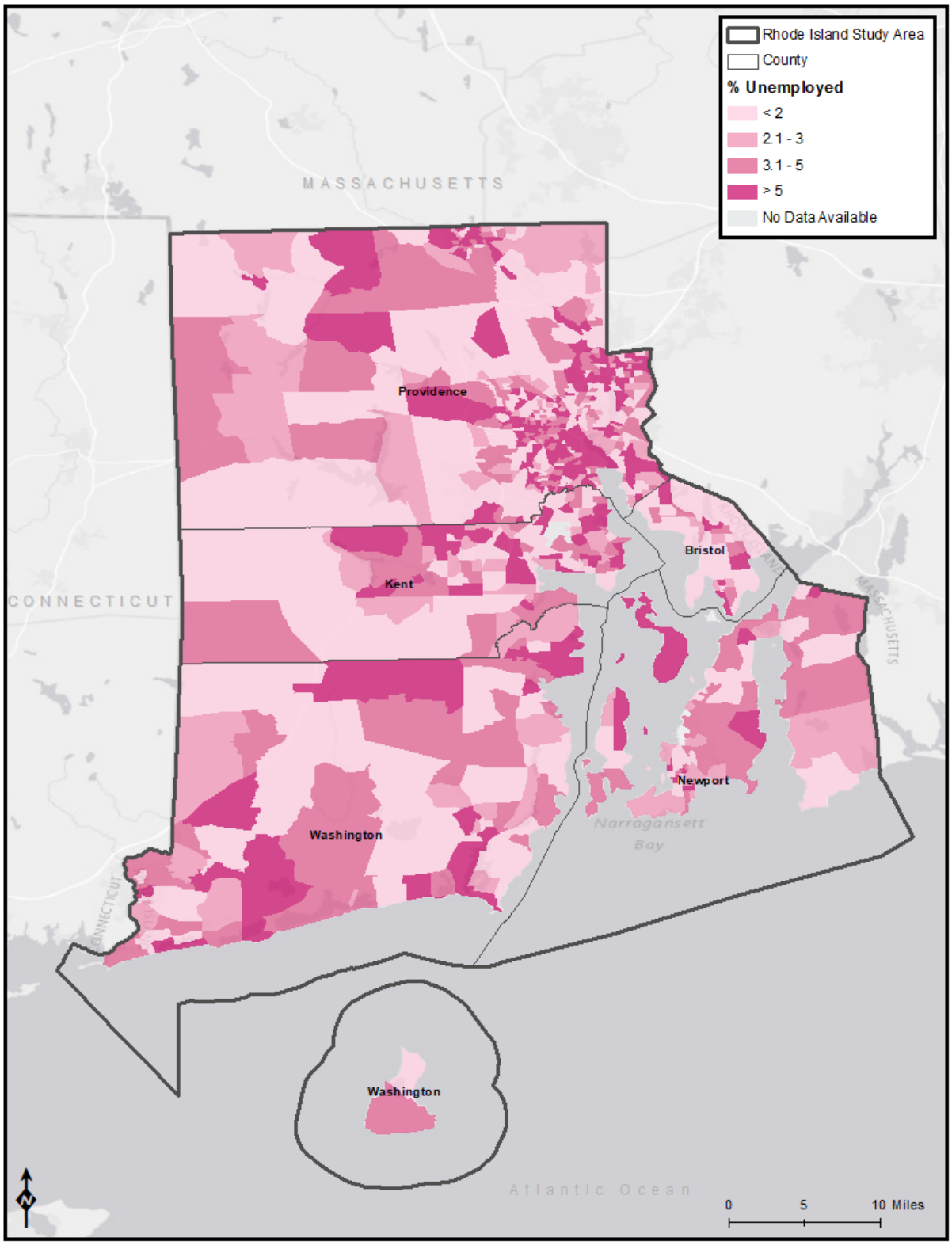
Figure 5-33 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor’s, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In the Study Area, 30.2% of the working-age population earned only a high school diploma; 37.3% earned a college or advanced degree (USCB 2017q).

Figure 5-34 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

Educational attainment across the Rhode Island counties are fairly commensurate (within a few percentage points) with State and national levels through workers with an associate degree. Newport, Bristol, and Washington Counties have a higher percentage of the working age population with a bachelor’s degree or a graduate or professional degree as compared to State and national levels as shown in Table 5-12.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.



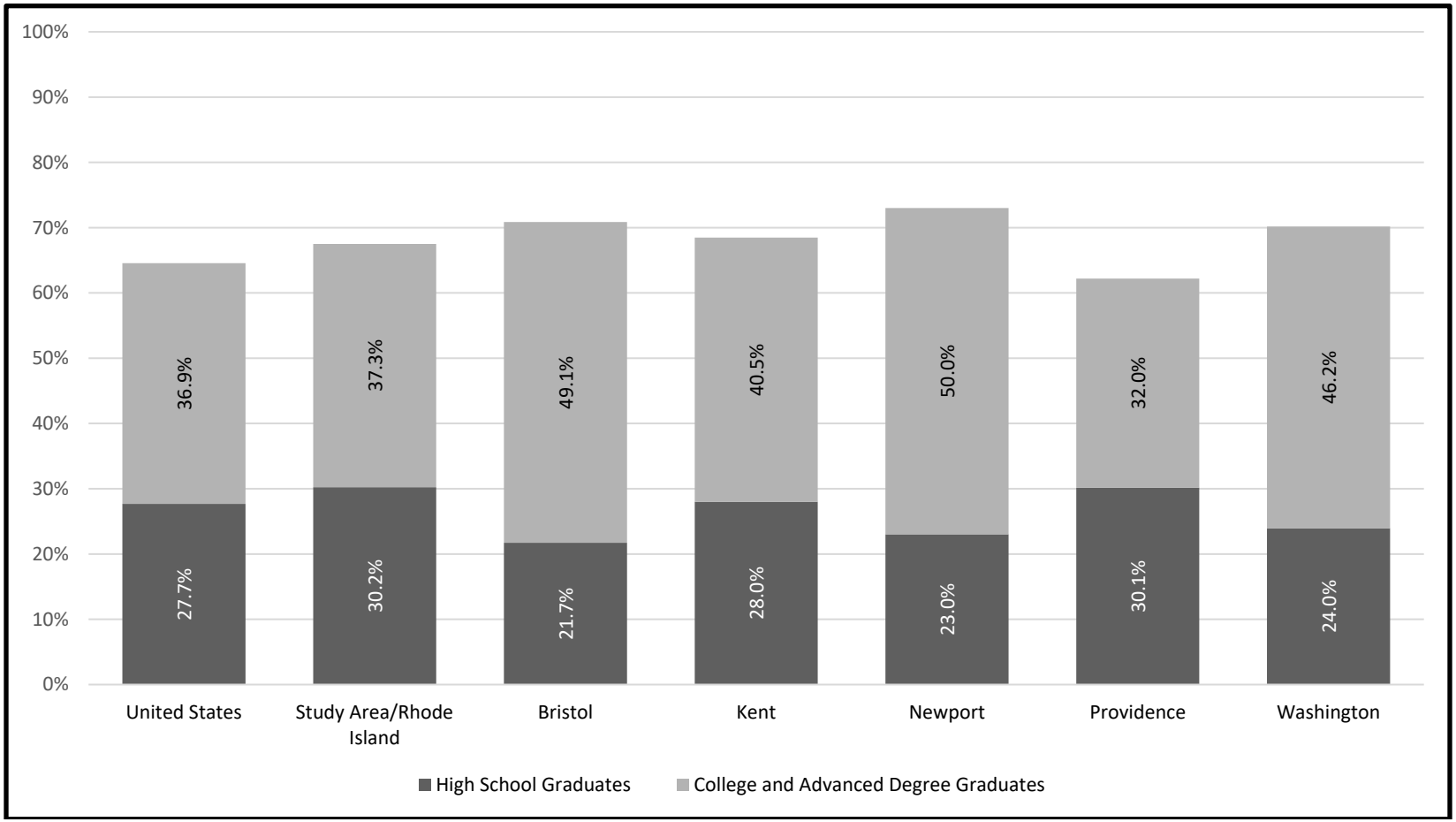
Source: USCB 2017r

Figure 5-32. Unemployment Rates in the Rhode Island Study Area by Census Block Group

Table 5-12. Educational Attainment in the Rhode Island Study Area

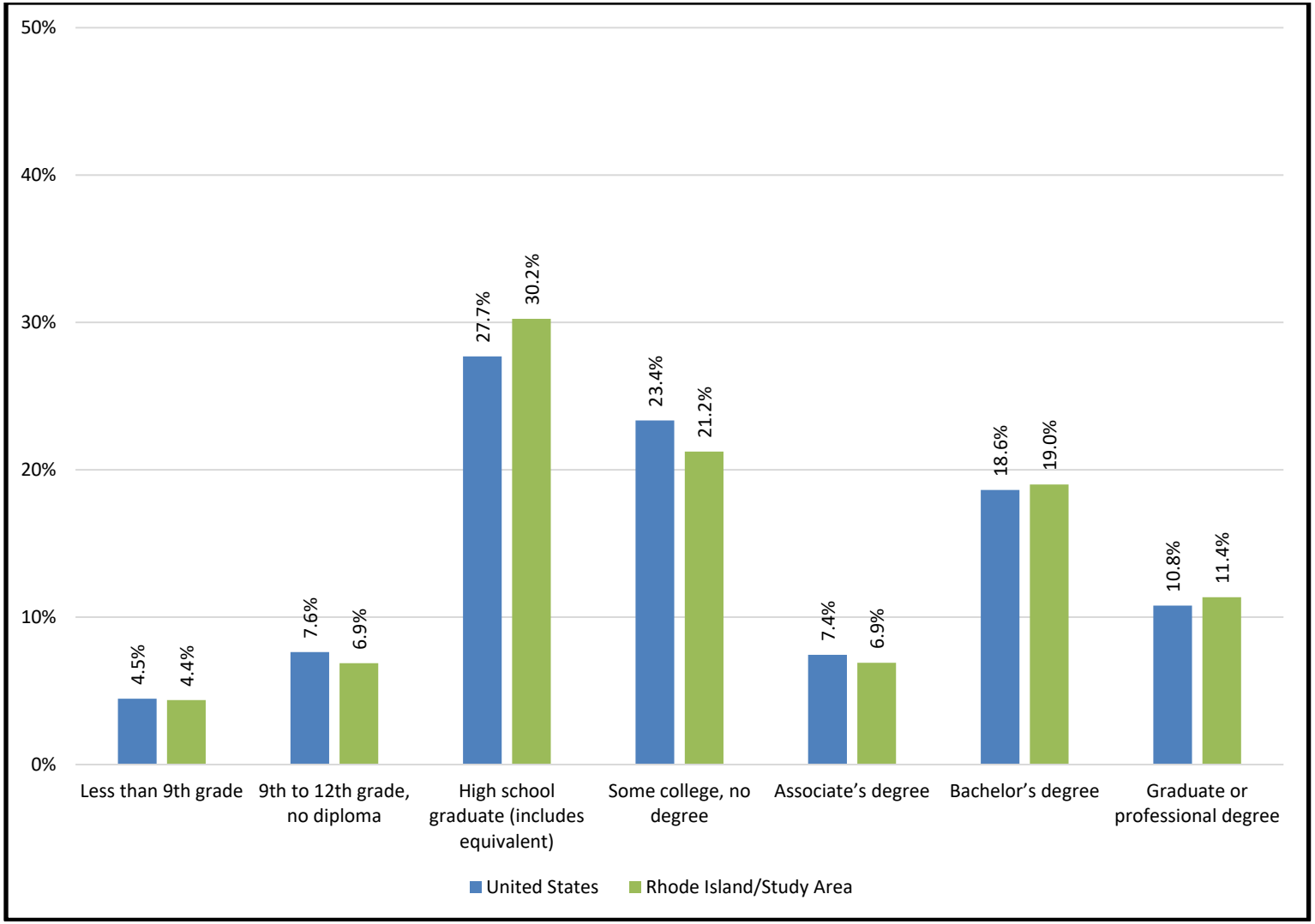
Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Bristol	1,194	2,321	8,587	8,006	2,765	9,165	7,502	39,540	3.0	5.9	21.7	20.2	7.0	23.2	19.0
Kent	3,219	8,229	37,098	30,290	13,315	26,212	14,063	132,426	2.4	6.2	28.0	22.9	10.1	19.8	10.6
Newport	1,550	3,209	15,730	13,674	4,253	18,720	11,171	68,307	2.3	4.7	23.0	20.0	6.2	27.4	16.4
Providence	32,783	45,022	151,119	111,765	32,969	81,157	46,504	501,319	6.5	9.0	30.1	22.3	6.6	16.2	9.3
Washington	1,421	4,893	24,911	24,712	7,581	23,805	16,641	103,964	1.4	4.7	24.0	23.8	7.3	22.9	16.0
Study Area/ Rhode Island	**37,301**	**58,647**	**257,892**	**181,073**	**58,876**	**162,053**	**96,825**	**852,667**	**4.4**	**6.9**	**30.2**	**21.2**	**6.9**	**19.0**	**11.4**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 5-33. High School, College, and Advanced Degree Graduate Rates in the Rhode Island Study Area



Source: USCB 2017q

Figure 5-34. Educational Attainment in the Rhode Island Study Area

5.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

5.4.5.1 Environmental Justice Communities of Concern

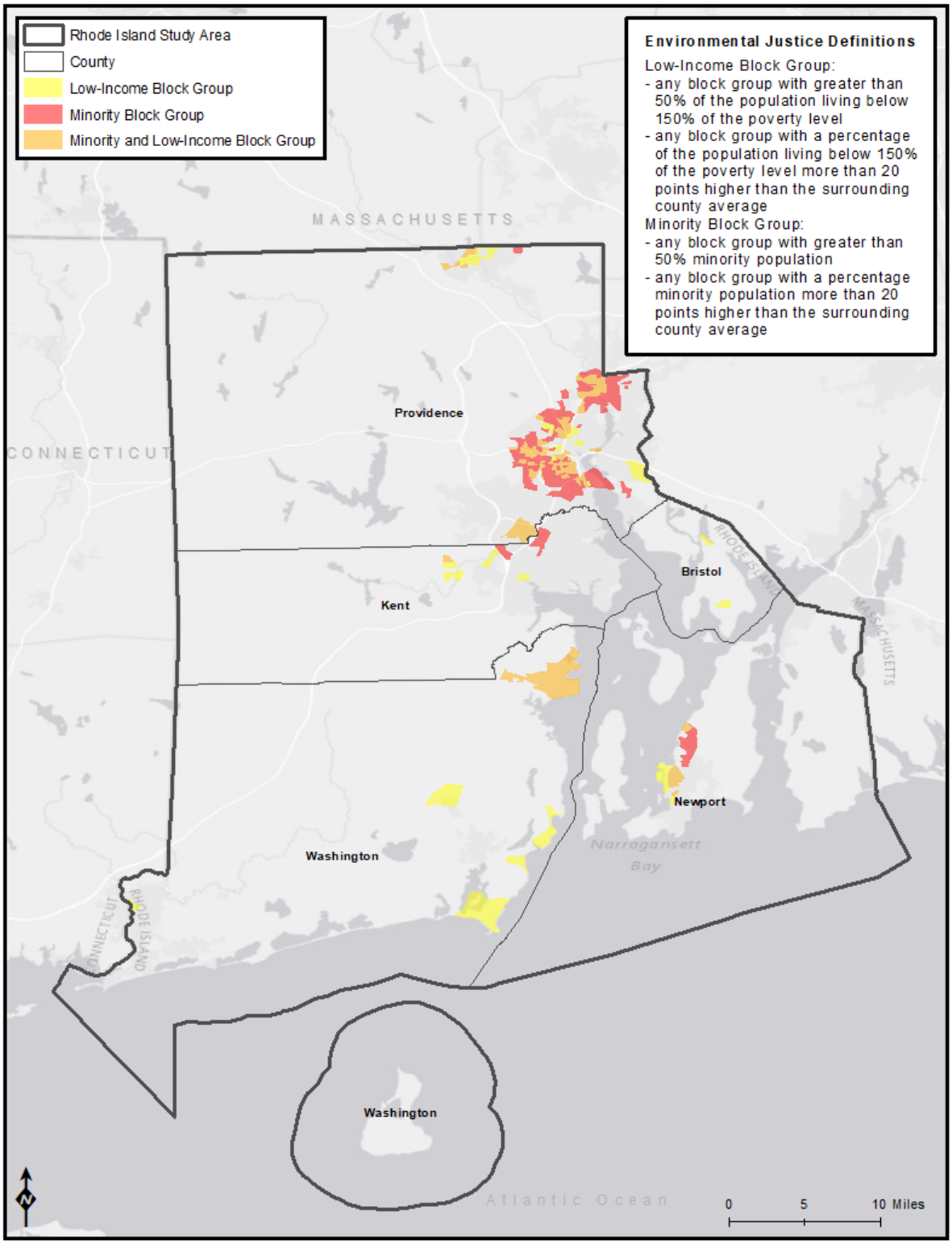
Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 5-35 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

5.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 5-13 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 1,056,138 people living in the Study Area, approximately 282,750 (26.8%) are minority. The percentage of minority population in the Study Area is less than the Nation (38.5%). Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 814 census block groups in the Study Area, approximately 21.0% (171 block groups) are considered minority populations (USCB 2017o).

Providence County contains the highest percentage of block groups with minority populations (32.3%). As shown in Table 5-13, Bristol County has no block groups with minority populations. As illustrated in Figure 5-35, several counties contain census block groups with high percentages of minority populations (USCB 2017o). According to RISPP, populations of minorities have grown in urban areas, resulting in disproportionately high unemployment rates, subsistence wages, and cost burdened households. Many minority single-parent households are low-income (RISPP 2014a).



Source: USCB 2017r

Figure 5-35. Minority and Low-Income Population in the Rhode Island Study Area by Census Block Group

Table 5-13. Low-Income and Minority Populations in the Rhode Island Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less Than 150% of the Poverty Level (%)
Bristol	49,028	45,446	3,582	7.3	38	3	7.9	0	0.0	45,441	5,718	12.6
Kent	164,012	146,824	17,188	10.5	122	7	5.7	3	2.5	162,382	23,030	14.2
Newport	83,204	71,549	11,655	14.0	62	7	11.3	6	9.7	79,623	11,066	13.9
Providence	633,704	394,363	239,341	37.8	499	86	17.2	161	32.3	608,324	156,612	25.7
Washington	126,190	115,206	10,984	8.7	93	8	8.6	1	1.1	120,153	17,247	14.4
Study Area/ Rhode Island*	**1,056,138**	**773,388**	**282,750**	**26.8**	**814**	**111**	**13.6**	**171**	**21.0**	**1,015,923**	**213,673**	**21.0**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

As mentioned in Chapter 5.4.4.1, in Rhode Island, minority populations are underrepresented in the workforce, according to RISPP. This discrepancy is largely attributed to educational performance (language barriers, lack of training, or lack of support in the K-12 educational system), causing difficulty for these populations to access middle-wage jobs. These same barriers, as well as racial discrimination, result in minorities also having low access to high-opportunity jobs. Resolution of these discrepancies is critical to Rhode Island's economy given that the minority population is expected to continue to grow and, as described in Chapter 5.4.1.2, the minority population is expected to be greater than 50% in Providence County by 2040 (RISPP 2014a).

Within the Study Area the largest minority group is Hispanic or Latino (7.7%) followed by Black or African-American (5.5%) (USCB 2017f).

5.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 5-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 1,015,923 people for whom poverty status is determined living in the Study Area, approximately 213,673 (21.0%) have incomes less than 150% of the poverty level. This is less than the Nation average of 23.7 with incomes less than 150% of the poverty level. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 814 block groups in the Study Area, approximately 13.6% (111 block groups) are considered low-income populations (USCB 2017o).

Providence County has the highest percentage of low-income block groups (17.2%); Kent County has the lowest (5.7%) (USCB 2017o). According to RISPP, minority and low-income populations have increased in urban areas (RISPP 2014a).

5.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this chapter, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report, we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in "Fishing Communities" (Chapter 5.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 5-36 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 5-36, Providence and Washington Counties have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 5-37 combines the CDC SoVI index (as shown in Figure 5-36) with minority and low-income populations (as shown in Figure 5-35) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC SoVI vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Providence and Kent Counties.

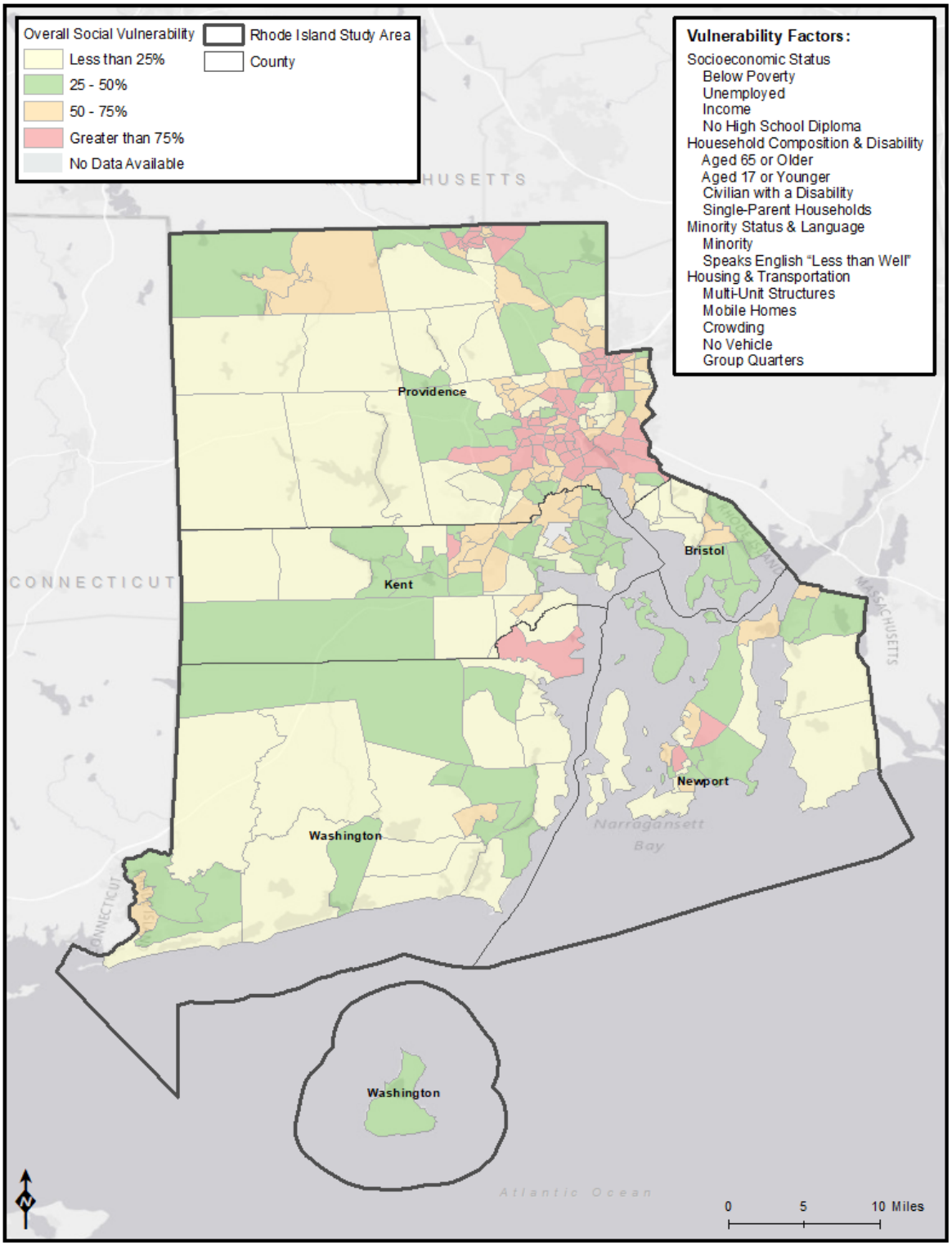
Figure 5-38 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 5-38 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 5.2.2.3 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

As discussed in Chapter 5.4.5.2, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that the location of socially vulnerable populations be considered when evaluating potential future OCS-related project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist in urban areas, most notably Providence, and along the coasts of the Study Area (CDC 2016).

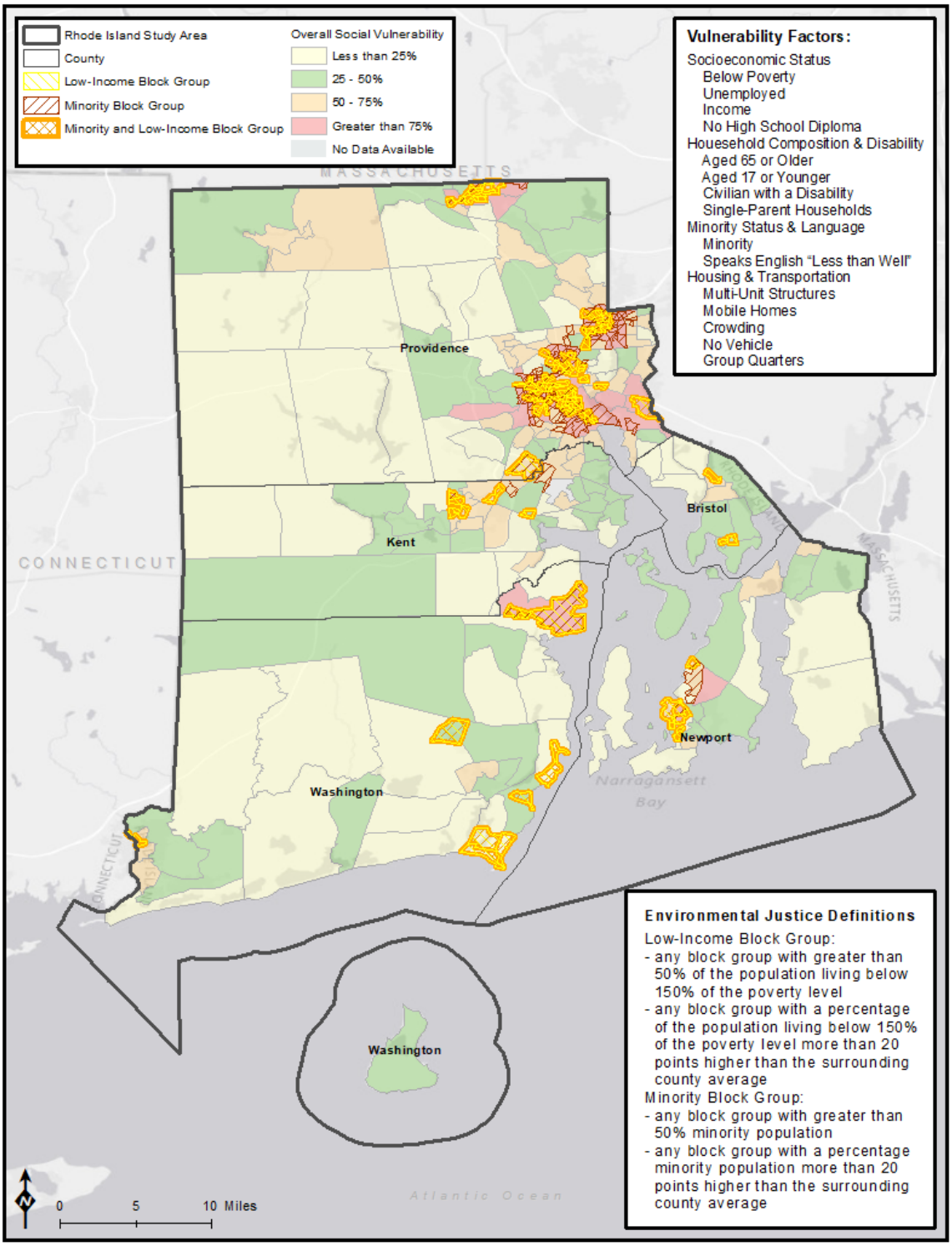
5.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.



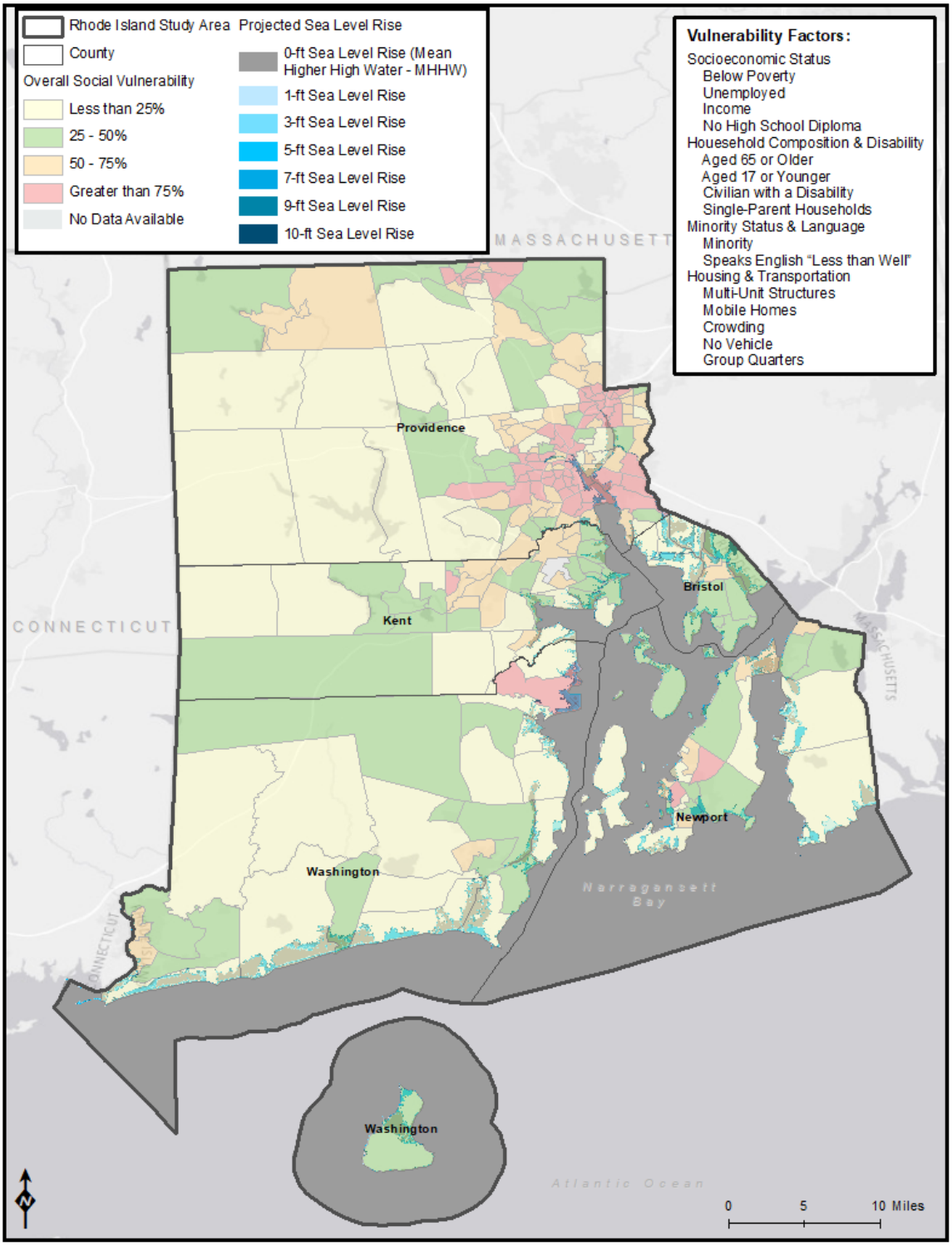
Source: CDC 2016

Figure 5-36. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Rhode Island Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 5-37. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Rhode Island Study Area



Sources: CDC 2016, NOAA 2018a

Figure 5-38. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Rhode Island Study Area by Census Tract

5.4.5.3.1 Fishing Communities

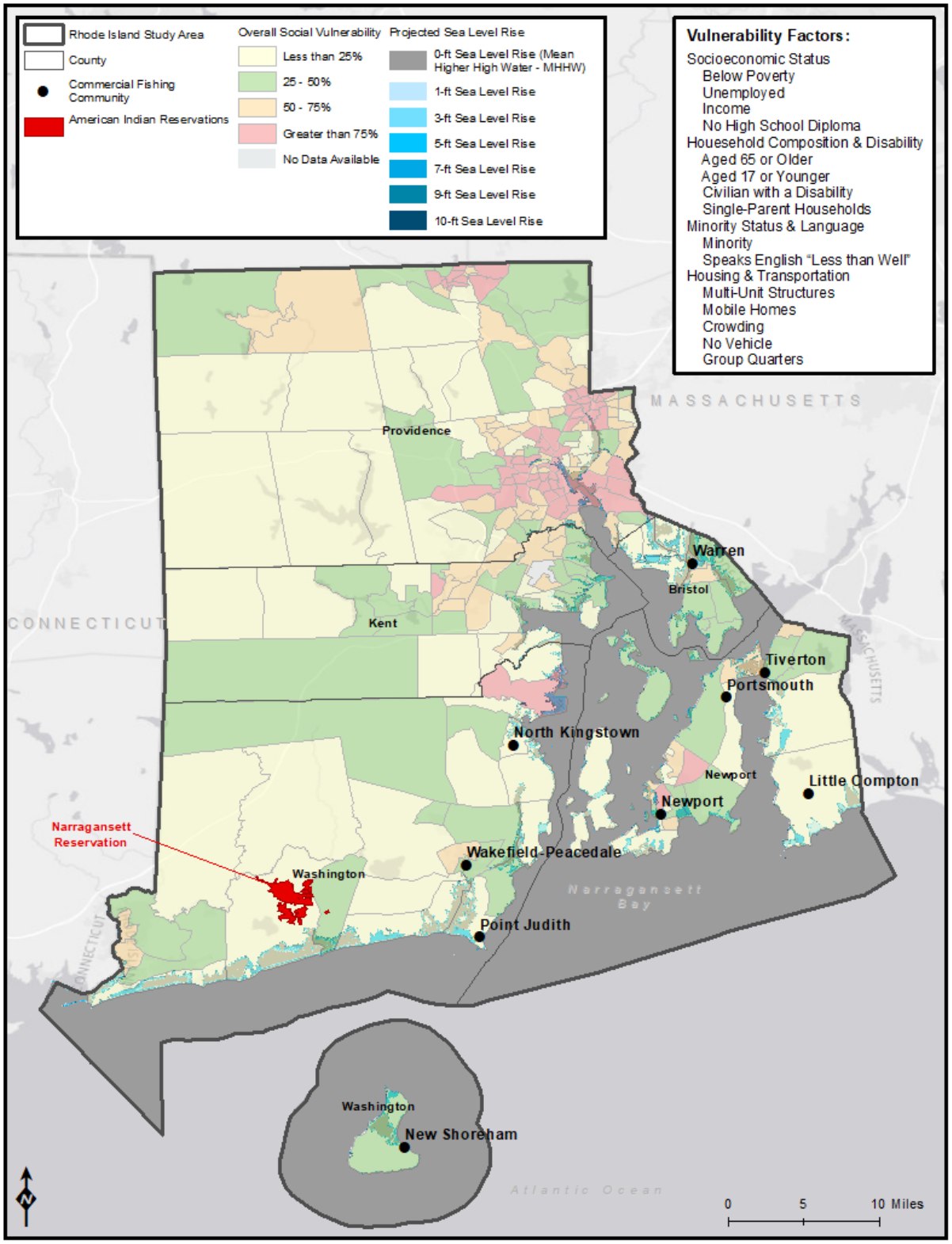
There are nine fishing communities in the Study Area, located in Washington, Newport, and Bristol Counties as illustrated in Figure 5-39.

The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Little Compton, Newport County
- Point Judith, Washington County
- New Shoreham, Washington County
- Newport, Newport County
- North Kingstown, Washington County
- Portsmouth, Newport County
- Tiverton, Newport County
- Wakefield-Peacedale, Washington County
- Warren, Bristol County

As can be seen in Figure 5-39, all nine of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 5.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that the location of fishing communities be considered early in the site-selection process for OCS-related projects. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 5-39. Potential Vulnerable Communities in the Rhode Island Study Area by Census Tract

5.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 5-39). These fishing communities have already been identified as potentially vulnerable communities based on NOAA's vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups, and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

5.4.5.4 Tribes

Rhode Island has six federally recognized tribes with historical ties to the State, which is also the entire Study Area. One tribe currently resides in Washington County (Narragansett Indian Tribe). There are no State-recognized tribes in Rhode Island. (NCSL 2019, HUD 2019b). Table 5-14 lists the federally recognized tribes in Rhode Island as well as tribes with an historical interest in the State. Federally recognized tribal lands are shown in Figure 5-39. These tribes could constitute socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics.

Table 5-14. Federally and State-Recognized Tribes with Historical Ties to Rhode Island

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Resident Tribes within the Study Area			
Narragansett Indian Tribe	Federal	Yes	Tribal members in Rhode Island currently reside in Washington County and have historical ties to Kent, Bristol, Providence, and Newport Counties.
Federally and State-Recognized Tribes Outside the Study Area			
Mashantucket Pequot Indian Tribe	Federal	Yes	Tribal members currently reside out of Rhode Island (primarily in Connecticut) but have historical ties to the Study Area (Kent, Newport, Bristol, and Providence Counties).
Mashpee Wampanoag Tribe	Federal	Yes	Tribal members currently reside out of Rhode Island (primarily in Connecticut) but have historical ties to the Study Area (Newport, Bristol, and Providence Counties).
Mohegan Tribe of Indians of Connecticut	Federal	Yes	Tribal members currently reside out of Rhode Island (in Connecticut) but have historical ties to the Study Area (Kent and Providence Counties).
Nipmuc	Federal	Yes	Tribal members currently reside out of Rhode Island but have historical ties to Northern Rhode Island. No tribal residents in Rhode Island.
Wampanoag Tribe of Gay Head (Aquinnah)	Federal	Yes	Tribal members currently reside out of Rhode Island (in Massachusetts) but have historical ties to the Study Area (Bristol, Providence, and Newport Counties).
Special Interest Groups and Organizations			
Niantic	Neither	Yes	Tribal members currently reside out of Rhode Island (in Connecticut) but have historical ties to the southern part of mainland Rhode Island, where the sea borders modern-day Westerly and Charlestown.

Sources: NCSL 2019, HUD 2019b, Lee 2020, Narragansett Indian Tribe 2018

There were five predominant indigenous groups in Rhode Island when Europeans arrived: the Pequots, the Nipmucs, the Niantics, the Narragansetts, and the Wampanoags (Lee 2020). Despite an attempt by the State of Rhode Island to illegally "detribalize" the Narragansett Tribe in the late 1800s, the Narragansett Tribe continued to uphold its traditional government. In 1934, the Narragansett Tribe of Indians was incorporated. In the early 1940s, the Longhouse was built to provide a convenient meeting place for Tribal members and activities. Previous gatherings were held in the Narragansett Indian Meeting House (also known as the Church), which is located on 3 acres, which is the only land that has never been out of the possession of the Narragansett Tribe (Narragansett Indian Tribe 2018). As shown in Table 5-14, the Narragansett Tribe is the only federally recognized that currently resides within the Study Area.

The Pequots historically occupied the area that later became southeastern Connecticut and southwestern Rhode Island. Conflict arose with the arrival of European settlers leading to the Pequot War (1636-1638) during which many tribal members were killed or enslaved. Some remaining tribal members were placed with the Mohegans and the group became known as the Mashantucket (Western) Pequots. Many members of the tribe now reside on the reservation in the Mashantucket area in Connecticut (Tribal History 2020).

The Nipmuc Indians historically occupied parts of central Massachusetts and northern Rhode Island. They have historical ties to the Pequot, Narragansett, and the Pennacook tribes. During King Philips's War

(also known as Metacom War or the First Indian War) in 1675-1676, the Nipmuc fought against and lost to the European settlers. Some Nipmuc were sold as slaves, it is believed other Nipmuc survivors either joined other tribes in the area or resettled in Canada (Lee 2020, Sultzman n.d.). The Nipmuc Nation does have a small reservation and is a State-recognized tribe in Massachusetts (UMB 2019).

Rhode Island's Niantics are related to, but a separate group from the southeastern Connecticut Niantics. The Rhode Island Niantics lived along the coast, primarily in Washington County near modern-day Westerly and Charlestown. The Niantic attempted to avoid conflict with the European settlers and did not participate in King Philip's War, however, over time the population of the tribe declined and their land was gradually assimilated by the European settlers. The tribe eventually became known as the Narragansett, though originally, they were different tribal groups. The Narragansett in Rhode Island are largely of Niantic descent, though they do include some members of Narragansett descent (Lee 2020).

The Wampanoags historically occupied southeastern Massachusetts and eastern Rhode Island. They were particularly hard hit by the diseases that came in with the European settlers and lost additional members in King Philip's War (Lee 2020). Though deeply affected by disease and war, the Wampanoag tribe survived and the Mashpee Wampanoag Tribe and Wampanoag Tribe of Gay Head, both located in Massachusetts are federally recognized and have historical ties to Rhode Island.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 5-38. Overall social vulnerability for Washington County is from 25% to 50% (CDC 2016). Also shown in Figure 5-38 is NOAA sea level rise data, indicating that tribal communities in Washington County could be subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective Federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

5.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and

particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 5-15 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 22.0% of the population does not speak English at home. Providence County has the highest percentage (31.1%) of this population within the Study Area. Spanish is the language spoken by the majority (119,710 people or 12.0%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 70,056 people (7.0%) of the Study Area population (USCB 2017e).

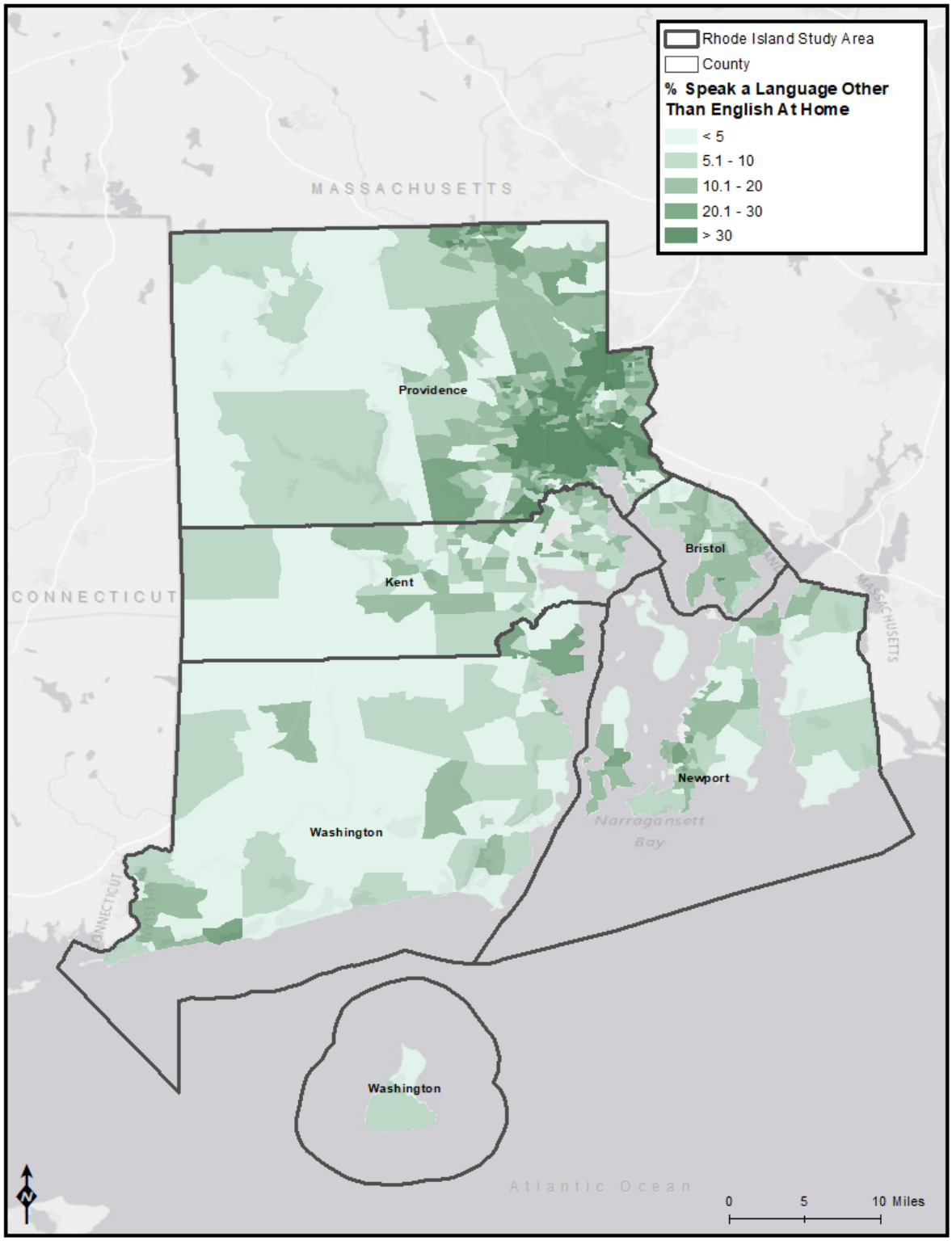
Table 5-15. People who Speak a Language Other than English at Home in the Rhode Island Study Area by Census Block Group

Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Bristol	47,101	5,449	11.6	601	4,152	609	87
Kent	155,996	13,624	8.7	4,050	6,565	2,352	657
Newport	79,546	8,189	10.3	3,077	3,685	1,023	404
Providence	597,444	185,847	31.1	109,783	51,883	17,614	6,567
Washington	121,480	7,718	6.4	2,199	3,771	1,413	335
Study Area/ Rhode Island	**1,001,567**	**220,827**	**22.0**	**119,710**	**70,056**	**23,011**	**8,050**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 5-40 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Providence (31.1%), Bristol (11.6%), and Newport (10.3%) (USCB 2017e).

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household.



Sources: USCB 2017r, USCB 2017e

Figure 5-40. Percent of People Who Speak a Language Other than English at Home in the Rhode Island Study Area by Census Block Group

Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

5.4.6 Summary – Demographics and Socioeconomics

Rhode Island's population is increasing but at a rate slower than the Nation. Population growth is slower than the Nation and other New England States. Rhode Island's estimated population was 1.1 million in 2017, having grown 0.3% since the 2010 Census with the addition of approximately 3,571 people (USCB 2017a, USCB 2017d). While Rhode Island is affected by the nationwide trend of aging population, the State still gains population from natural increase. Much of the slowdown in the State's population growth is a result of domestic out-migration, as more people are moving out of Rhode Island than into the State. International migration offset the State's domestic outmigration loss, resulting in a small net population gain of 829 people in 2018 USCB figures (USCB 2019b).

There are five counties (Bristol, Kent, Newport, Providence, and Washington) in the State of Rhode Island, which also comprise the Study Area. Between 2010 and 2017, two out of five counties gained population, while three counties lost population. Providence County grew the most (1.1%); Bristol County decreased the most (1.7%) (USCB 2017a, USCB 2017d). Population density of the Study Area was 1,022 persons per square mile in 2017, greater than the Nation (90 persons per square mile). Population densities in the Study Area ranged from 383 persons per square mile in Washington County to 2,031 persons per square mile in Bristol County (the county seat, located near the city of Providence) (USCB 2017d, USCB 2017c). In general, population densities are higher inland than on the coast. Density is concentrated near and within the city of Providence and adjacent urban areas along Narragansett Bay. Minority populations are growing rapidly in urban areas, notably Providence, Newport, and Cranston (RISPP 2014a). The Providence-Warwick, RI-MA metropolitan area comprises the entire Study Area (Data.gov 2017).

According to the RISPP, the State's population is projected to grow only 1.3% (1.1 million residents) between 2017 and 2040. In contrast, the Nation's projected population growth is 16.4%. During the same period, a population gain of 15.4% is projected in Washington County; a population loss of 10.1% is projected in Newport County, likely due to the confluence of several factors: aging of the population, suburban sprawl, major military cutbacks, and a slow recovery from the Great Recession (RISPP 2013, RISPP 2014a). In early 2020, a new economic development report, Rhode Island Innovates 2.0 was released which indicates that between 2016 and the time of publication of the report, Rhode Island's economy had seen significant improvement, particularly with regard to unemployment (Rhode Island Council 2020). Unfortunately, the current impacts of the COVID-19 pandemic are creating new economic challenges and have once again resulted in an increase in unemployment. The full effects of the pandemic on the Rhode Island economy and job rates are not yet known.

The Study Area is aging. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population and 5.2% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. In 2017, Providence County had the highest (5.7%) percentage of young children. Bristol County had the smallest percentage (3.9%). Projections for the year 2040 indicate this group's decline to 5.7% in the Nation and

the Study Area (4.9%). County-level projections are not available for age categories (USCB 2017b, USCB 2018b, RISPP 2013).

According to 2017 estimates, the elderly represented 14.9% and 16.1% of the national and State/Study Area population, respectively. The number and proportion of elderly to the overall population are projected to rise, fueled by aging baby boomers. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. Newport County had the highest (20.1%) percentage of elderly in 2017. Providence County had the smallest percentage (14.5%). By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S. and 24.7% in the Study Area. County-level projections are not available for age categories (USCB 2017b, USCB 2018b, RISPP 2013).

Homeownership in Rhode Island was 60.0%, lower than the Nation (63.8%). Renters comprised approximately 40.0% of the State population in 2017 (USCB 2017m).

Median home values were higher in the Study Area ($242,200) than the Nation ($193,500) in 2017. Median home values are higher near the coasts. Newport County has the highest median home value ($362,800); Kent County had the lowest ($212,600) (USCB 2017l). Home values in the State increased 2.7% during the 12-month period ending November 2019 according to Zillow (Zillow.com 2019j). During the same period, home values in the Providence-Warwick RI-MA metropolitan area increased 2.8%. According to Zillow the market temperature of both areas was characterized as “very hot” (Zillow.com 2019j, Zillow.com 2019k). Prices of multifamily homes surged between 2017 and 2018, indicating the value of the rental properties as a real estate investment (RISPP 2014a). The market temperature of the Study Area is characterized as “very hot” by Zillow (Zillow.com 2019j).

Housing affordability for low- and moderate-income workers is a problem in Rhode Island. A large proportion of the State (31%) is considered extremely low income, and of these households, 54% have a severe cost burden due to housing costs (National Low Income Coalition 2018). Per Rhode Island State Law 45-5342, 10% of housing stock must qualify as low- and moderate-Income housing. Six out of 39 Rhode Island communities have met this goal. Four of the communities are in Providence County (Burrillville, Central Falls, Providence, and Woonsocket), one is in Newport County (city of Newport), and one is in Washington County (New Shoreham). Rhode Island affordable housing resources include the HOME Investment Partnership Program and Housing Trust Fund, which provide capital necessary to build affordable housing. Unlike other New England States, it does not support the funding of operating expenses or rental subsidies necessary to keep rents low (RISPP 2014a).

In 2017, home vacancy rates in Rhode Island (11.7%) were lower than the Nation (12.2%). Highest vacancy rates are near popular coastal tourist destination counties in Washington (21.8%) and Newport (16.2%). Bristol and Kent Counties (both at 6.9%) have the lowest vacancy rates (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. According to an Airbnb press release, Washington and Newport Counties were the two most popular destination counties for short-term rentals.

The Study Area has a total employment of approximately 526,000 jobs, representing approximately 0.4% of the total jobs in the U.S. The dominant industry sectors are: educational services, and health care and social assistance (27.5%); retail trade (12.0%); manufacturing (10.8%); and arts, entertainment, and recreation, and accommodation and food services (10.8%). As the Study Area and the State are the same, the dominant industries are the same (USCB 2017p). Rhode Island’s ocean economy accounted for 45,496 maritime jobs in 2016, accounting for 9.8% of employment (NOAA 2016b, USCB 2017i). Within the State, tourism and recreation was the dominant sector, accounting for 82.4% (36,366) of maritime jobs. The highest percentage of maritime jobs to overall county jobs were in Newport (25.2%),

Washington (21.5%), and Bristol (17.9%) Counties, reflecting their proximity to the ocean and maritime employment opportunities (NOAA 2016b, USCB 2017i).

Out of 50 States, Rhode Island finished last in CNBC's 2019 rankings for business due to sluggish economic growth, unfavorable tax and regulatory climate, and deficient bridges, roads, and transportation infrastructure (Cohn 2019). The State's recession began before the Great Recession, as the State's manufacturing sector lost approximately 20,000 jobs between 2000 and 2010. However, the sector is beginning to recover with new manufacturing opportunities. New job growth in the State has been in high and low wage jobs, while losing middle wage jobs. Minorites are underrepresented in the workforce, yet minority populations are growing and represent the workforce of the future (RISPP 2014a). The unemployment rate in the Study Area is 6.8%, slightly higher than the Nation (6.6%). Within the Study Area, unemployment rates ranged from 4.2% in Bristol County to 7.6% in Providence County in 2017 (USCB 2017h).

In 2017, Rhode Island's median income was $74,630 (29.4% higher than the Nation's median income) and a per capita income of $38,343 (23.0% higher than the Nation's per capita income). While Rhode Island's income metrics are higher than the Nation, the State has noted that income stagnation is a particular problem. This was attributed to the State's ongoing recovery from the last recession. Income disparities among age, gender, and race were also noted. High wage jobs have experienced income growth, while low and middle wage jobs have not. A particular problem for Rhode Island is that new job growth has been concentrated in high and low wage jobs; the State is losing middle income jobs (USCB 2017k, USCB 2017n). Median household income ranged from $52,530 (Providence County) to $77,862 (Washington County). In 2017, per capita income ranged from an average of $29,025 (Providence County) to an average of $43,603 (Newport County). Income metrics are higher in areas outside the city of Providence (USCB 2017k, USCB 2017n).

The greater portion of jobs are located near the urban areas in the cities of Providence and Pawtucket, located in Providence County. According to a RISPP report, there is job growth in suburban areas, resulting from larger private industry, educational and health employers outside the urban core. Due to proximity to other metropolitan areas, many Rhode Island workers commute to Boston and New York, where high paying jobs are more plentiful. The State's regional transit network allows for commuting by rail (RISPP 2014a).

In the Study Area, 28.1% of the working-age population earned only a high school diploma; 37.4% earned a college or advanced degree. These rates are similar to the national high school graduation rate (27.7%) and college and advanced degree rate of 36.9 (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 1,056,138 people living in the Study Area, approximately 282,750 (26.8%) are minority, less than the national rate of 38.5%. Of the 814 census block groups in the Study Area, approximately 21.0% (171 block groups) are considered minority populations. Providence County contains the highest percentage of block groups with minority populations (32.3%); Bristol County has no block groups with minority populations. Several counties contain census block groups with high percentages of minority populations (USCB 2017f). According to RISPP, minority and low-income populations have increased in urban areas. Barriers to better employment for minorities include shortfalls in meeting required education and job experience, limited-English language ability, and racial discrimination (RISPP 2014a). Within the Study Area the largest minority group is Hispanic or Latino (7.7%) followed by Black or African-American (5.5%) (USCB 2017f). The minority population in Providence County is projected to grow from 37.8 in 2017 to greater than 50% by 2040 (RISPP 2014a, USCB 2017a).

Of the population of 1,015,923 people for whom poverty status is determined living in the Study Area, approximately 213,673 (21.0%) have incomes less than 150 of the poverty level. This is less than the national level of 23.7%. However, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 814 block groups in the Study Area, approximately 13.6% (111 block groups) are considered low-income populations. Therefore, the area contains low-income populations subject to consideration as potential environmental justice communities of concern (USCB 2017o). Providence County has the highest percentage of low-income block groups (17.2%); Kent County has the lowest (5.7%) (USCB 2017o). According to RISPP, populations of minorities have grown in urban areas, resulting in increasing poverty caused by low-paying jobs, unemployment, and cost burdened households stressed by housing costs (RISPP 2014a).

Resource-dependent populations include nine fishing communities located in Washington, Newport, and Bristol Counties and subsistence populations (NOAA Fisheries 2019g). There is one federally recognized American Indian tribe currently residing in the State (Narragansett Indian Tribe) and several others with historic ties to the State.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist in urban areas, most notably Providence, and along the coasts of the Study Area (CDC 2016). Providence and Washington Counties have the highest vulnerability ranking within the Study Area. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Providence and Kent Counties (CDC 2016, USCB 2017f, USCB 2017o). Therefore, it is important that the location of socially vulnerable populations is considered when evaluating potential future OCS-related projects.

Populations that speak a language other than English are present within the Study Area; approximately 22.0% of the population do not speak English at home. Spanish is the language spoken by the majority (119,710 people or 12.0%) of non-English speakers at home. Indo European languages are spoken at home by 70,056 people (7.0%) of the Study Area population (USCB 2017e). Counties with the highest percentages of these populations were Jasper (12.6%) and Beaufort (11.5%).

The counties with the smallest percentage on non-English speaking households were Providence (31.1%), Bristol (11.6%), and Newport (10.3%). Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project analysts during their evaluation process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise, storm surge are felt at the local level (by changing drainage, patterns or land use, etc.)(Siegel et al. 2001).

5.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

5.5.1 Regional Observations

Rhode Island's Narragansett Bay is an estuary of national significance. Wetlands and salt marshes and salt ponds are an important part of the estuary system. The riverine, estuarine, and wetland systems are vital parts of Rhode Island's ecosystem, are protected areas, and also offer various recreational opportunities.

Sea level is rising at increasing rates in Rhode Island. Land subsidence as a result of crustal rebounding following the last Ice Age further amplifies the rate of sea level rise. Flooding is an increasing problem throughout the State, and the Rhode Island Statewide Planning Program anticipates transportation infrastructure throughout the State will be impacted by combined flooding and sea level rise events. Communities most at risk for flooding and sea level rise are those surrounding the Narragansett Bay and on Block Island. Sea level rise is also predicted to result in a rise in coastal groundwater, which could compromise potable (groundwater wells) and wastewater systems.

Storm surge is also a concern throughout this coastal State. Rhode Island is subject to both hurricanes and nor'easters. Both types of storms can exasperate coastal erosion, which is a concern along the Rhode Island coastline, particularly along the Matunuck Headline. Storm surge also contributes to flooding issues throughout the coastal areas.

Rhode Island's predominant land covers are forested and developed areas. Most of the urban development is along the coast.

In Rhode Island, local planning is governed by State laws (RI MPO 2020a). Rhode Island has prepared a legislative handbook titled "Rhode Island General Laws Related to Land Use and Planning" that includes all of the laws related to zoning and land management, including the Rhode Island Comprehensive Planning and Regulation Act, Land Development and Subdivision Review Enabling Act, Zoning Enabling Act, and Historical Area Zoning. These laws are important because land development and subdivision regulations must be in accordance with zoning ordinances and because municipal zoning ordinances and maps must be consistent with the comprehensive planning and land use planning. Another related document that should be considered is the State Guide Plan, which is a centralized and integrated long-range planning document that contains 18 elements of planning grouped into nine functional areas such as economic development, energy, land use, and natural resources. The State Guide Plan provides standards by which specific projects or proposals are evaluated for consistency with State goals, objectives, and policies (RI MPO 2020b). Every community in the Study Area has a comprehensive plan, zoning ordinance, and set of land development regulations.

Because Rhode Island is the second most densely populated State in the Nation, it suffers from congestion as do most medium and large metropolitan areas. Congestion is an issue both on highways and certain public transit routes. Rhode Island has developed a congestion management process that is an integral part of metropolitan planning in Rhode Island (RISPP 2017).

Rhode Island's population has grown the slowest of the six New England States (Maine, New Hampshire, Vermont, Massachusetts, and Connecticut) and slower than the Nation. Measuring 1,033 square miles, it is also the smallest of the 50 States in terms of area (World Population Review 2020). The State's population is expected to continue similar levels of slow growth through 2040. Much of the slowdown in the State's population growth is a result of domestic out-migration, as more people are moving out of Rhode Island than into the State.

Minority populations are growing within the State, particularly in the urban areas. However, minorities remain underrepresented in the State's workforce. Providing opportunities for these populations to participate more fully in the workforce will be essential to support the State's future economy (RISPP 2014a).

Rhode Island has a shortage of rental homes affordable and available to extremely low-income households. Rhode Island affordable housing resources include the HOME Investment Partnership Program and Housing Trust Fund, which provide capital necessary to build affordable housing.

Out of 50 States, Rhode Island finished last in CNBC's 2019 rankings for business due to sluggish economic growth, unfavorable tax and regulatory climate, and deficient bridges, roads, and transportation infrastructure (Cohn 2019). The State's recession began before the Great Recession, as the State's manufacturing sector lost approximately 20,000 jobs between 2000 and 2010. However, the sector is beginning to recover with new manufacturing opportunities. New job growth in the State has been in high and low wage jobs, while losing middle wage jobs (RISPP 2014a). Rhode Island residents are also within commuting distance from Boston and New York, where high-paying jobs are more plentiful. The State's regional transit network allows for commuting by rail (RISPP 2014a).

According to RISPP, income stagnation is a particular problem in Rhode Island as the State has yet to recover from the Great Recession. Income disparities of age, gender, and race exist. High wage jobs have experienced income growth, while low and middle wage jobs have not. New job growth in the State has been in high and low wage jobs, while losing middle wage jobs (RISPP 2014a).

5.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Analysis of potential future projects will need to consider the potential impact to the Narragansett Bay Estuary and all connected systems. As protected areas, potential impacts to these ecosystems will likely need to be minimized and it is possible industrial development in these areas could be discouraged.
- Future project analysis should consider the project's compatibility with Rhode Island's State Plan and Comprehensive Planning and Land Use Act. Future projects will likely receive more support if they are consistent with the State's planning objectives.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support. Congestion on Rhode Island's roadways and the flooding issues associated with storms, storm surge, and sea level changes need to be considered during future project analysis.
- Availability of workforce and opportunities to provide jobs for minorities should be considered during future project analysis. Since Rhode Island has a growing minority population who experience challenges in achieving middle- and high-income jobs, and income stagnation is a problem, future projects which provide opportunities to these communities may receive more support in the State.
- Given the reported challenges the State's economy has experienced in recent years and the out-migration that has resulted in a loss of wealth for the State, it is possible that potential future projects that would offer opportunities for economic stimulus and increased jobs could be well received in the State.
- The first, and currently only operational offshore wind farm in the U.S. is Block Island wind farm which is located off the coast of Rhode Island. There is at least one other potential wind farm under consideration near Rhode Island. This indicates the area is receptive to at some OCS-related projects (Green City Times 2020). In fact, Rhode Island's new economic plan, *Rhode Island Innovates 2.0*, approved by the Economic Development Planning Council in early 2020, identified ocean-related economic activity ("Blue Economy") as a major opportunity area. The report encourages the state to capitalize on the moniker as the "Ocean State" by investing in Blue Economy development. Activities of interest could include offshore wind projects, marine

industry, tourism, and educational activities such as the University of Rhode Island oceanography program (Rhode Island Council 2020, Fitzpatrick 2020).

- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 6

CONNECTICUT

6 Connecticut

6.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Connecticut to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Connecticut is located near the North Atlantic Planning Area. A total of four counties are located within the Connecticut Study Area (Study Area) along the Connecticut coastline. The counties range in population size from around 164,000 in Middlesex County to almost 950,000 in Fairfield County (ESRI 2019a). These counties include diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. The proximity of Connecticut to New York City, New York increases the diversity of demographics and visitors to the area. Although Connecticut's location in the north has geographical commonalities with many of the other Atlantic States, it is largely protected by Long Island, New York. The Connecticut coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes the overall counties that are located within the State of Connecticut. The Study Area is shown in Figure 6-1 and Figure 6-2 and includes Fairfield, Middlesex, New Haven, and New London Counties.

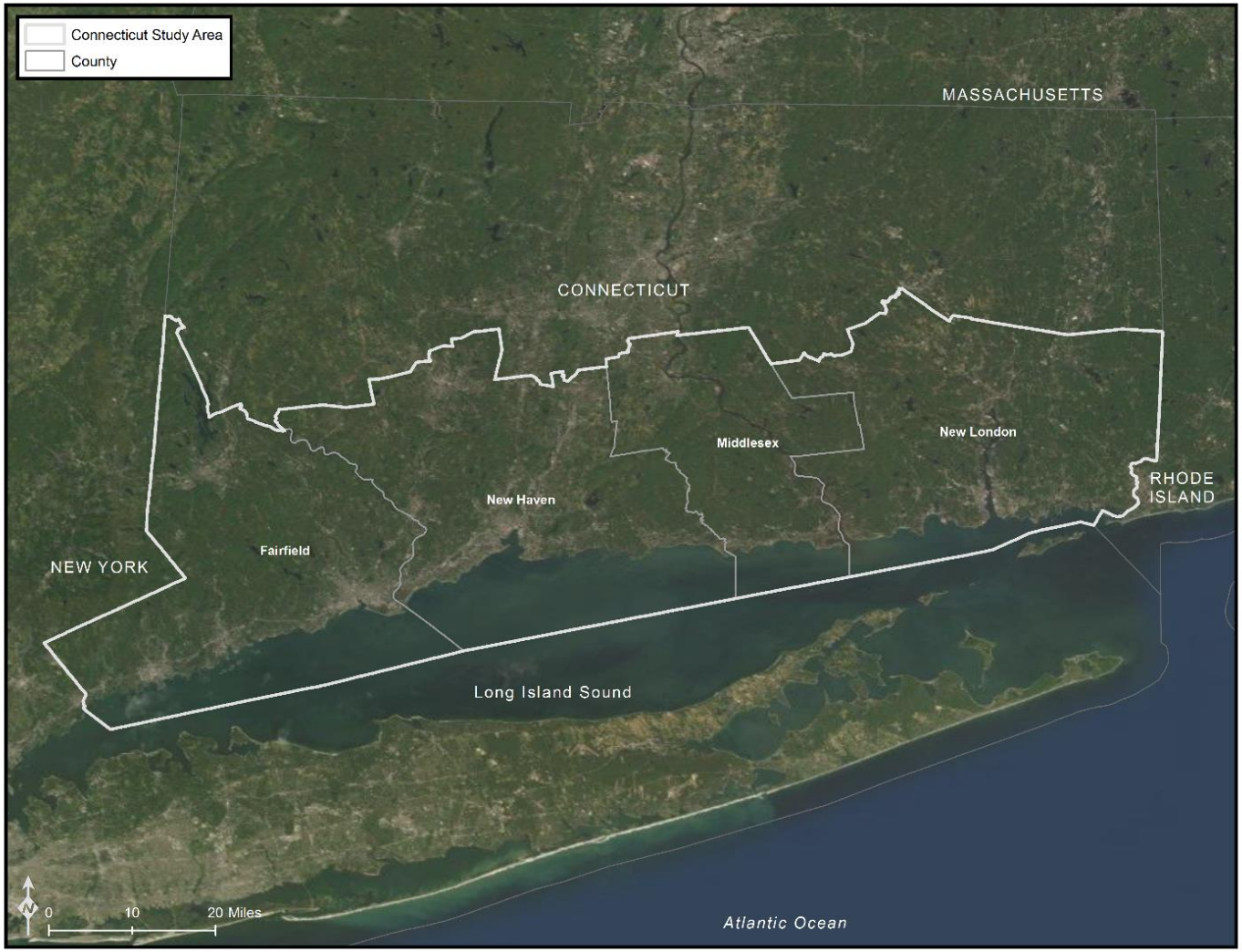
6.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Connecticut are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

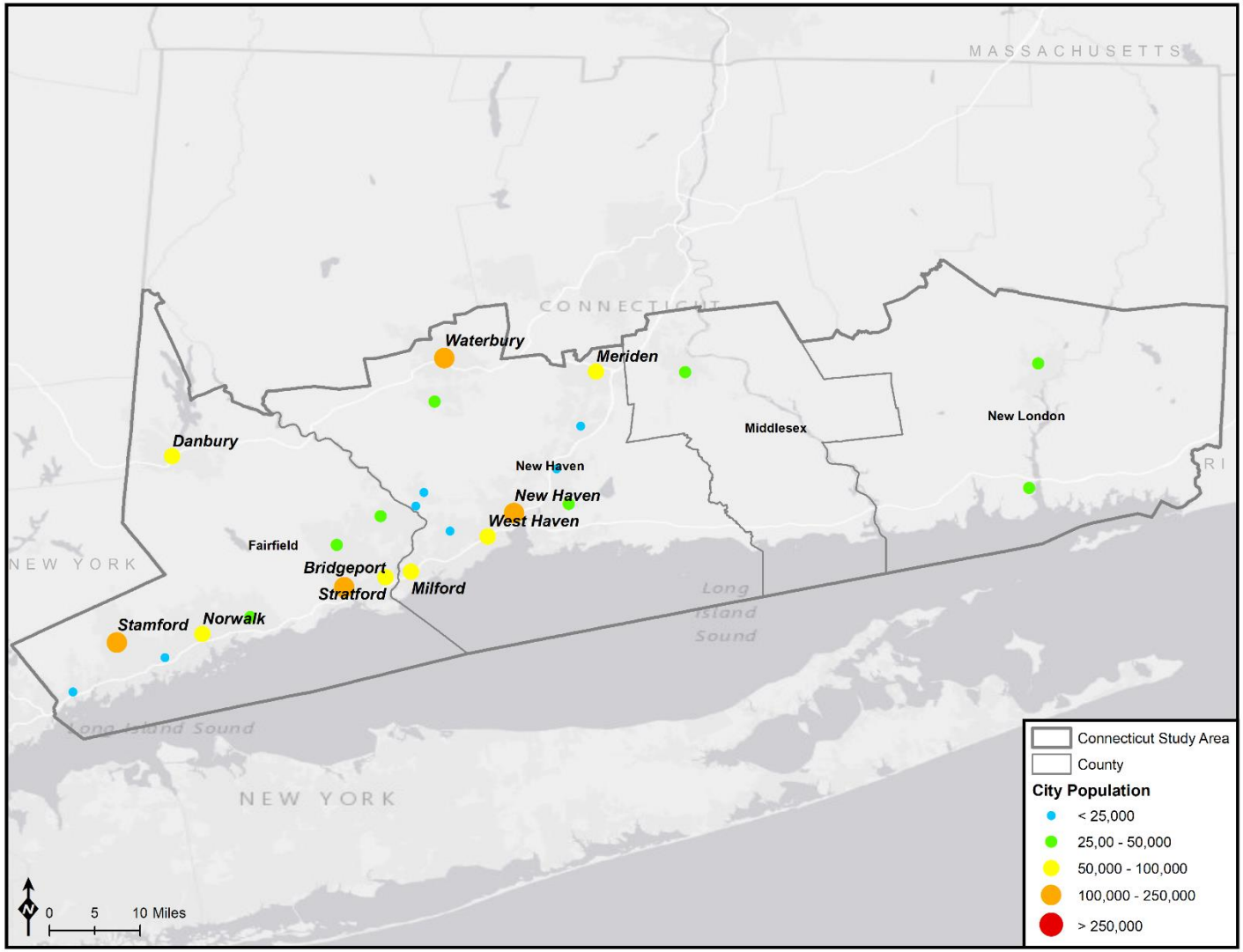
- Connecticut Department of Environmental Protection

The metadata database for Connecticut data sources is included in Appendix A.



Source: ESRI 2019a

Figure 6-1. State of Connecticut Study Area



Source: ESRI 2019a

Figure 6-2. Cities in the Connecticut Study Area

6.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

6.2.1 Water Resources

Connecticut's water resources include Long Island Sound, rivers, ponds, lakes, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

6.2.1.1 Long Island Sound

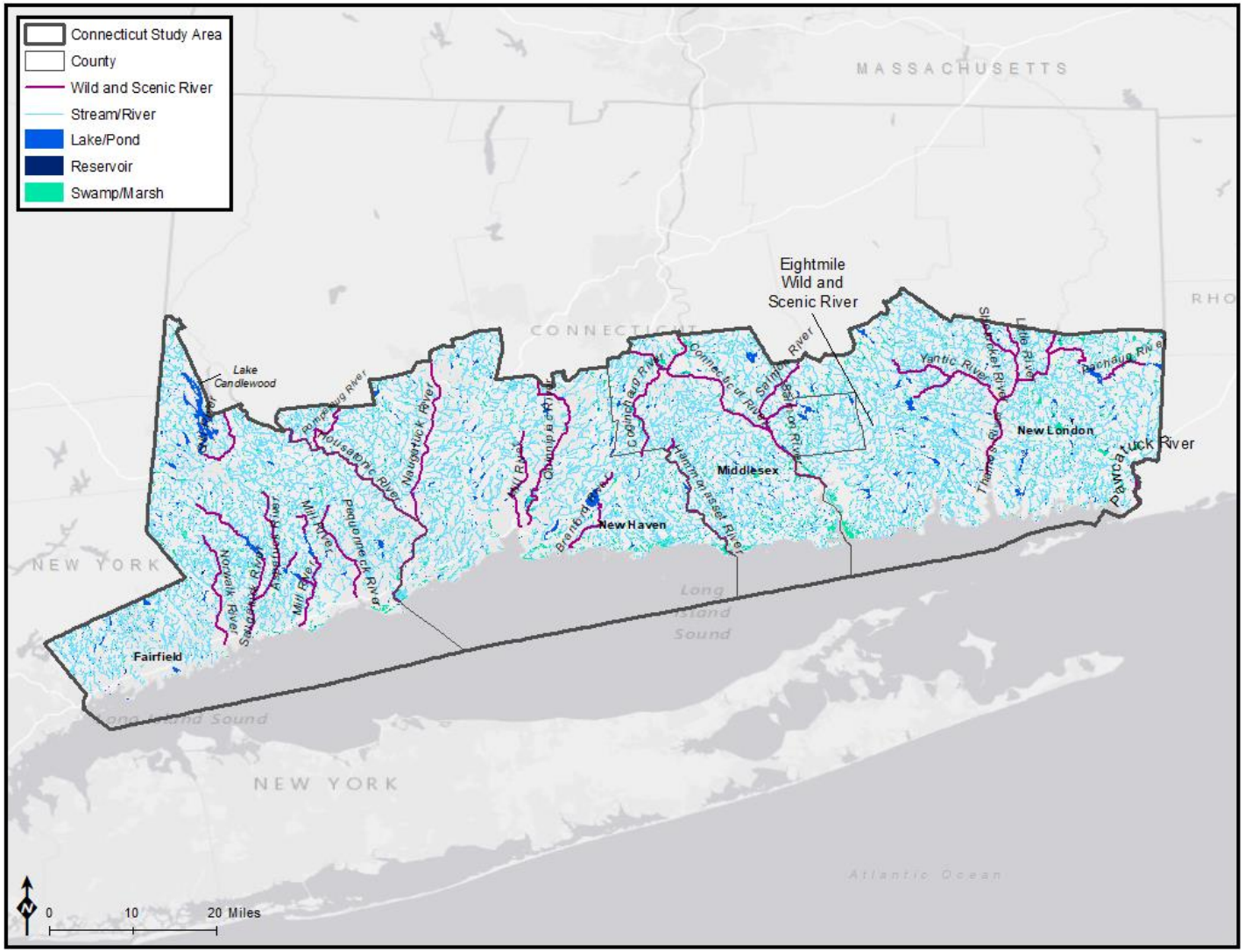
Long Island Sound (the Sound), shown in Figure 6-3, is a central feature of Connecticut and one of New England's largest estuaries (LISS 2010). Located in one of the most populated areas of the U.S. and in both New York and Connecticut, the Sound is a narrow body of water about 110 miles long and up to 21 miles wide. Part of the National Estuary Program, the Sound's 1,320-square mile embayment averages 63 feet in depth overall, receiving 90% of its fresh water from the Thames, the Housatonic, and the Connecticut Rivers. Connecticut's 332-mile shoreline in the Sound includes 219 miles of bays, harbors, and coves (CT DEEP 2015, LISS 2020a, LISS 2020b, NYSDEC 2019b).

Protected by land on three sides, the Sound nourishes a wealth of estuarine ecosystems where fresh and salt water mix providing rich, diverse habitats along with pollution mitigation and erosion control. Concerns for the health of these systems include pollution along with loss and degradation of habitat (CT DEEP 2015, LISS 2020a, NYSDEC 2019b).

Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Dead zones may result from a confluence of tides and currents along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. The dead zone in Long Island Sound occurs in bottom waters from mid-July through September with more severe hypoxia in the stratified, nutrient-rich western waters of the Sound. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and turf runoff reduction practices (LISS 2020a, NYSDEC 2019b, USEPA 2017).

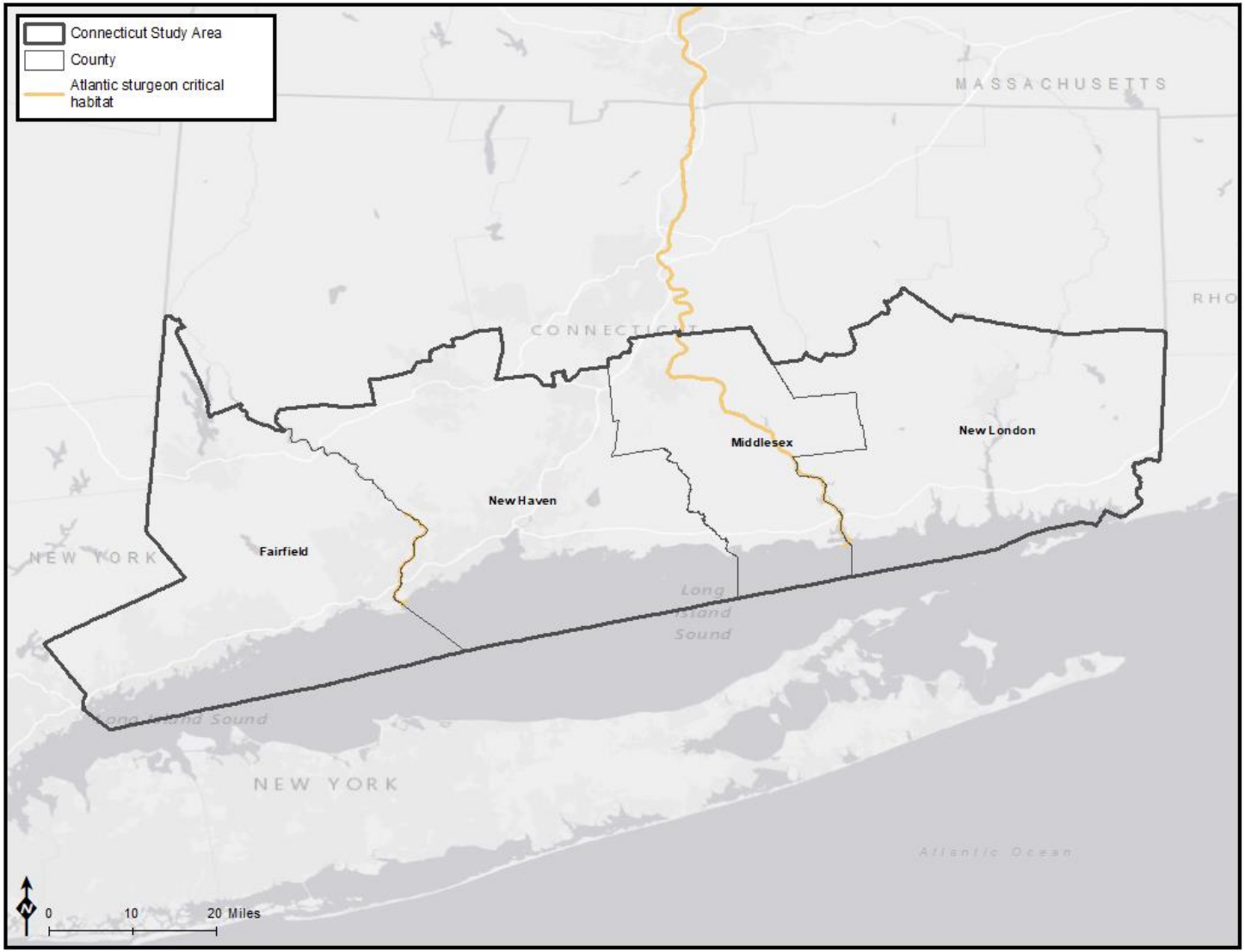
As shown in Figure 6-4, the coastal area of Connecticut within the Study Area includes designated critical habitat for the Atlantic sturgeon.(USFWS 2019i, USFWS 2019j).

The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Connecticut, the designated critical habitat of the Atlantic sturgeon is in the Connecticut and Housatonic rivers (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).



Source: USGS 2019e

Figure 6-3. Hydrography in the Connecticut Study Area



Sources: USFWS 2019i, USFWS 2019j

Figure 6-4. Critical Habitat within the Connecticut Study Area

6.2.1.2 Rivers

Within the Study Area, major drainage basins flow into Long Island Sound and ultimately into the Atlantic Ocean. As shown in Figure 6-3, major rivers from east to west in the Study Area are the Housatonic, the Connecticut, and the Thames Rivers. In addition, at the far west of the State, the Pawcatuck River (CT DEEP 2015, LISS 2020b, USGS 2019e).

In the eastern portion of the Study Area, the Housatonic River flows south from the Berkshire Mountains in Massachusetts entering Connecticut in Litchfield County. Continuing in its southerly direction until joined by the Ten Mile River from New York near Gaylordsville, the Housatonic then flows southeasterly to be joined by the Still River and the Shepaug River before transcribing the border between Fairfield and New Haven Counties. Joined by the Pomperaug, the Housatonic continues in its southeasterly journey until it is joined by the strong southerly flow of the Naugatuck near Derby. The Housatonic River soon flows in a more southerly direction entering Long Island Sound between Stratford and Milford. The Housatonic provides critical habitat for the Atlantic sturgeon (CT DEEP 2015, CT DEEP 2019a, NOAA 2019l, USFWS 2019i, USFWS 2019j).

West of the Housatonic, the Connecticut River flows south from the Canadian border through Vermont, New Hampshire, and Massachusetts before flowing through central Connecticut and entering Long Island Sound. The Connecticut River enters Connecticut in central Hartford County where it is joined by the Scantic River and then by the Farmington River before being joined by the Hockanum River and meandering into Middlesex County. The Connecticut River is then joined by the Mattabesset River, fed by the Coginchaug River, before flowing southeasterly and being joined by the southerly flowing Salmon River. The Connecticut is then joined by the Eightmile River at Homberg Cove where it widens and then empties into the Sound at Old Lyme. As seen in Figure 6-4, the Connecticut River also provides critical habitat for the Atlantic sturgeon (CT DEEP 2015, CT DEEP 2019a, NOAA 2019l, USFWS 2019i, USFWS 2019j).

West of the Connecticut, the Thames River also provides much of the fresh water entering Long Island Sound. Flowing south from Massachusetts, the Quinebaug River joins with the Shetucket River north of Norwich, which then merges with the Yantic at Norwich to form the Thames River. The Thames then enters the Sound between New London and Groton. As seen in Figure 6-4, the Thames River also provides habitat for the shortnose sturgeon and the Atlantic sturgeon (CT DEEP 2015, CT DEEP 2019a, NOAA 2019l, USFWS 2019i, USFWS 2019j).

West of the Thames, along the southern edge of New London County's border with Rhode Island, the Pawcatuck River flows west from South Kingston, Rhode Island towards Connecticut, turning south to prescribe the border, broadening for the Pawcatuck estuary, and entering Little Narragansett Bay on Long Island Sound at Stonington, Connecticut. Important feeders for the Pawcatuck include Connecticut's Green Fall River, which joins with the Ashaway River in Rhode Island before joining the Pawcatuck, and the Wood River. While the bay is well mixed, the Pawcatuck estuary is highly stratified (NWSRS 2020).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Connecticut has approximately 5,828 miles of river, only 39.3 miles are designated wild and scenic rivers. In the Study Area, 25.3 miles of the Eightmile River and its tributaries, the East Branch along with Harris, Beaver, and Falls Brooks, are designated wild and scenic river. The Study Area also includes parts of the Wood-Pawcatuck Watershed in southeastern Connecticut, which are recognized as wild and scenic river (USFWS 2019a).

With almost 5,830 miles of rivers and streams, water withdrawal in Connecticut is primarily surface water for thermoelectric use followed by water for public supply. In 2015, Connecticut water withdrawals for thermoelectric use totaled 2,593 million gallons per day with water for public supply at 240 million gallons per day. In 2015, Connecticut withdrew a total of 3,128 million gallons per day, nearly 96% from surface water but only 20% of that total 3,128 million gallons per day was freshwater. While crystalline bedrock aquifers underlie the State, the most productive groundwater aquifers in Connecticut are the unconsolidated stratified drift deposits of sand and gravel in the central Connecticut River Valley. Most of Connecticut's groundwater systems are localized and interconnected with the surface waters roughly following the surface water drainage patterns. In 2015, in the Study Area, Fairfield County had the highest water demands using nearly 90 million gallons per day, almost 95% surface water, followed New Haven at nearly 55 million gallons per day with more than 91% surface water sources. Middlesex County had the lowest usage at 7 million gallons per day in 2015, mostly from groundwater (63%). And on the eastern edge of the Study Area, New London County used 8 million gallons per day in 2015, about 72% from surface water sources (CT DEEP 2019c, CWPC 2019, USGS 2015a).

6.2.1.3 Floodplains

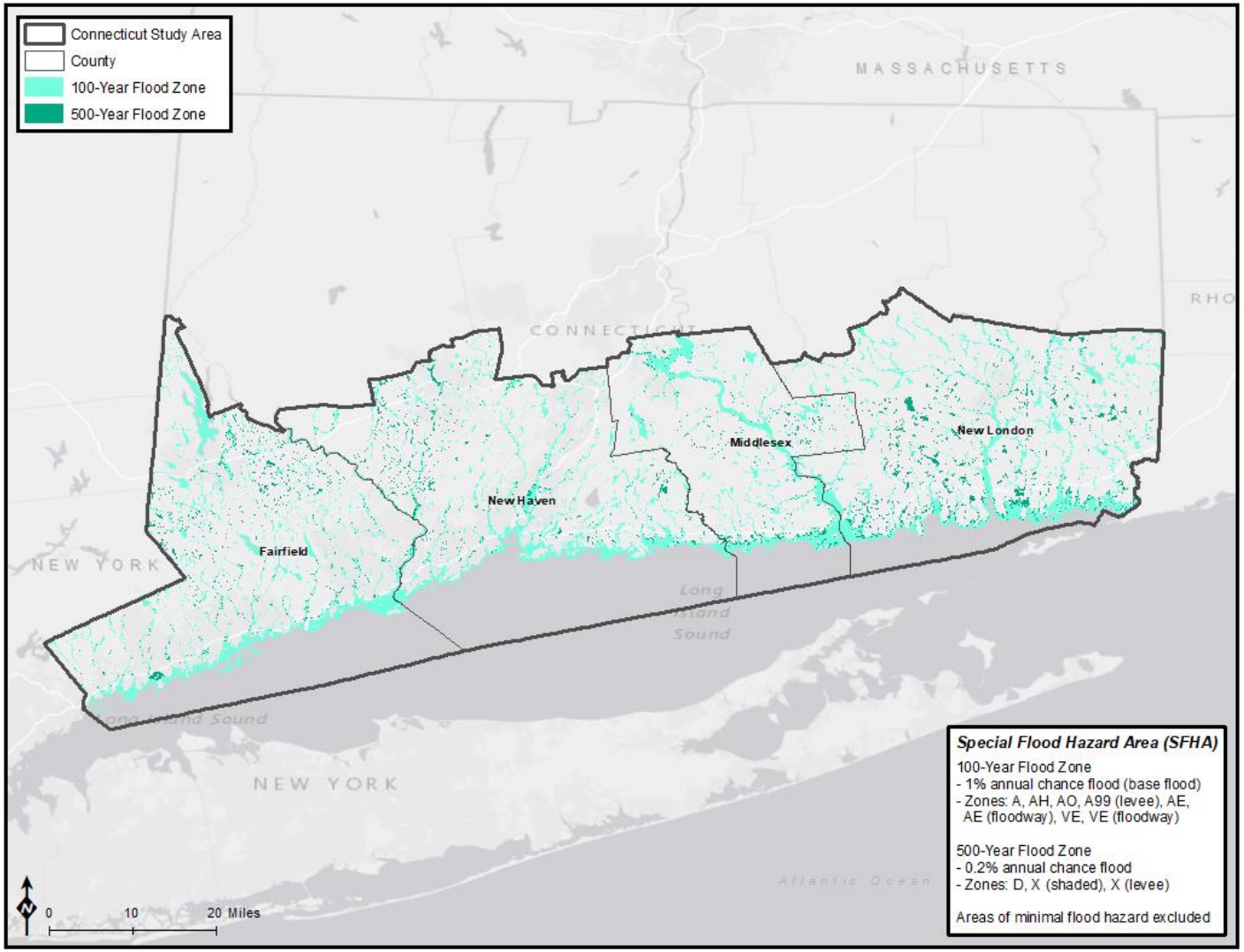
Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 6-5, floodplains are present within each of the counties in the Study Area. Table 6-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 6-1. Floodplains in the Connecticut Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (100 year) (%)
Fairfield	51,725	12.9	8,864	2.2
Middlesex	32,546	13.8	4,711	2.0
New Haven	45,909	11.9	7,905	2.0
New London	53,758	12.6	16,433	3.9
Study Area Total	**183,938**	**12.7**	**37,913**	**2.6**

Sources: USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: FEMA 2019b

Figure 6-5. Floodplains of the Connecticut Study Area

6.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 6-6, wetlands are a large part of the land area in each of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 6-2 details the wetland acreage in the Study Area along with other water resources. Wetlands comprise about 30% of the Study Area with the western counties of Middlesex and New London having fewer wetland areas (23% and 22%, respectively) while the eastern counties of Fairfield and New Haven have more wetland areas (29% and 35%, respectively) (USFWS 2018a).

Connecticut also designates inland wetlands. In contrast to tidal wetland areas, which are defined by their current or former tidal connection and their ability to support wetland vegetation, the Connecticut Inland Wetlands and Watercourse Act defines inland wetlands by soil drainage class and by landscape position. In Connecticut, inland wetlands are defined as poorly drained and very poorly drained soils and as alluvial and floodplain soils found along watercourses, which are broadly defined as natural or artificial and as permanent or intermittent bodies of water. In addition, inland wetlands do not always need to appear wet. Regardless of drainage type, all floodplain soils are inland wetland soils by definition. These inland wetlands are regulated by municipal agencies (CT DEEP 2019a, CT DEEP 2019b, CWPC 2019).

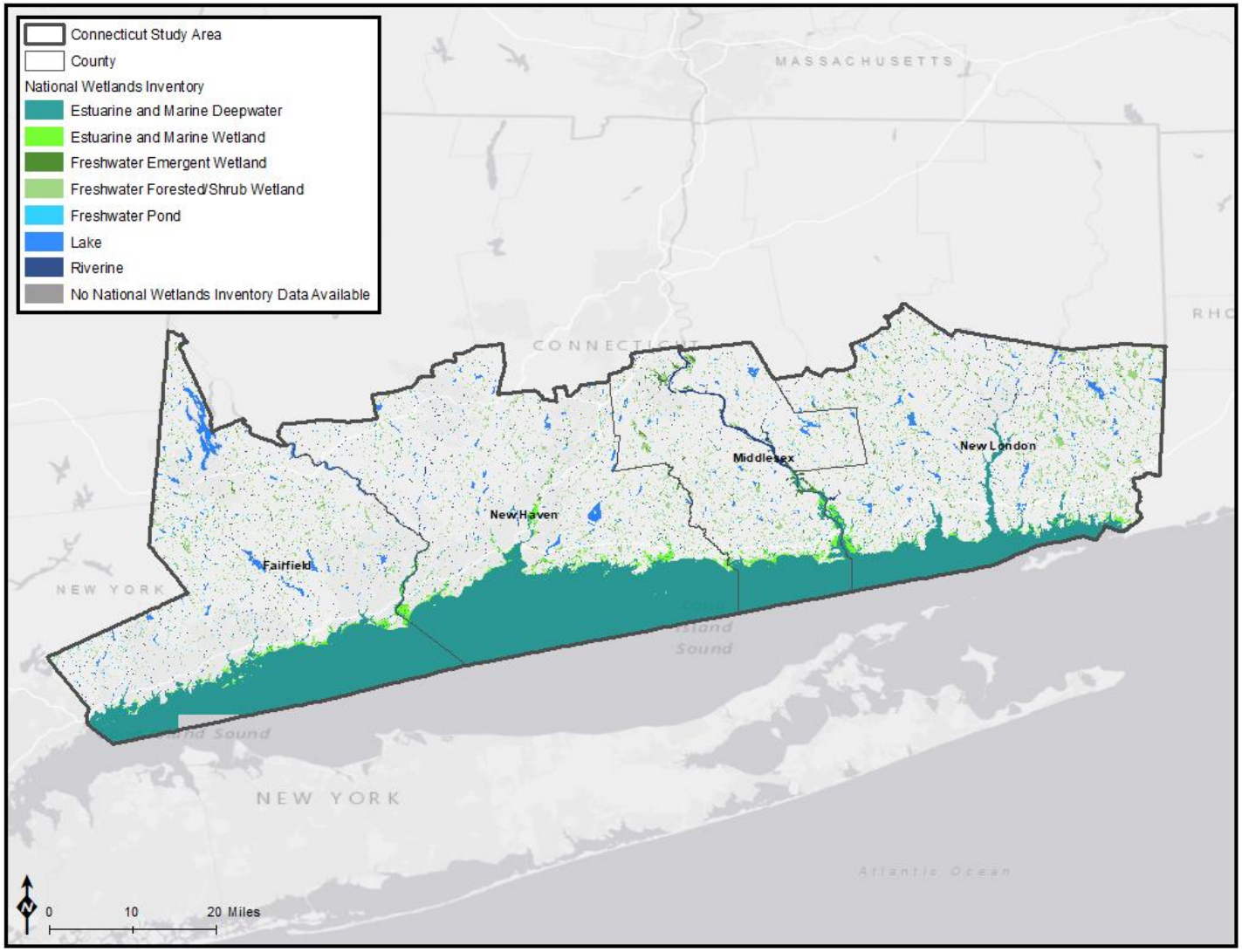
With a rich mix of fresh and salt water, Connecticut estuaries include a wealth of wetlands providing health, recreational, and economic benefits from diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as salt marsh restoration and fish passage restoration (CT DEEP 2019a, CT DEEP 2019b, CWPC 2019, LISS 2010, LISS 2020a). As such, this is an important natural and cultural resource within the Study Area.

6.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

6.2.2.1 Sea Level Rise

Figure 6-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.



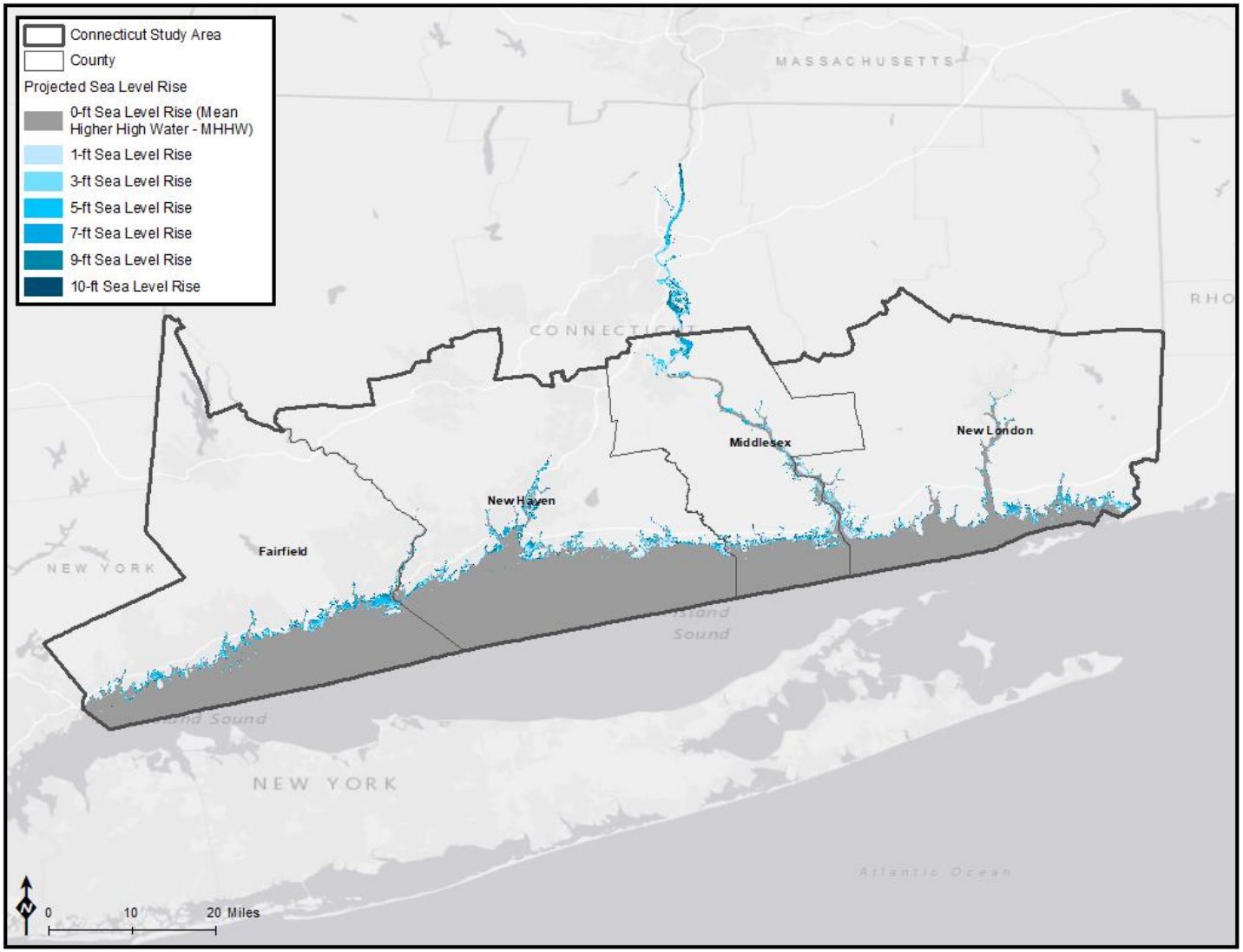
Source: USFWS 2018a

Figure 6-6. Wetlands in the Connecticut Study Area

Table 6-2. Wetlands in Connecticut Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Fairfield	156,899	3,706	1,674	15,120	118,572	10,652	3,165	4,009
Middlesex	65,393	2,976	2,647	13,212	36,741	3,132	1,852	4,835
New Haven	192,071	6,656	1,545	15,727	156,639	5,767	2,351	3,386
New London	109,455	3,730	3,324	30,147	59,201	7,264	2,701	3,088
Study Area Total	**523,818**	**17,067**	**9,190**	**74,206**	**371,153**	**26,816**	**10,068**	**15,318**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.



Source: NOAA 2018a

Figure 6-7. Projected Sea Level Rise throughout the Connecticut Study Area

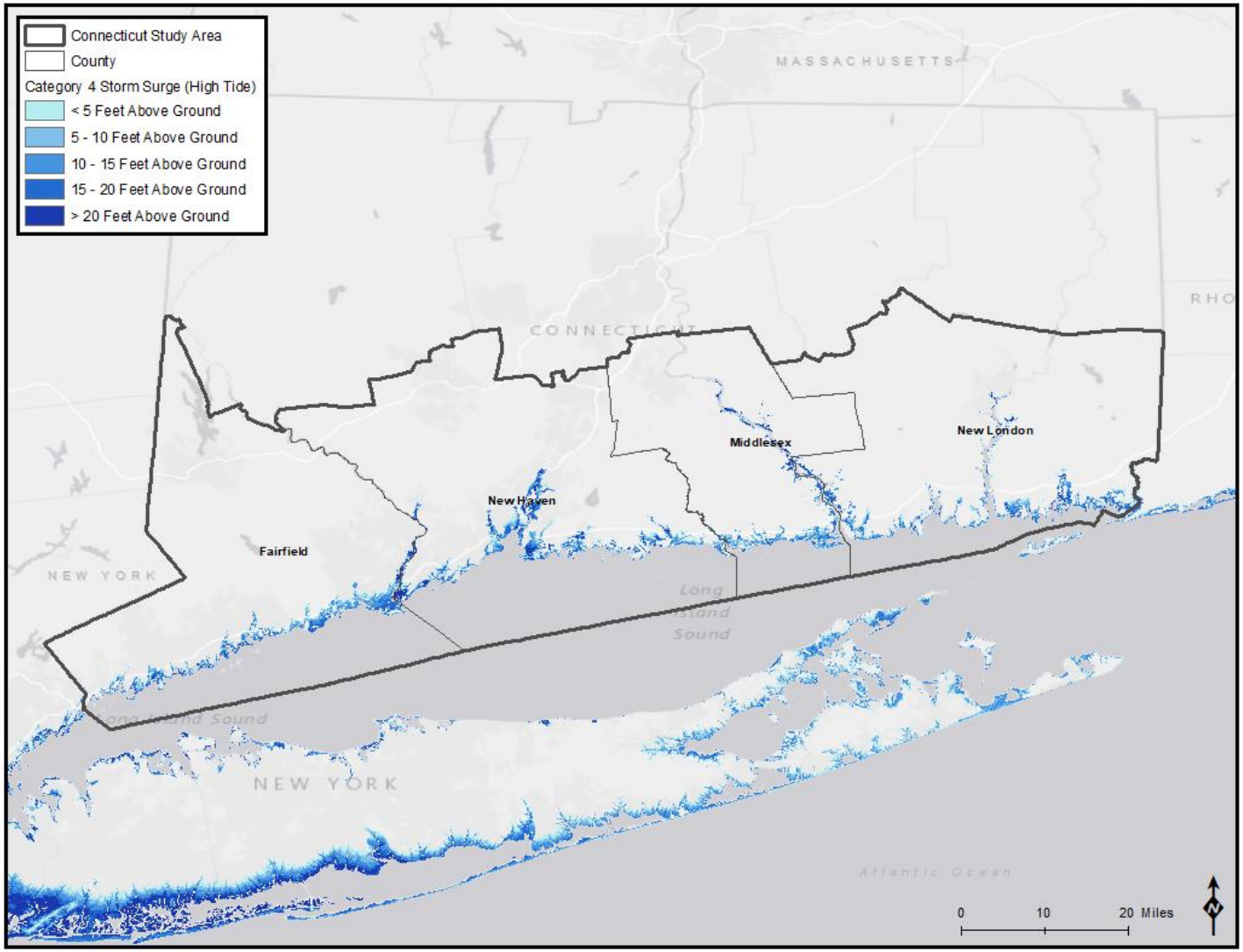
Based on data collected at Bridgeport, Connecticut, area sea level is up to 5 inches higher than it was in 1964 (0.09 inches/year) and is accelerating. Scientists predict another 6 inches of sea level rise in the next 15 years (0.4 inches/year). This increase is mostly due to ice melting into the ocean and Connecticut's sinking land, or subsidence. There are already over 7,000 properties at risk from frequent tidal flooding in Connecticut (SeaLevelRise.org 2019). According to the NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.11 inches/year (NOAA 2019b).

Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is a multi-disciplinary organization of experts in the natural sciences, engineering, economics, political science, finance, and law created to provide practical solutions to problems arising as a result of a changing climate. The mission of CIRCA is to increase the resilience and sustainability of Connecticut's coast against coastal hazards (Bonsack 2016a). According to CIRCA, the current rate of relative sea level rise in the Study Area should be the global rate minus vertical land movement, or subsidence. Annual mean sea level records from Long Island Sound gauges indicate that a current rates of relative mean sea level rise are around 0.10 inches a year. Factor in the local rate of subsidence, and rates increase to 0.38 inches a year. As a result, CIRCA recommends that Connecticut plans for up to 20 inches (1.67 feet) of sea level rise higher than the national tidal datum in Long Island Sound by 2050 and that it is likely that sea level will continue to rise after that date (O'Donnell 2019). To visualize these predictions, CIRCA maintains a map viewer showing different sea level rise projections along the Connecticut coastline and the adjacent inland (Bonsack 2016b).

Flooding that occurs during small storms or at high tide is often referred to as "nuisance flooding." As sea levels rise, the frequency of nuisance flooding will also increase. In Bridgeport and other coastal Connecticut cities, high lunar cycle tides are typically over 1.5 feet higher than normal high tides. Factor in sea level rise and you end up with nuisance flooding regardless of the weather (Bonsack 2018, SeaLevelRise.org 2019). Connecticut's Department of Energy and Environmental Protection's (CT DEEP's) sea level rise analysis indicate nuisance flooding on coastal roads occurred at least every 90 days on a total of 5.75 miles of road in 2010 and predict impacts to up to 79.31 miles by 2055 and 271.58 miles by the end of the century. Flooding will occur every 30 days. Even homes elevated after flooding during Superstorm Sandy would be inaccessible due to road flooding (CT DEEP 2019a, CT DEEP 2019b, Spiegel 2019).

6.2.2.2 Storm Surge

Figure 6-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the Connecticut coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario.



Source: NOAA 2020a

Figure 6-8. Projected Storm Surge throughout the Connecticut Study Area for a Category 4 Hurricane

The coast of Connecticut experiences seasonal storms, both hurricanes in the summer and nor'easters in the winter; these storm systems are described in greater detail in Chapter 1.4.2.2. Coastal flooding occurs during these storms, due to waves, storm surge, and rainfall. The varied features of Connecticut's coastline, its marshes, small beaches, and rocky headlands, determine how and where flooding will occur. As the sea levels rise, the frequency of coastal flooding during all storms will increase as well as the total flooded area at high tide (Bonsack 2018). In 2012, Hurricane (Superstorm) Sandy hit Connecticut, causing widespread damages to the State due to high wind and coastal storm surge (SeaLevelRise.org 2019). The highest tides and storm surges in Connecticut occur during nor'easters, especially during higher lunar tide cycles (SeaLevelRise.org 2019).

One impact from storm surge in the Study Area is erosion. Because of the coastal geology of Long Island Sound, the land is constantly shifting. Some sandy coastal areas are eroding while others are accreting. Some areas do both depending on weather and seasonal factors (CT DEEP 2019a). Shoreline erosion occurs on tidal and inland waters as daily high tides and wave action, but it is exacerbated by storm surges, damaging shoreline structures, changing patterns of tidal exchange or flushing rates, and altering existing basin characteristics and channel contours (CCSWC and DEP 2002).

6.2.3 Summary – Physical Characteristics

Water resources in the Study Area include Long Island Sound, rivers, floodplains, and wetlands. Critical habitat for the Atlantic sturgeon has been designated in the Housatonic and Connecticut rivers (USFWS 2019i, USFWS 2019j). The water resources in the Study Area provide valuable ecosystem services and potable water for the community and are also frequently recreation destinations.

Sea level rise in the Study Area is due to ice melting into the ocean and Connecticut's sinking land, or subsidence. There are already over 7,000 properties at risk from frequent tidal flooding in Connecticut. The Connecticut sea level is up to 5 inches higher than it was in 1964 (0.09 inches/year) and accelerating. Scientists predict another 6 inches of sea level rise in the next 15 years (0.4 inches/year) (SeaLevelRise.org 2019). CIRCA recommends that Connecticut plan for up to 20 inches (1.67 feet) of sea level rise higher than the national tidal datum in Long Island Sound by 2050 and that it is likely that sea level will continue to rise after that date (O'Donnell 2019). In Bridgeport and other coastal Connecticut cities, high lunar cycle tides are typically over 1.5 feet higher than normal high tides. As sea levels rise, the frequency of nuisance flooding will also increase (Bonsack 2018, SeaLevelRise.org 2019).

Coastal flooding on the coast of Connecticut result from seasonal storms, both hurricanes in the summer and nor'easters in the winter. As the sea levels rise, the frequency of coastal flooding during all storms will increase as well as the total flooded area at high tide (Bonsack 2018). The highest tides and storm surges in Connecticut occur during winter nor'easters, especially during higher lunar tide cycles (SeaLevelRise.org 2019). Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the Connecticut coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. Within the Study Area, storm surge erosion would damage shoreline structures, changing patterns of tidal exchange or flushing rates, and altering existing basin characteristics and channel contours (CCSWC and DEP 2002).

In summary, physical characteristics of the Study Area influence land use and land cover, demographics, and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

6.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

6.3.1 Land Cover

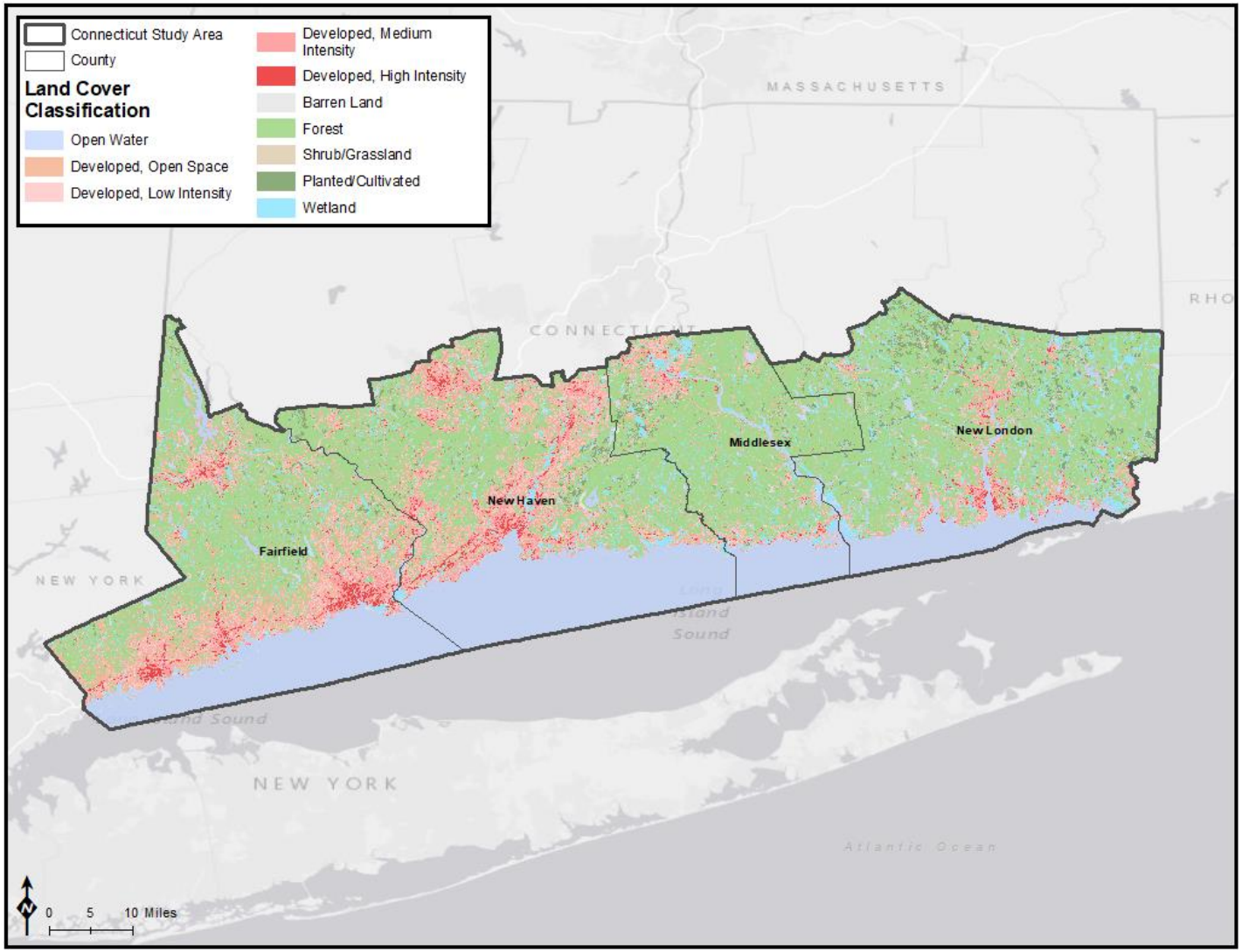
Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

Figure 6-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 6-3 presents the NLCD data for each county within the Study Area by acreage. With the exception of open water land cover (e.g., rivers, lakes, ponds, ocean), Table 6-4 presents the same NLCD data for each county by percentage and presents a summary of the overall land cover for each geographic unit. Open water land use was excluded in Table 6-4 because this type of land cover would not be considered in future industrial development. The following section discusses the key findings of this analysis.

The primary land cover in the four counties within the Study Area is forest, with the highest percentages of forest land in Middlesex and New London Counties. Urban development is the second most predominant land cover in the Study Area, primarily in Fairfield and New Haven Counties along the coast and the Connecticut River. It is important to note that, because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serves as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of the Study Area may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of "Forest" could be very broad.

Table 6-4 presents an assessment of the general land cover for each of the four counties in the Study Area based on the majority of the land cover within that geographic unit. Based on the assessment presented in Table 6-4, the majority land cover type within the Study Area is a combination of forest and urban development. Fairfield and New Haven Counties are a combination of forest and urban development, while Middlesex and New London Counties are primarily forest. As described previously, "Forest" land cover in the State of Connecticut could range from natural forested areas to neighborhoods in suburban areas. These are likely indicative of wooded suburban landscapes.

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). A total of 2.4% of the land cover in the Study Area changed at least once. Figure 6-10 and Table 6-5 show the land cover change within the Study Area from 2001 to 2016. Fairfax, Middlesex, and New Haven Counties all experienced 2.4% land change whereas New London County experienced 2.3% change. The majority of the change in every county appears to be from or to the developed land cover types (MRLC 2016).



Source: NLCD 2016a

Figure 6-9. National Land Cover in the Connecticut Study Area

Table 6-3. Acres of Land Cover by NLCD Classifications in the Connecticut Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Fairfield	535,711	79,141	48,197	33,460	11,543	172,341	1,045	195,625	2,473	5,415	23,909	134,904
Middlesex	281,002	21,074	14,207	7,113	1,717	44,111	1,034	159,267	3,104	7,512	21,322	44,652
New Haven	551,729	56,986	51,716	40,913	11,061	160,675	1,824	185,661	4,199	8,912	26,113	164,345
New London	494,056	27,048	20,746	15,648	4,217	67,659	2,013	270,932	8,246	24,880	52,809	67,518
Study Area Total	1,862,498	184,249	134,866	97,134	28,537	444,787	5,916	811,483	18,022	46,718	124,153	411,418

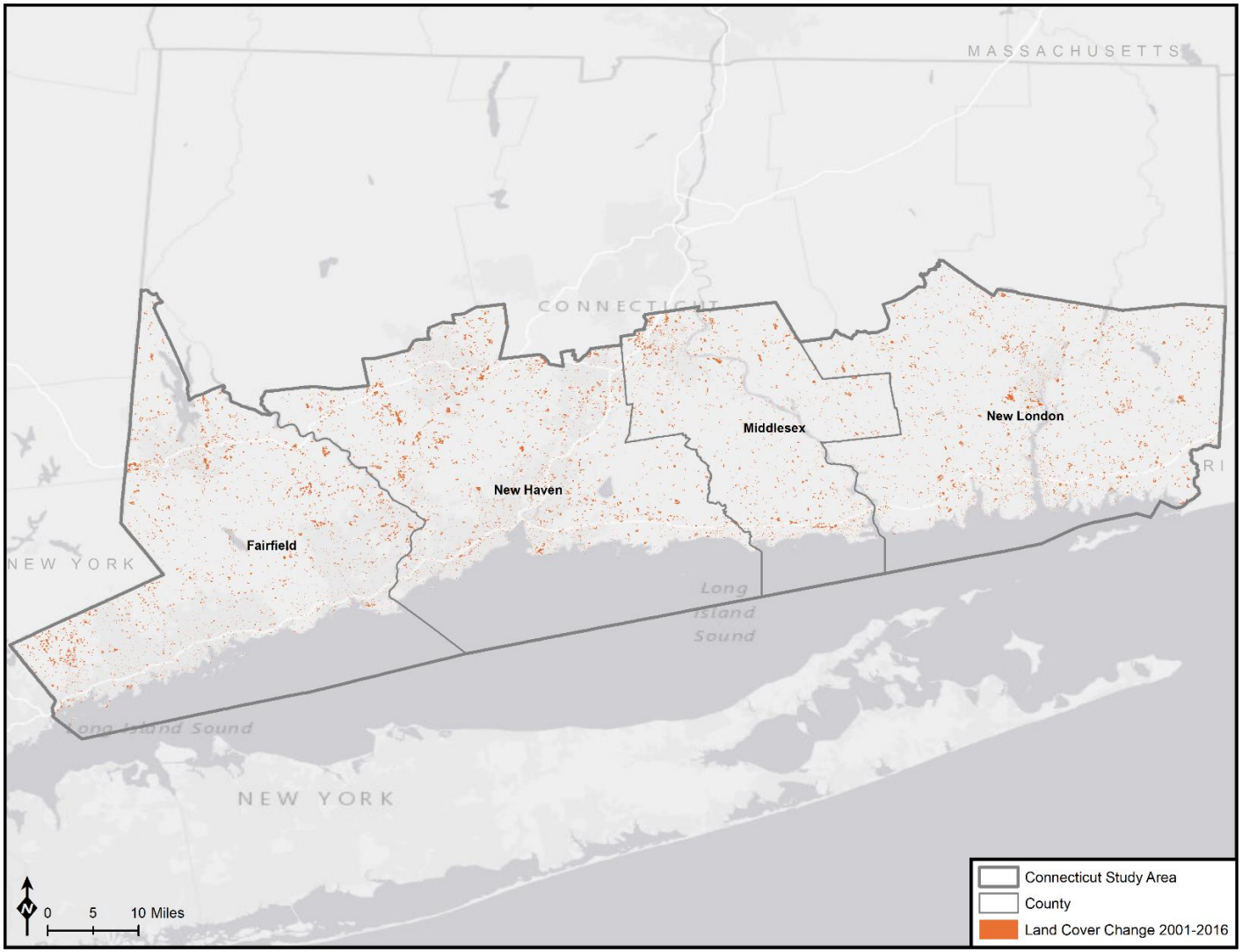
Source: NLCD 2016a

Table 6-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Connecticut Study Area (Excluding Open Waters)

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Types
Fairfield	19.7	12.0	8.3	2.9	43.0	0.3	48.8	0.6	1.4	6.0	Forest/Developed
Middlesex	9.0	6.0	3.0	0.7	18.7	0.4	67.4	1.3	3.2	9.0	Forest
New Haven	14.7	13.3	10.6	2.9	41.5	0.5	47.9	1.1	2.3	6.7	Forest/Developed
New London	6.3	4.9	3.7	1.0	15.9	0.5	63.5	1.9	5.8	12.4	Forest
Study Area Total	12.7	9.3	6.7	2.0	30.7	0.4	55.9	1.2	3.2	8.6	Forest/Developed

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2001-2016

Figure 6-10. Land Cover Change in the Connecticut Study Area

Table 6-5. Land Cover Change in the Connecticut Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Fairfield	535,711	12,800	2.4
Middlesex	281,002	6,641	2.4
New Haven	551,730	13,415	2.4
New London	494,056	11,272	2.3
Study Area Total	**1,862,500**	**44,128**	**2.4**

Source: NLCD 2001-2016

Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types, such as Fairfield and New Haven Counties. New London County may also support future industrial development.

It is also likely that future industrial development would want to avoid counties that are much less developed and have a larger proportion of undisturbed land covers. Middlesex County may fall into this category.

Based on an analysis of the general land cover within the Study Area, it seems most likely that Fairfield and New Haven Counties would be the most suitable counties to accommodate future industrial coastal projects.

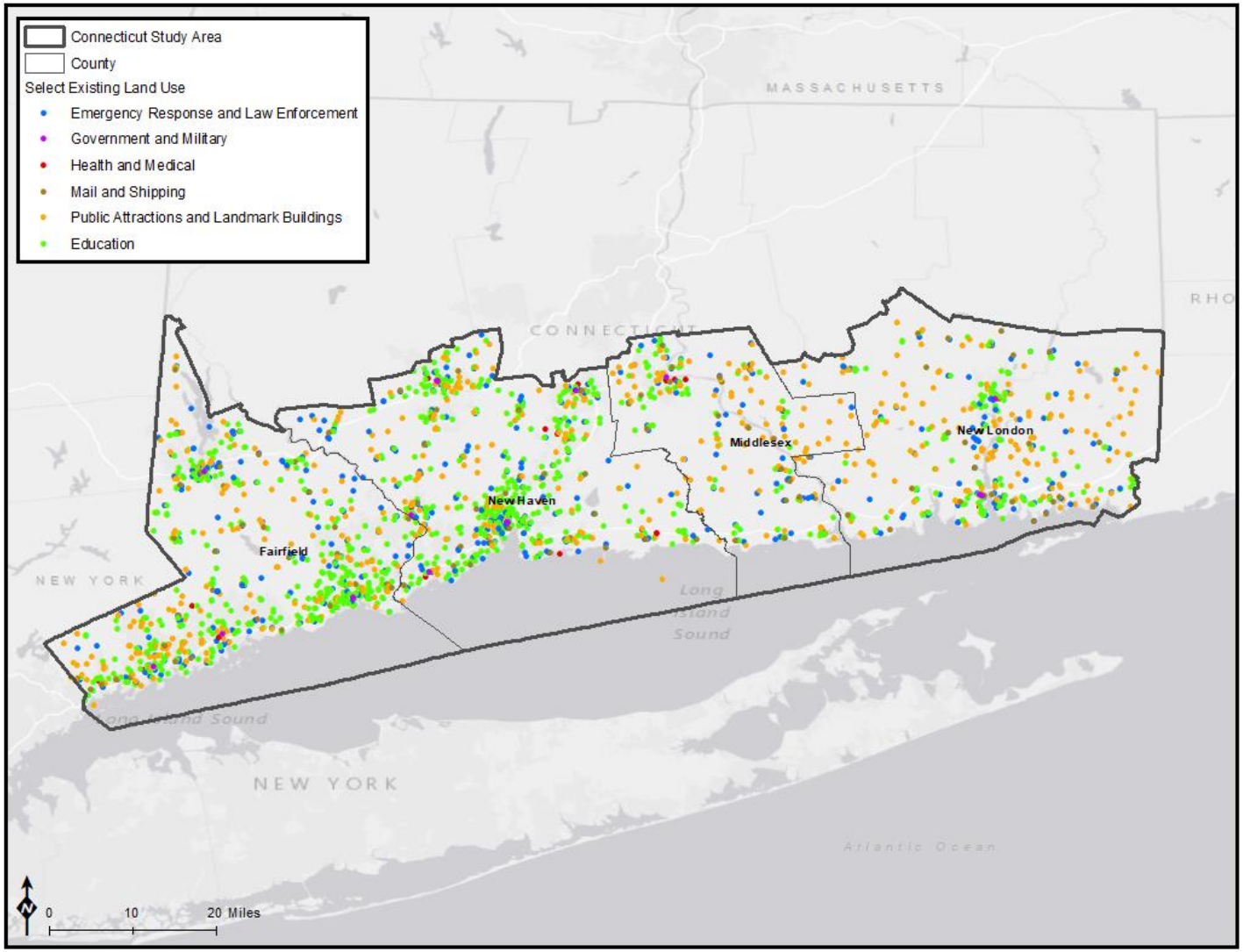
6.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

6.3.2.1 Existing and Future Land Use

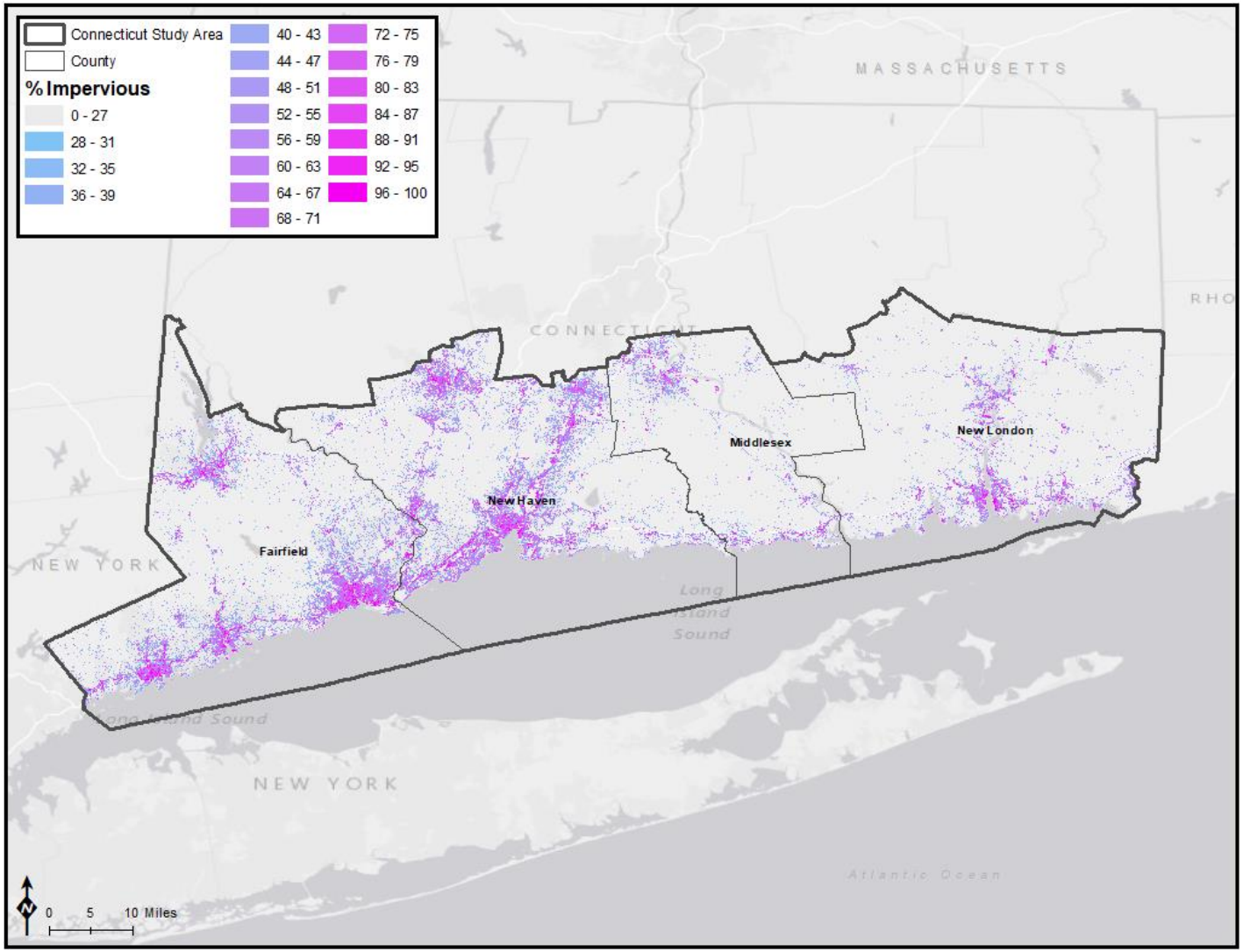
The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 6-11 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 6-12 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 6.3.1, and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

As expected, the existing land use maps for the Study Area indicate that there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Structures and impervious surfaces in the Study Area mirror land cover trends for urban development, while public attractions and landmark buildings can be found throughout the Study Area.



Source: USGS 2017

Figure 6-11. Select Existing Land Uses within the Connecticut Study Area



Source: NLCD 2016b

Figure 6-12. Impervious Surfaces within the Connecticut Study Area

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. In Connecticut, the State's Office of Responsible Growth is responsible for preparing a State Plan of Conservation and Development every 5 years. This plan provides the policy framework for decisions regarding future growth and development in the State (CT OPM 2019a, CT OPM 2019b). However, there are no county governments. Counties serve only as dividing lines for the State's judicial systems; thus, towns are responsible for all local government activities. Therefore, there are Regional Councils of Governments that address regional issues concerning infrastructure, land use, and economic development, typically outlined in a regional conservation and development plan. These designated planning regions provide a geographical framework whereby municipalities can address and coordinate common interests with State plans and programs. The State's Office of Policy and Management can designate or re-designate the boundaries of a logical planning region; thus, the municipalities within each Regional Council of Government can vary (CT OPM 2019c).

Municipalities in the four counties of the Study Area belong to seven of the nine current Regional Councils of Government in Connecticut. In Fairfield County, 16 towns are part of the Western Council of Governments, six towns are part of the Metropolitan Council of Governments, and one town (Shelton) is part of the Naugatuck Valley Council of Governments. In New Haven County, 12 towns are part of the Naugatuck Valley Council of Governments and 15 towns are part of the South Central Council of Governments. In Middlesex County, all 15 towns are part of the Lower Connecticut River Valley Council of Governments. In New London County, 18 towns are part of the Southeastern Council of Governments, two towns are part of the Lower Connecticut River Valley Council of Government, and one town is part of the Northeastern Council of Governments (CT OPM 2019c). Each Regional Council of Government has their own Conservation and Development Plan. Appendix B includes links to relevant planning documents.

Connecticut is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. The State's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. Throughout Connecticut, 72 urban and suburban areas have been designated as Opportunity Zones. An interactive map of opportunity zones is located at https://ctozmap.com/ (CT.gov 2020).

Future OCS-related project analysis will need to consider the conservation and development plan (or equivalent) of the particular region and municipality within which they are interested in developing a new project. They should also consult statewide conservation and development plans and associated State laws and regulations that may be applicable to the proposed activities. Municipalities and regulating regional or State agencies will be more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

6.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in geographic information system formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the

Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during OCS-related project analysis. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

6.3.2.3 Industrial Incentives

Connecticut has a variety of organizations and programs that encourage business growth in the State. Connecticut's Department of Economic and Community Development (DECD) supports existing businesses, attracts new businesses, strengthens communities by providing funding and technical support for local communities, and promoting Connecticut business interests. The DECD creates programs and incentives to develop opportunities for businesses and industries in the State. These programs and incentives include tax credits, economic development zones, talent recruitment, business marketing, and other supportive actions for different types of businesses and industries (CT DECD 2019).

The Connecticut Department of Revenue Services (DRS) works to provide tax filing information and to file tax returns for businesses while helping businesses save money through key tax advantages (CT DRS 2019). Connecticut's DECD and DRS both provide incentive opportunities for various businesses and industries that are offered by the State.

Connecticut's development programs are administered by DECD and DRS, and some services provided by each agency overlap. Grants and incentives that may be helpful to OCS-related ventures include the following, among others:

- Connecticut Opportunity Zones
- Enterprise Zones
- Energy Assistance
- Corporate Business Tax Credits
- Urban/Industrial Sites Reinvestment Tax Credit

The Connecticut Business and Industry Association (CBIA) represents thousands of member companies across a range of industries (CBIA 2019). The CBIA is a collection of businesses in Connecticut that have organized membership and leadership to protect and grow businesses. The CBIA contains smaller councils that navigate strategies and communicate with State government about specific fields or areas of interest such as government, law, and environmental affairs (CBIA Councils 2019). The CBIA provides its members with products and services, including insurance and employee benefits, HR resources, and energy purchasing solutions (CBIA 2019). The CBIA advocates for a positive and globally competitive business climate in the State (CBIA 2019).

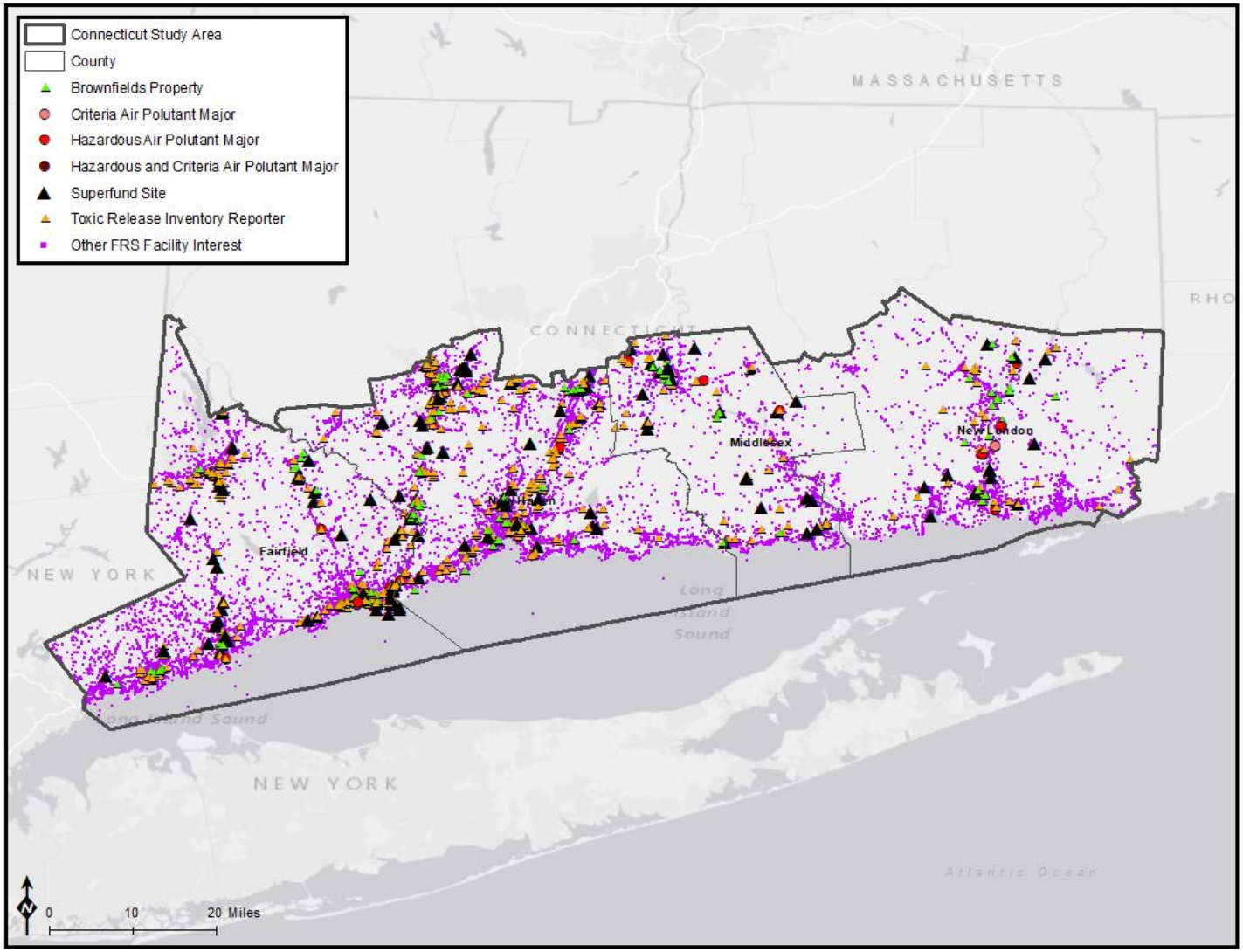
6.3.2.4 Industry

A variety of industry is present throughout the Study Area. The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 6-13 presents

the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory-listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

As described above, industrial sites are frequently concentrated in industrial zones or near other industrial properties. When purchasing property, particularly existing industrial property, developers will frequently conduct a Phase I Environmental Site Assessment to research the current and historical uses of a property and determine if the current or historic uses of the property may have impacted or pose a threat to the environment and/or human health. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties, which may be similar in nature or which may provide services relevant to the new site; therefore, a Phase I Environmental Site Assessment is often a useful evaluation to conduct during the site-selection and planning process. Chapter 6.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 6-13. USEPA Facility Register Service Record for the District of Columbia Study Area

6.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 6-14 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, U.S. Fish and Wildlife Service, and the National Park Service.

As can be seen in Figure 6-14, Middlesex and New London Counties contain several areas of protected land, which are primarily State forests and State parks. The Connecticut Department of Energy and Environmental Protection has a website with an interactive map identifying locations and names of State forests and State parks in Connecticut (CT DEEP 2019a). There are also several local parks throughout the Study Area, particularly in Fairfield and New Haven Counties. Analysts of future potential OCS-related projects will need to consider protected areas during their site-selection process and consider potential impacts to nearby protected areas for project construction and operations.

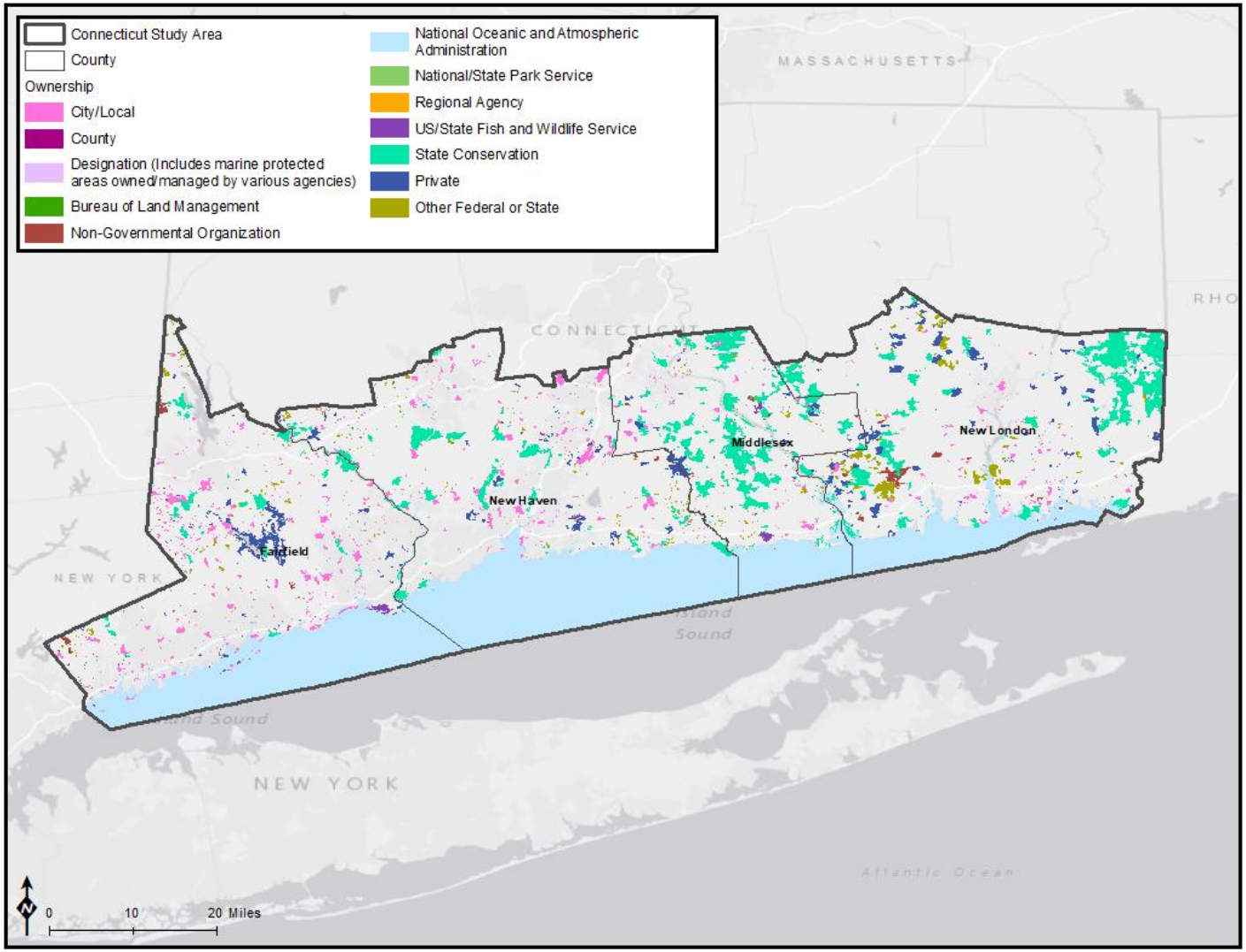
6.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Connecticut, resided in the area long before the era of European exploration. They utilized the resources along rivers and streams and were known to have used a wide range of stone tools for hunting, gathering, and ceremonies. Upon European contact, local Algonquian-speaking peoples, including the Pequot, Mohegan, and Nipmuc, were living in semi-permanent dwellings (Hoyt and Stolberg 2020). Temporary European trading posts were established along the Connecticut River. In 1633, the first permanent European settlers came from the Massachusetts Bay Colony and Plymouth Colony in Massachusetts and established the colony of Windsor (Hartford County). In 1635, additional settlers began moving into the Saybrook–New Haven coastal strip (Hoyt and Stolberg 2020).

Only one battle from the Revolutionary War (1775-1783) was fought in Connecticut at New London and Groton (New London County) on September 6, 1781. Connecticut's manufacturing industries aided the war effort, as they furnished many supplies for the Continental Army. They also provided General George Washington with beef, salt, flour, and gunpowder (State of Connecticut 2019). Slavery was gradually phased out beginning in 1797, with some cities like Middletown (Middlesex County) being a stop along the Underground Railroad.

During the American Civil War (1861-1865), Connecticut supported the Union Army and Navy and served as a major supplier of war material, equipment, money, and supplies. The Colt Armory in Hartford along the Connecticut River became famous for manufacturing firearms during this period and Connecticut has remained a leader in armament manufacture throughout most of the 20th century including World Wars I and II, the Korean War, and Vietnam War. With the decline in government spending after the end of the Cold War in the late 1980s and early 1990s, Connecticut shifted focus to export sales and pioneering legislation to help diversify the economy (Hoyt and Stolberg 2020).



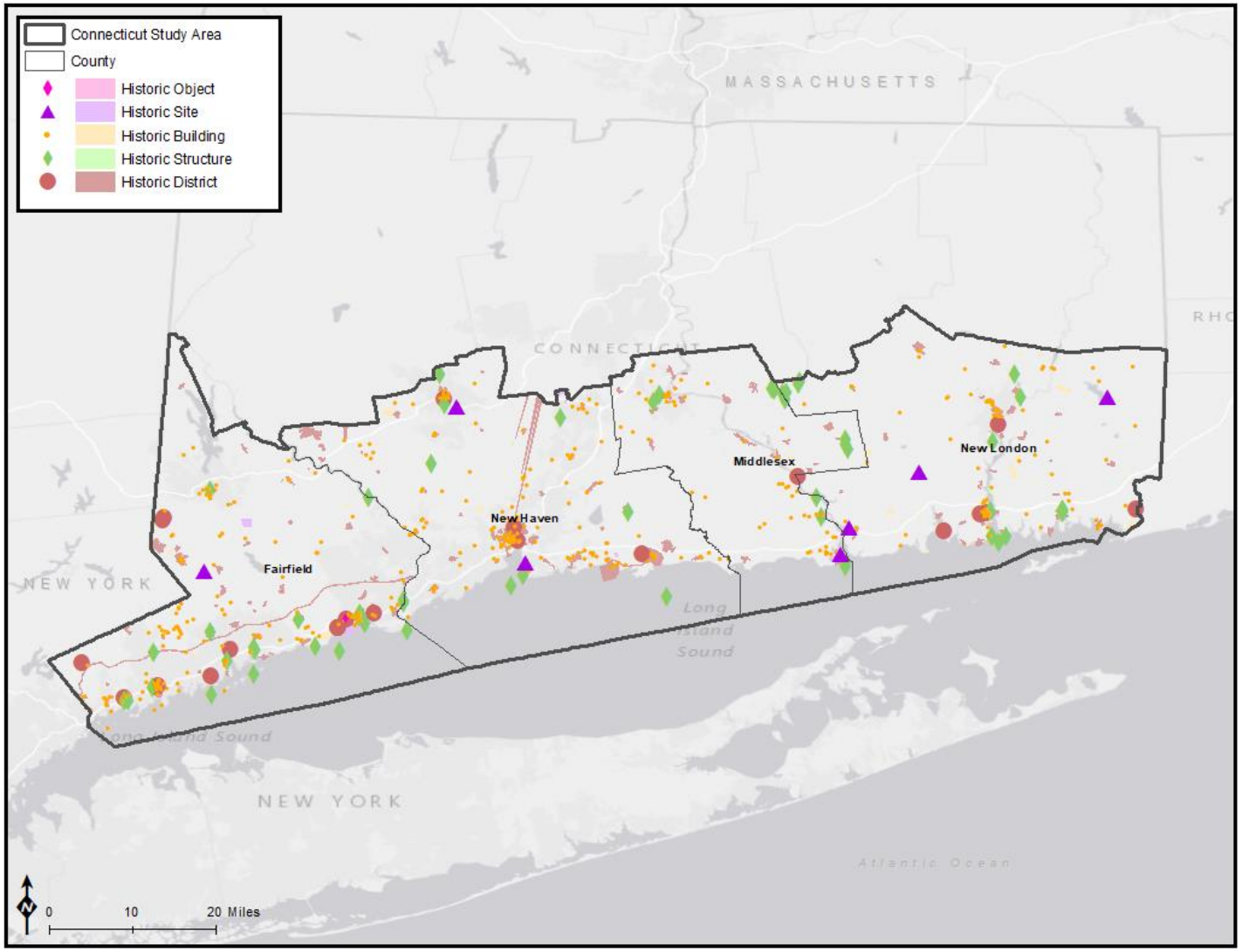
Source: USGS 2019f

Figure 6-14. Protected Areas within the Connecticut Study Area

Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with Native Americans, colonial settlements, the American Revolution, the American Civil War, the Industrial revolution, and World Wars I and II. Connecticut's economy was historically based on traditional industry, and today focuses on business with finance, insurance, and real estate being the largest industries. The State's leading manufactured products were pins, clocks, silverware, sewing machines, firearms, and many brass products. Today, Connecticut is a leader in advanced manufacturing of products such as aerospace and other transportation equipment, chemicals, and fabricated metal products (Hoyt and Stolberg 2020, NAM 2020). Because of the duration of the human presence in Connecticut, Connecticut has an abundance of historic sites. Figure 6-15 and Figure 6-16 present a summary of many of these locations, including maritime sites and shipwrecks located in the Long Island Sound.

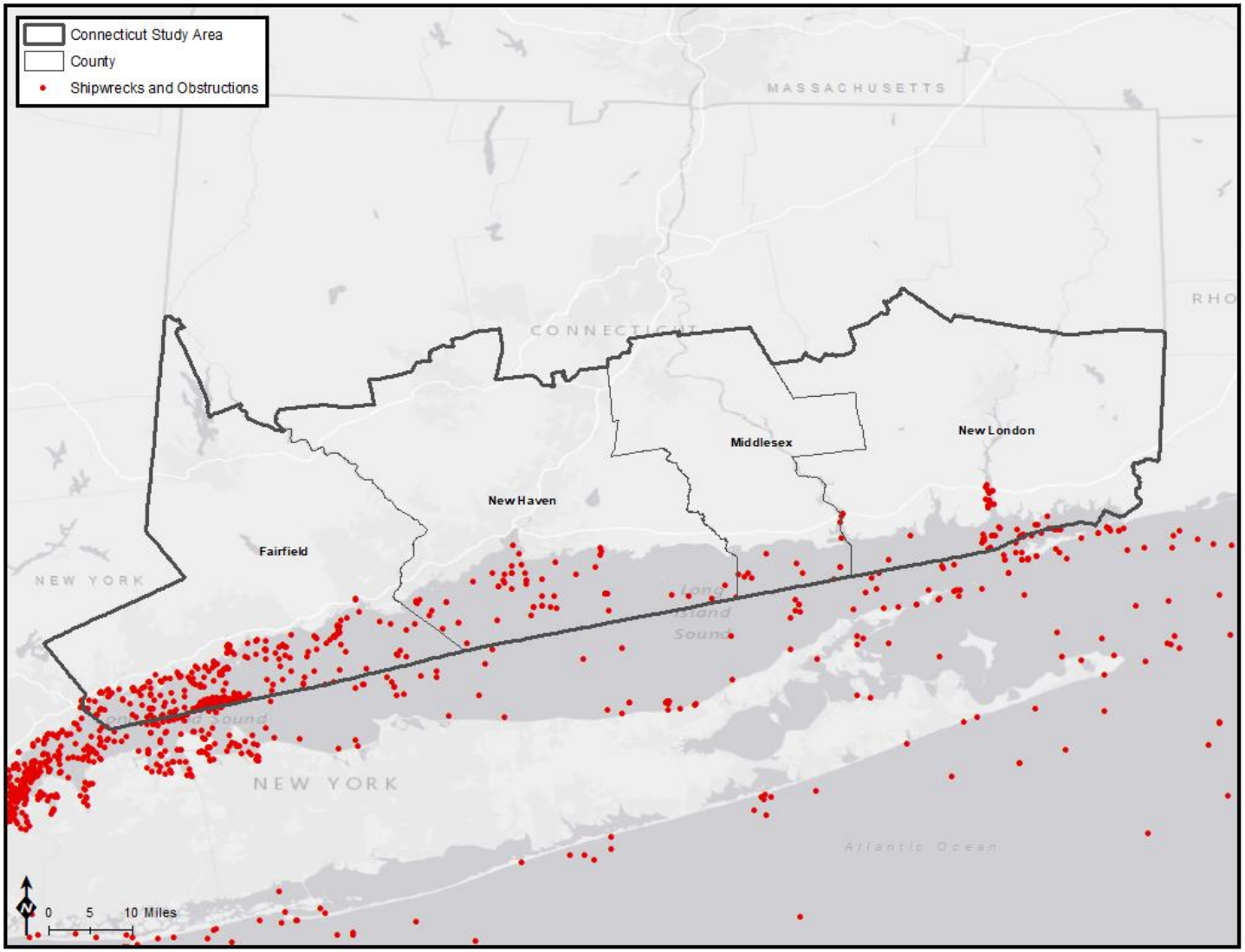
Impacts to cultural resources/historic properties located near the OCS-related have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Connecticut was excluded from this study because "none of its coast faces the open sea." However, within defined visual areas of potential effect, concern for cultural and historic sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 6-15 and Figure 6-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Connecticut's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.



Source: NPS 2014

Figure 6-15. Cultural and Historic Sites within the Connecticut Study Area



Source: NOAA 2016a

Figure 6-16. Shipwrecks and Obstructions within the Connecticut Study Area

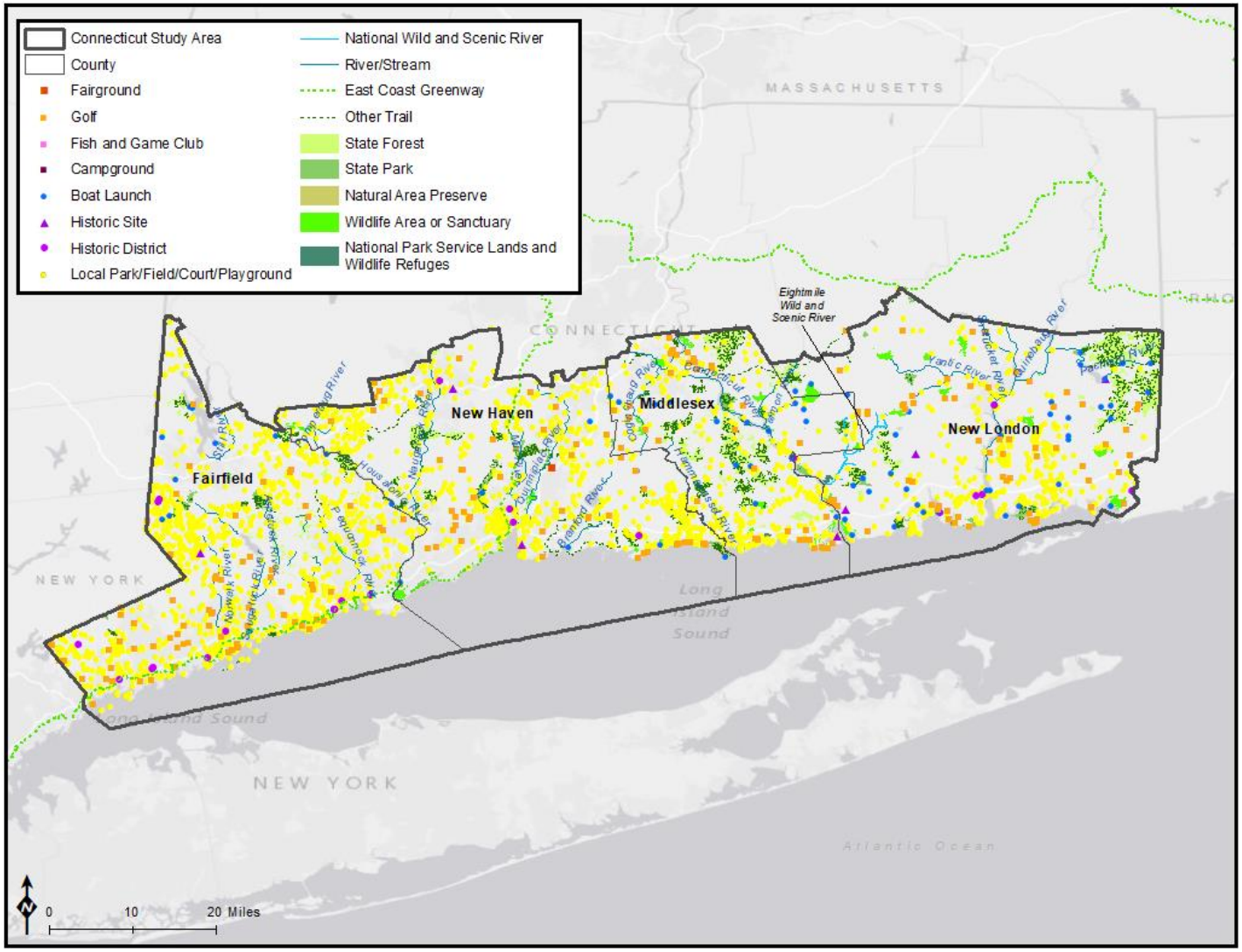
6.3.2.7 Recreation

The Study Area has diverse recreational opportunities including beaches, lakes, rivers, maritime heritage, State forests, wildlife management areas, local parks, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 6-17. The cultural and historic resources shown in Figure 6-15 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 6-14. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 6.3.2.6), transportation (Chapter 6.3.2.8), tourism employment (included in Chapter 6.4.4), and rental housing (included in Chapter 6.4.3).

In the Study Area, tourism industry sales in 2015 were greatest in Fairfield County ($2.37 billion), followed by New London County ($2.2 billion), New Haven County ($1.14 billion), and Middlesex County ($660 million) (Sacks and Pike 2016). Some of the top-rated attractions in Fairfield County include the Aldrich Contemporary Art Museum, Maritime Museum, Beardsley Zoo, Stepping Stones Museum for children, other art and history museums, and Weir Farm National Historic Site. Other popular tourist attractions within the Study Area include lighthouse cruises, casinos, U.S. Coast Guard Museum, Mystic Seaport (maritime museum), Mystic Aquarium and Institution for Exploration, and the Mashantucket Pequot Museum and Research Center in New London County; the Yale Peabody Museum of Natural History in New Haven County; and Gillette Castle State Park in Middlesex County (Law 2019a).

There are numerous beaches, lakes, rivers, State forests, State parks, and local parks, and wildlife management areas in the Study Area. There are no National Park Service-managed parks, sites, or monuments in the Study Area. The Connecticut Department of Energy and Environmental Protection has a website with an interactive map identifying locations and names of State forests and State parks in Connecticut (CT DEEP 2019d). Connecticut State Parks saw an approximate 10% increase in visitors to the parks in 2018 and 2019 because of a Passport to the Parks initiative (NBC Connecticut 2019). This initiative eliminated park fees at Connecticut State parks for those with Connecticut registered vehicles and raised registration fees for out of State visitors (CT DEEP 2020). Although not interactive components, local parks and wildlife management areas are also identified on the map. The Connecticut Department of Energy and Environmental Protection also has another website that lists all the State forests and State parks in Connecticut, with each listed forest and park linking to their individual website (CT DEEP 2019e). Additionally, there are numerous local parks in the Study Area, especially in Fairfield and New Haven Counties. Some of the main attractions in New London County are the Mystic Aquarium which has approximately 700,000 visitors and 16,000 members annually (Mystic Aquarium 2016), the Mystic Seaport Museum which had almost 249,000 visitors in 2019 (Mystic Seaport Museum 2020), and Gillette Castle State Park which has over 300,000 annual visitors (Ellis 2019)

The Study Area has several popular annual festivals and events throughout the year, particularly in Fairfield and New Haven Counties. Events in Fairfield County include the Westport Victory Cup Polo Match and Hot Air Balloon Festival (September), Dogwood Festival (May), Milford Oyster Festival (August), Stamford Downtown Parade Spectacular (November), Georgetown Day Festival (June), Barnum Festival (June), and Absolute Sound Music Festival (August) (Higgins Group 2015). Notable annual events in New Haven County include the St. Patrick’s Day Parade (March), International Festival of Arts (June), and Shakespeare on the Shoreline (July-August), among several others (Visit New Haven 2020). The Sea Music Festival (June), Mystic Outdoor Art Festival (August), and By Land and By Sea Antique Vehicle Show (September) are popular annual events in New London County (Top Events USA 2020a).



Sources: NPS 2014, USFS 2019b, CT DEEP 2006, CT DEEP 2008, CT DEEP 2017

Figure 6-17. Select Recreational Resources within the Connecticut Study Area

In summary, there are many recreational activities within the Study Area found in areas along the coast, as well as inland, natural settings, urban settings, parks/greenspaces, and built attractions. Fairfield and New Haven Counties appear to have more local parks than Middlesex and New London Counties, but Middlesex and New London Counties appear to have more State forests, State parks, and wildlife areas for tourists to visit. May through October is the busiest season for tourism in Connecticut, with August being the busiest month, so it is likely that travel costs (e.g., hotels) will be highest in August and during the summer months in the Study Area. Also, there are several annual festivals and events that occur through the Study Area, especially in Fairfield and New Haven Counties. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages. Therefore, future OCS-related project analysts should consider the potential impacts on events and attractions during the planning phase and site-selection process.

6.3.2.8 Transportation Resources

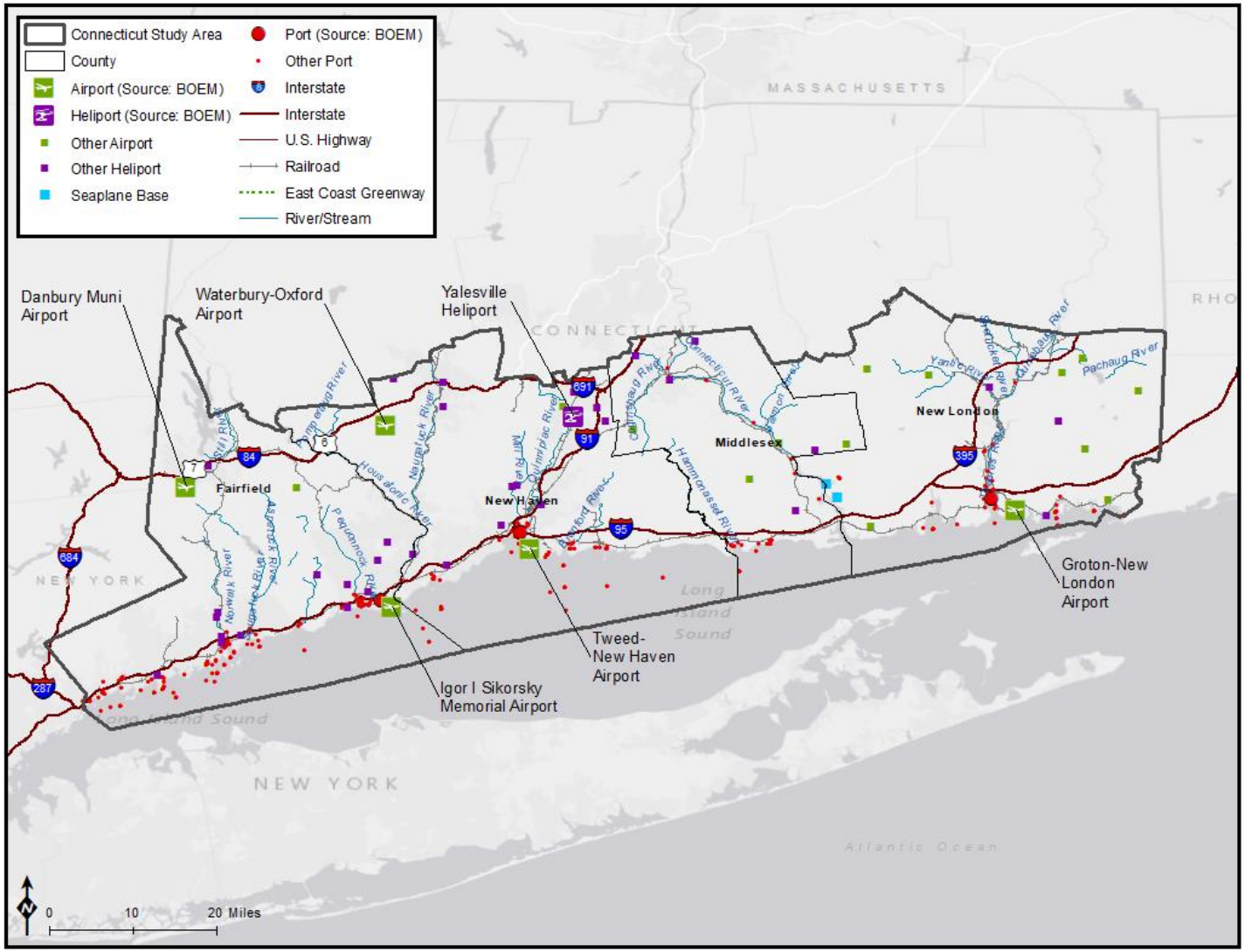
There are a variety of transportation resources throughout the Study Area, including major interstate and State highways; national, international, regional, and local public airports; interstate railroads and some local railroad spurs; and ports. Figure 6-18 shows the transportation resources throughout the Study Area.

Surface transportation routes in the Study Area are influenced by the area's shape and the large total of coastline miles compared to the area's size. Interstate 95 traverses the entire coastline of the Study Area and effectively connects to major markets in both New York, New York and Boston, Massachusetts. The East Coast Greenway runs parallel along the western half of Interstate 95, while a railroad parallels the entirety of the interstate throughout the Study Area. U.S. Highways 6 and 7 cross the northwestern section of the Study Area. Interstates 684, 91, and 395 all traverse north to south and split the Study Area into thirds. Other railroads run along several rivers found in the Study Area; the rivers flow in a north to south direction (Figure 6-18).

The Study Area contains five airports, of which none are international. The five airports are municipal and regional in service and are not commercially viable airports (ESRI 2019b). Given the Study Area's proximity to major airports in New York and New Jersey, the international airports and services provided by these States also serve the people and industries in Connecticut.

There are several ports along the shoreline of the Study Area that are situated within reach of multiple domestic markets and offers access to millions of consumers. Connecticut has three deepwater ports in Bridgeport, New Haven, and New London. These ports generate an economic impact of $1.7 billion annually and generally deal with break bulk cargo over containerized goods. Of the three deepwater ports, although not the largest of the State's ports, the New Haven port is largely industrial and commercial. The Port of New Haven's district has seven terminals and includes a pipeline to Bradley International Airport for jet fuel. The Connecticut Port Authority is a semi-public agency that has been developing and maintaining Connecticut's ports and maritime economy since 2016 (CERC 2019).

As of 2017, there were just 522 miles of railroad track in the State of Connecticut, a State that largely uses its railroads for the movement of passengers rather than freight. While not as prevalent as it once was, the movement of commercial goods by railroad has remained a viable option for the State, with a major railroad running from New London, Connecticut, to the border with Canada at East Alburgh, Vermont. This railroad is managed by New England Central Railroad, and the commodities shipped range from agricultural products to petroleum products and goods. As far as passenger and commuter trains, the State of Connecticut and Amtrak run their own independent services (CTRR 2020).



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 6-18. Transportation Resources within the Connecticut Study Area

Any potential future development will depend on the integrated transportation network during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site-selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. However, existing ports within the Study Area (Figure 6-18) are expected to be large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

A proposed future development could connect the Study Area to Long Island by means of a bridge(s), tunnel(s), or combination of both (WSP 2017). This proposed plan would reduce travel time, expand access to labor markets, and improve freight movement across the Study Area. This proposed connector has three proposed alignments, two between Connecticut and Long Island, New York, and one between Long Island, New York and Port Chester, New York (WSP 2017). The proposed central alignment, between Port Jefferson, New York and Bridgeport, Connecticut, would have one end close to a major oil refinery in Bridgeport (City of New Haven 2019).

An area of concern over the transportation infrastructure in the Study Area is its vulnerability to deterioration and flooding. Deterioration of Connecticut's transportation infrastructure includes 57% of roadways and 33.5% of bridges that serve both roads and railroads needing repairs or replacement (ARBTA 2017). Deteriorating transportation infrastructure, along with investments into the least beneficial areas of Connecticut's transportation resources, would greatly affect businesses and industries in the Study Area that rely on effective and efficient transportation infrastructure (ARBTA 2017). Another area of concern is flooding within the Study Area. The sea level around Connecticut has risen 5 inches since 1964, which has caused complications with tidal flooding, and projected sea level rise will only continue to impact the Study Area (SeaLevelRise.org 2019).

6.3.3 Summary – Land Cover and Land Use

The predominant land cover type within the Study Area is a combination of forest and urban development. Fairfield and New Haven Counties are a combination of forest and urban development, while Middlesex and New London Counties are primarily forest. As described previously, "Forest" land cover in the State of Connecticut could range from natural forested areas to neighborhoods in suburban areas. These are likely indicative of wooded suburban landscapes.

In Connecticut, the State's Office of Responsible Growth is responsible for preparing a State Plan of Conservation and Development every 5 years. This plan provides the policy framework for decisions regarding future growth and development in the State (CT OPM 2019a, CT OPM 2019b). However, there are no county governments. Counties serve only as dividing lines for the State's judicial systems; thus, towns are responsible for all local government activities. There are Regional Councils of Governments that address regional issues concerning infrastructure, land use, and economic development, typically outlined in a regional conservation and development plan. These designated planning regions provide a geographical framework whereby municipalities can address and coordinate common interests with State plans and programs. The State's Office of Policy and Management can designate or re-designate the boundaries of a logical planning region; thus, the municipalities within each Regional Council of Government can vary (CT OPM 2019c). Each Regional Council of Government has their own Conservation and Development Plan.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during OCS-related project analysis. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Zoning may or may not apply to pipeline routes. Often, projects attempt to plan the placement of new pipelines within or parallel to existing pipeline rights-of-way to minimize new ground-disturbing impacts to other areas.

Multiple business opportunities and incentives exist in the Study Area through Connecticut State agencies DECD and DRS. These services aim to provide businesses a positive and competitive business climate that also promotes the entirety of the Connecticut business economy. The CBIA is a collection of businesses and companies across industries that promote Connecticut businesses and advocate at local and State government for a positive business climate.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, potential impacts to these resources should be considered during future OCS-related project analysis.

A variety of transportation resources are available throughout the Study Area, including roadways, railroads, airports, and ports. Surface transportation routes in the Study Area are influenced by the area's shape and the large total of coastline miles compared to the area's size. Interstate 95 and a railroad traverse the entire coastline of the Study Area and effectively connects to major markets in both New York, New York and Boston, Massachusetts. The East Coast Greenway runs parallel along the western half of Interstate 95. U.S. Highways 6 and 7 cross the northwestern section of the Study Area. Interstates 684, 91, and 395 all traverse north to south and split the Study Area into thirds. Other railroads run along the several rivers found in the Study Area; the rivers flow in a north to south direction (Figure 6-18).

6.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

6.4.1 Population

After decades of rapid growth, Connecticut's population is increasing, but at a slower rate. According to the USCB, Connecticut's estimated population was 3.6 million in 2017. Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. As shown in Table 6-6, the population of Connecticut grew 0.6% since the 2010 Census,

having added approximately 20,381 people. During the same period, the population of the U.S. grew 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). Connecticut is affected by the nationwide trend of aging population as indicated by its declining rate of natural increase. According to USCB 2018 estimates, Connecticut's natural increase declined 35.7% from 2016 (5,807 people) to 2018 (3,736 people). Much of the slowdown in population growth is a result of domestic out-migration as more people are moving out of Connecticut than into the State. This is an accelerating trend. In 2018, approximately 21,509 people moved out; this loss was partially offset by a gain of approximately 16,494 residents from international migration, resulting in an approximate overall population loss of 1,215 (USCB 2019b). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Northeastern States have higher senior populations as compared to southern and western States. Connecticut, as well as the neighboring States of New York and New Jersey, is experiencing high senior migration losses as a result of a national migration pattern toward the southern and western parts of the United States. According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather. This trend was stalled by the Great Recession (which lasted from 2007 to 2009) due to the housing crisis and unemployment (Rich 2013). Migration resumed slowly after the recession as the economy recovered (Frey 2019). Many people moving out of the State are wealthy, nearing retirement, and seeking warmer climate and lower taxes (realprocity.com 2019).

Other reasons for migration losses include a sluggish economy, long-term unemployed workers seeking new job opportunities, corporate relocations, and high property and income taxes (Maciag 2016).

During 2018, the majority of people moving out of Connecticut moved to New York, Massachusetts, New Jersey, Florida, , and California (USCB 2019c).

6.4.1.1 Study Area Trends

Four counties (Fairfield, Middlesex, New Haven, and New London) comprise the Connecticut Study Area. The counties have not been delineated into regions for this chapter.

According to 2017 population estimates, the Study Area represented 62.4% (2.2 million residents) of the overall State population of 3.6 million. Table 6-6 shows population growth and decline in the Study Area counties. Between 2010 and 2017, one county gained population, two experienced population decline, and one had stagnant growth. During the same period, the population of the Study Area grew 1.1%, faster than the State (0.6%) and slower than the Nation (4.0%) (USCB 2017a, USCB 2017d).

Table 6-6. 2010 and 2017 Total Population and Population Projections Through 2040 in the Connecticut Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Fairfield	916,829	947,328	907,603	897,553	905,219	3.3	-4.4
Middlesex	165,676	164,110	167,213	166,533	163,365	-0.9	-0.5
New Haven	862,477	862,127	873,659	891,371	900,635	0.0	4.5
New London	274,055	270,772	278,756	280,847	276,187	-1.2	2.0
Study Area Total	**2,219,037**	**2,244,337**	**2,227,231**	**2,236,304**	**2,245,406**	**1.1**	**0.0**
Connecticut	**3,574,097**	**3,594,478**	**3,604,603**	**3,633,994**	**3,654,015**	**0.6**	**1.7**
United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**373,528,000**[4]	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - CTSDC 2017; 4 - USCB 2018b

Fairfield County, in commuting distance to the New York metropolitan area, grew 3.3% due to an influx of New Yorkers seeking more affordable housing (Kramer 2020). Middlesex and New London Counties declined in population by 0.9% and 1.2%, respectively. Growth in New Haven County was flat (USCB 2017a, USCB 2017d).

Figure 6-19 shows population counts in census block groups within the four counties located in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to metropolitan statistical areas (MSA), defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 6-20, the MSAs present in the Study Area are

- Bridgeport-Stamford-Norwalk, Connecticut;
- New Haven-Milford, Connecticut; and
- Norwich-New London, Connecticut.

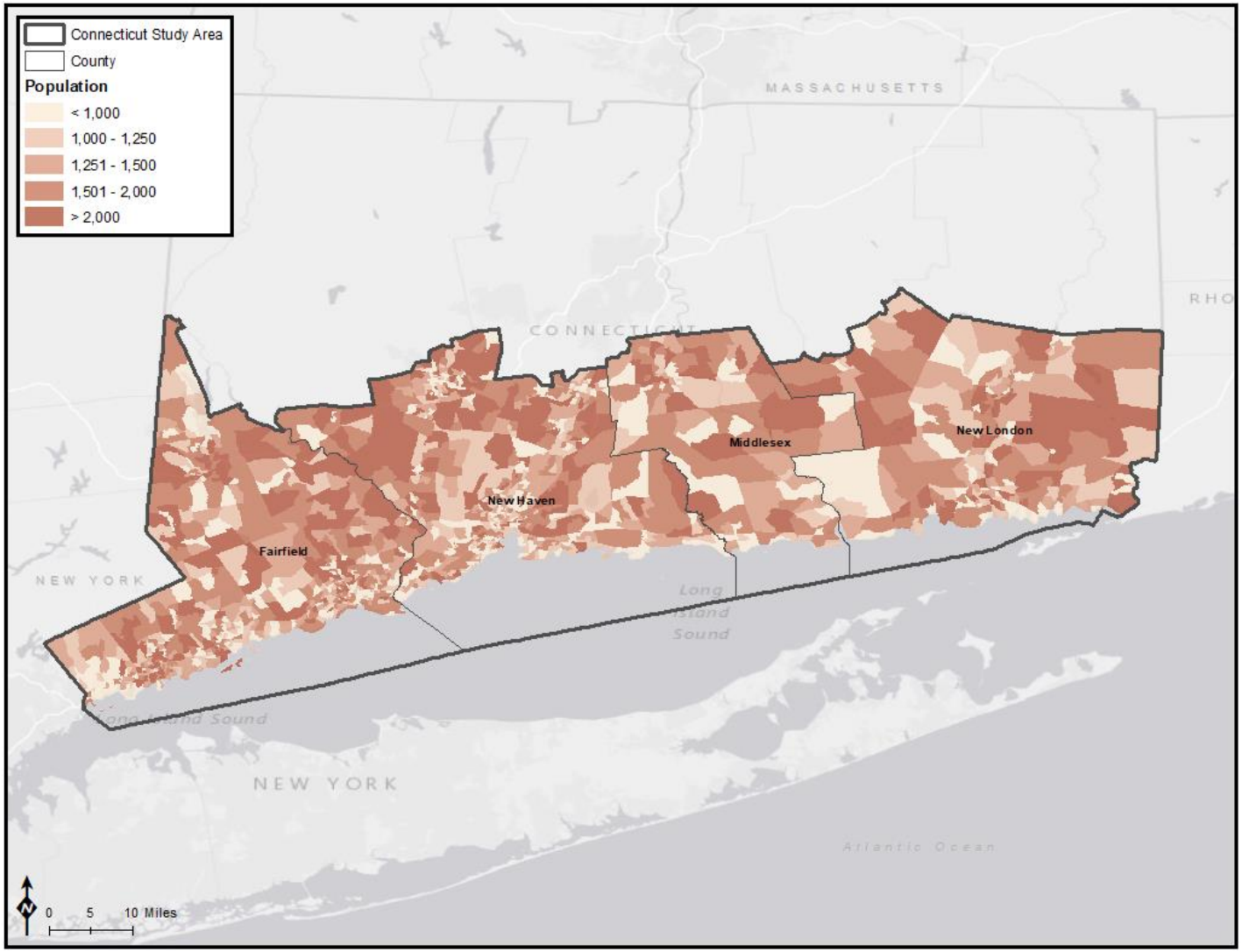
No portion of any MSA is located within the less populated Middlesex County (Data.gov 2017).

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is also reflected in Connecticut. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 6-7, the Study Area is 2,264 square miles, representing 46.7% of the State's total land area of 4,845 square miles. Therefore, more than half (62.4%) of Connecticut's population resided in 46.7% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c).

Table 6-7. 2017 and 2040 Population Density in the in the Connecticut Study Area

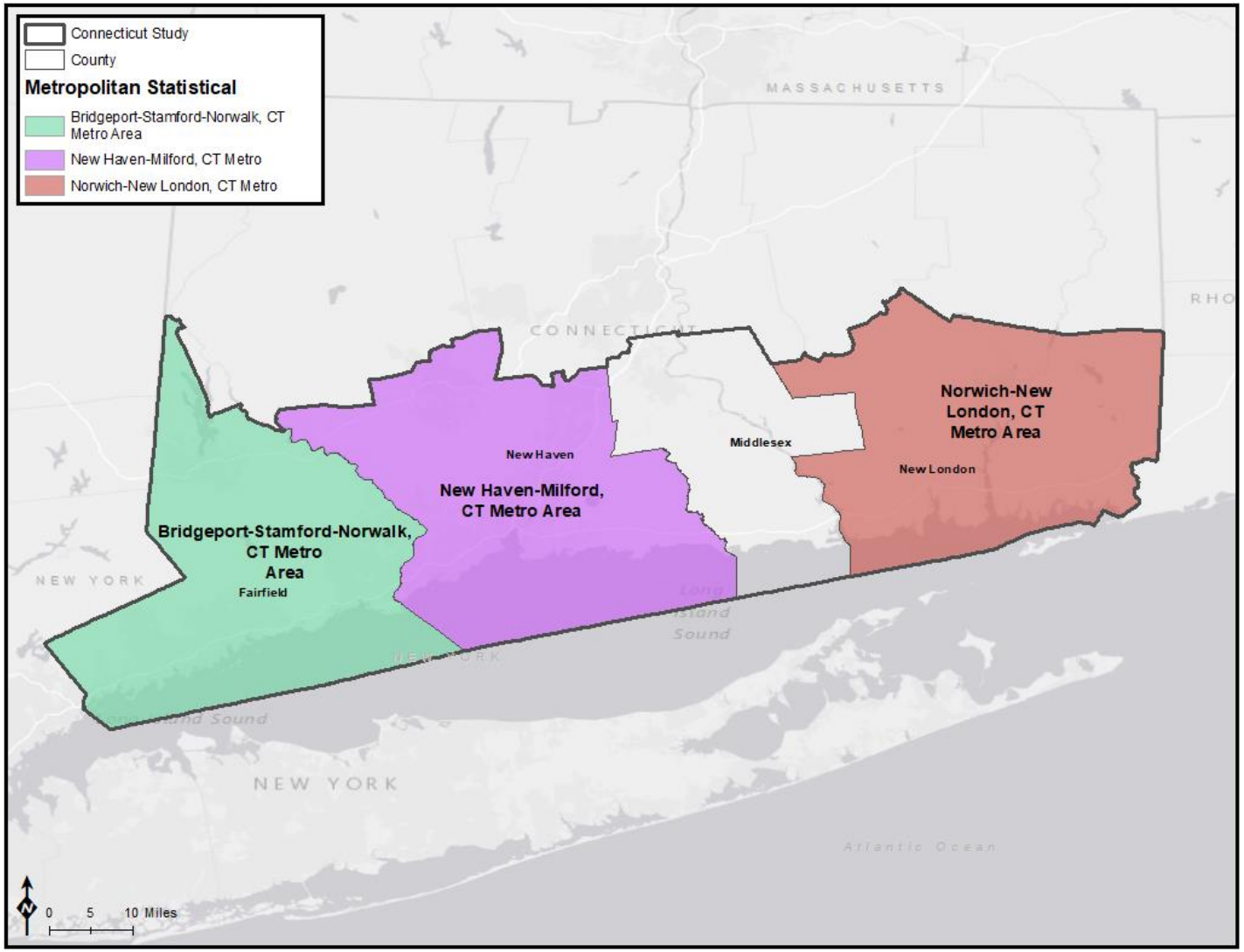
Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (persons per square mile of land area)	2040 Population Density (people per square mile of land area)
Fairfield	947,328	905,219	625	1,515.8	1,448.4
Middlesex	164,110	163,365	369	444.4	442.4
New Haven	862,127	900,635	605	1,426.1	1,489.8
New London	270,772	276,187	665	407.1	415.2
Study Area Total	**2,244,337**	**2,245,406**	**2,264**	**991.3**	**991.8**
Connecticut	**3,594,478**	**3,654,015**	**4,845**	**741.9**	**754.2**
United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: CTSDC 2017, USCB 2017c, USCB 2017d, USCB 2018b



Source: USCB 2017r

Figure 6-19. Population in the Connecticut Study Area Counties by Census Block Group



Source: USCB 2017r

Figure 6-20. Metropolitan Statistical Areas Located within the Connecticut Study Area

As shown in Table 6-7, the population density of the Study Area was 991 persons per square mile in 2017, greater than the State (742 persons per square mile) and the Nation (91 persons per square mile) (UVA 2019d, USCB 2017d, USCB 2017c). Figure 6-21, which shows population per square mile in the Study Area, illustrates geographic high-density concentrations in major urban areas, surrounded by contiguous low-density areas comprising the "1,001 to 1250 persons per square mile" and the less than "1,000 persons per square mile" categories. Population densities in the Study Area ranged from 407 persons per square mile in New London County to 1,516 persons per square mile in populous Fairfield County (which contains the Bridgeport-Stamford-Norwalk, Connecticut metropolitan area) (USCB 2017d, USCB 2017c).

6.4.1.2 Population Projections

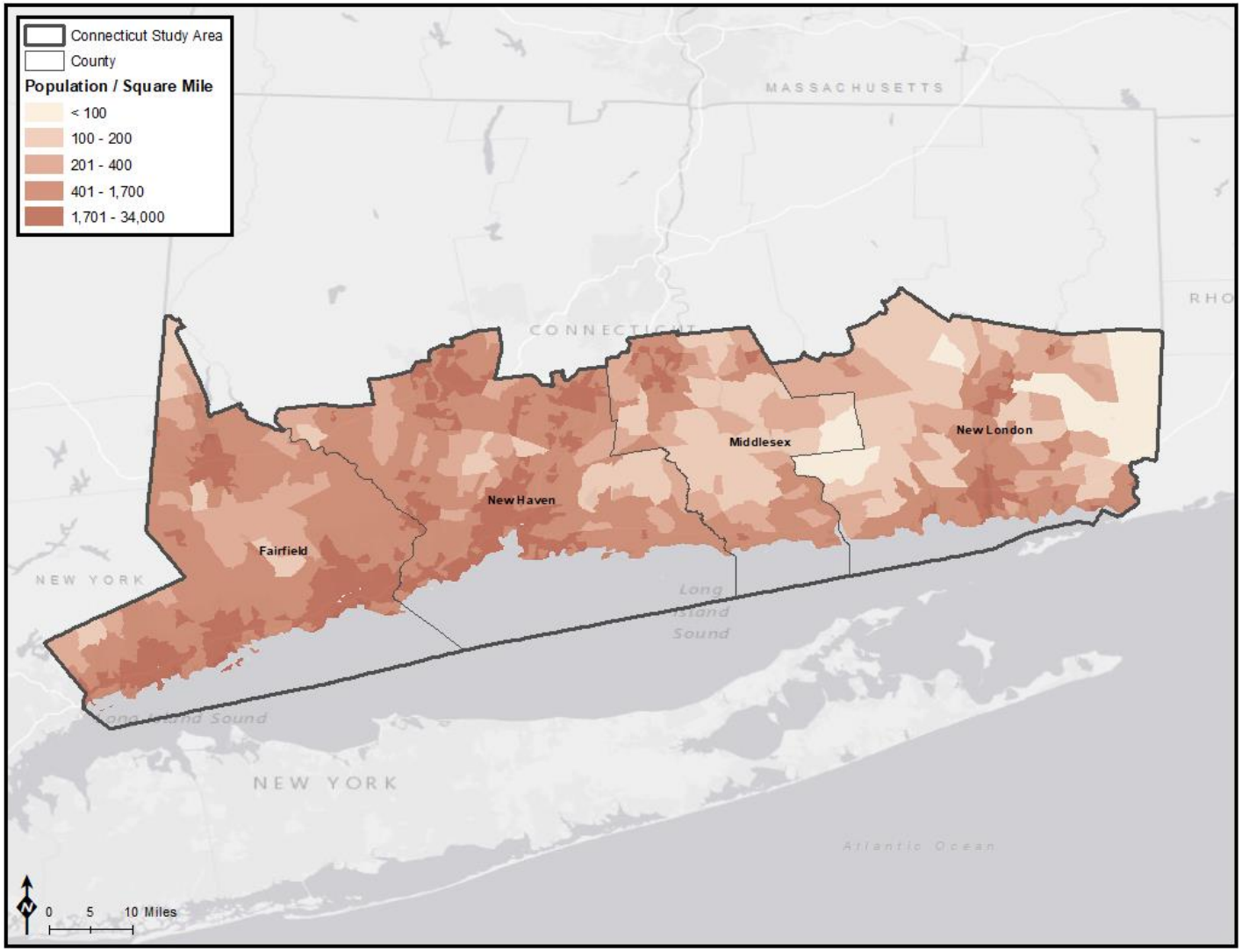
According to the Connecticut State Data Center, the State's population is projected to grow 1.7% (3.7 million residents) by 2040. However, population growth in the Study Area is stagnant (0.0%), illustrating an opposing pattern to that of the State and Nation (16.4%). As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Connecticut Study Area is the only Study Area with no projected growth. Table 6-6 provides details of the projected population for the U.S., the State, and Study Area counties from 2017 to 2040 (USCB 2017d, USCB 2017c, USCB 2018b, CTSDC 2017). Figure 6-22 shows the overall projected percent change in population in each county during the same period.

As shown in Table 6-6, projections indicate that 61.5% (2.2 million people) of the State's population will reside in the Study Area by 2040 as compared to 62.4% (2.2 million people) in 2017. Population forecasts reveal shifting patterns in the Study Area. Of the four counties, New Haven and New London are projected to increase population at 4.5% and 2.0%, respectively. Population loss of 0.5% is projected for Middlesex County. Fairfield County is projected to lose 4.4% of its population despite its historical population gain and proximity to the New York metropolitan area (USCB 2017d, CTSDC 2017).

Population density in the Study Area is projected to increase from 991 persons per square mile to 991 persons per square mile between 2017 and 2040 (USCB 2017d, USCB 2017c, CTSDC 2017).

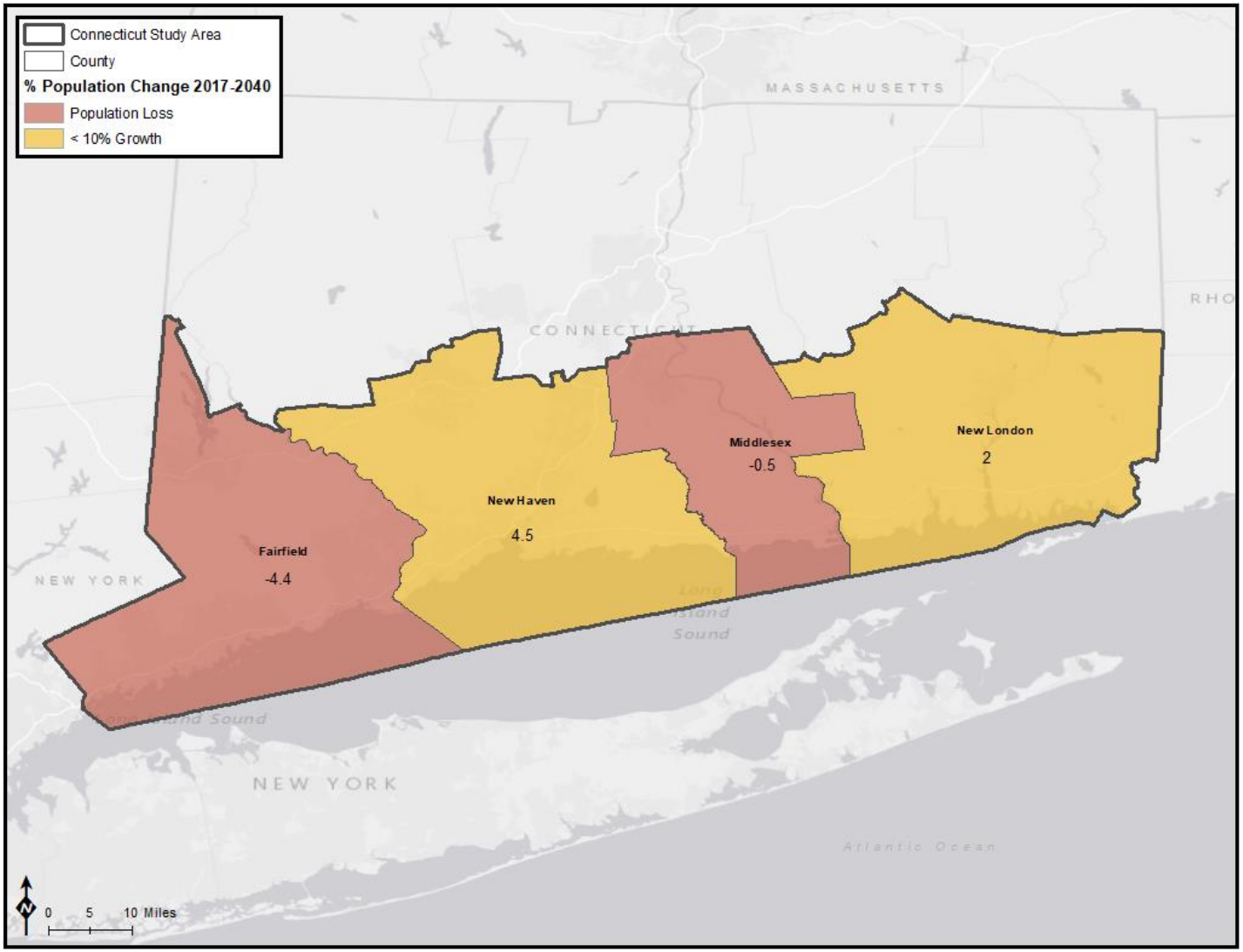
6.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Connecticut and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 6-23 and Figure 6-24 show the 2017 estimated population under age 5, and over age 65, respectively. Figure 6-25 and Figure 6-26 show the projected change in these groups by 2040. Table 6-8 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Connecticut, and the Study Area (Brookings Institute 2018, USCB 2017b, CTSDC 2017).



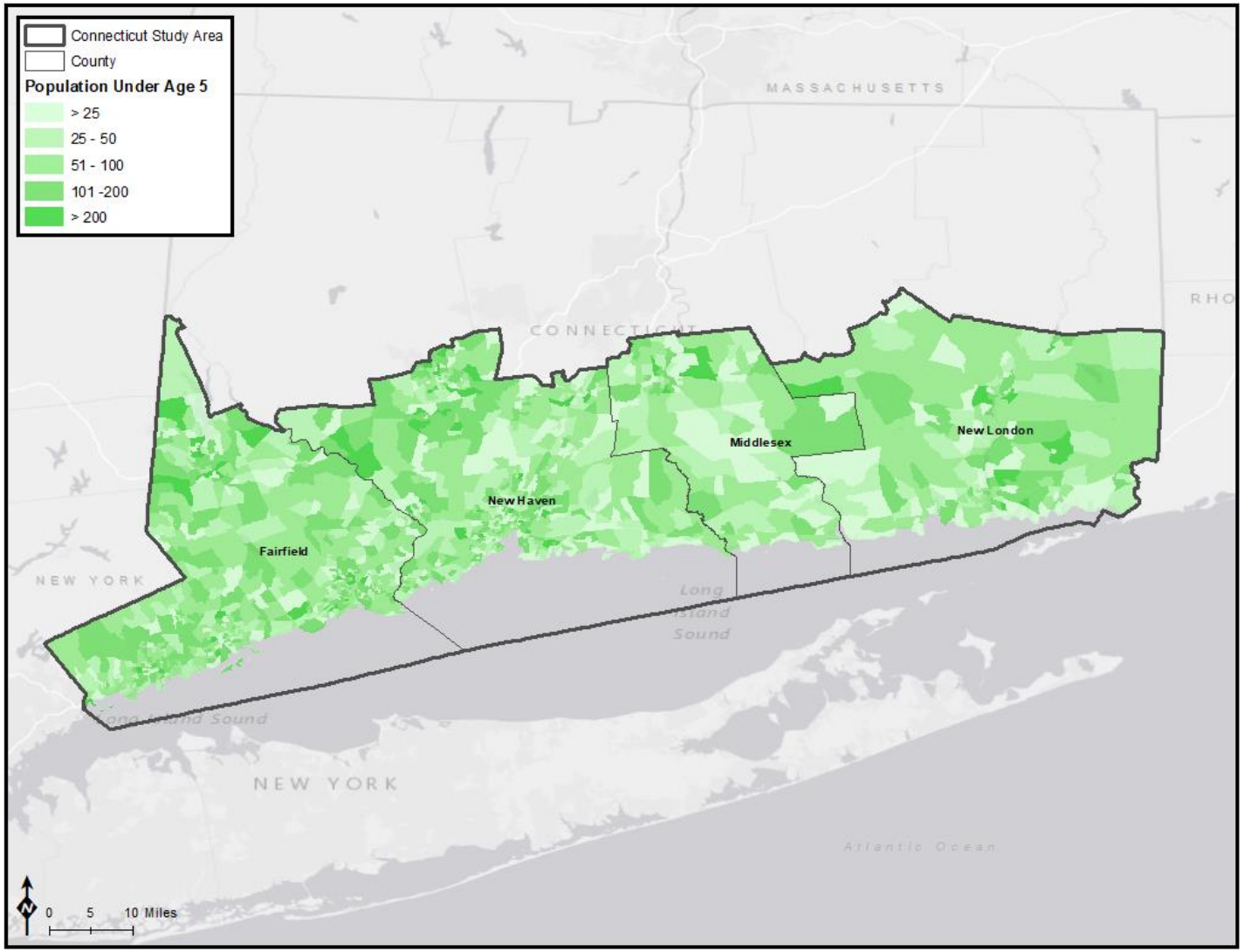
Source: USCB 2017r

Figure 6-21. Population Density in the Connecticut Study Counties by Census Block Group



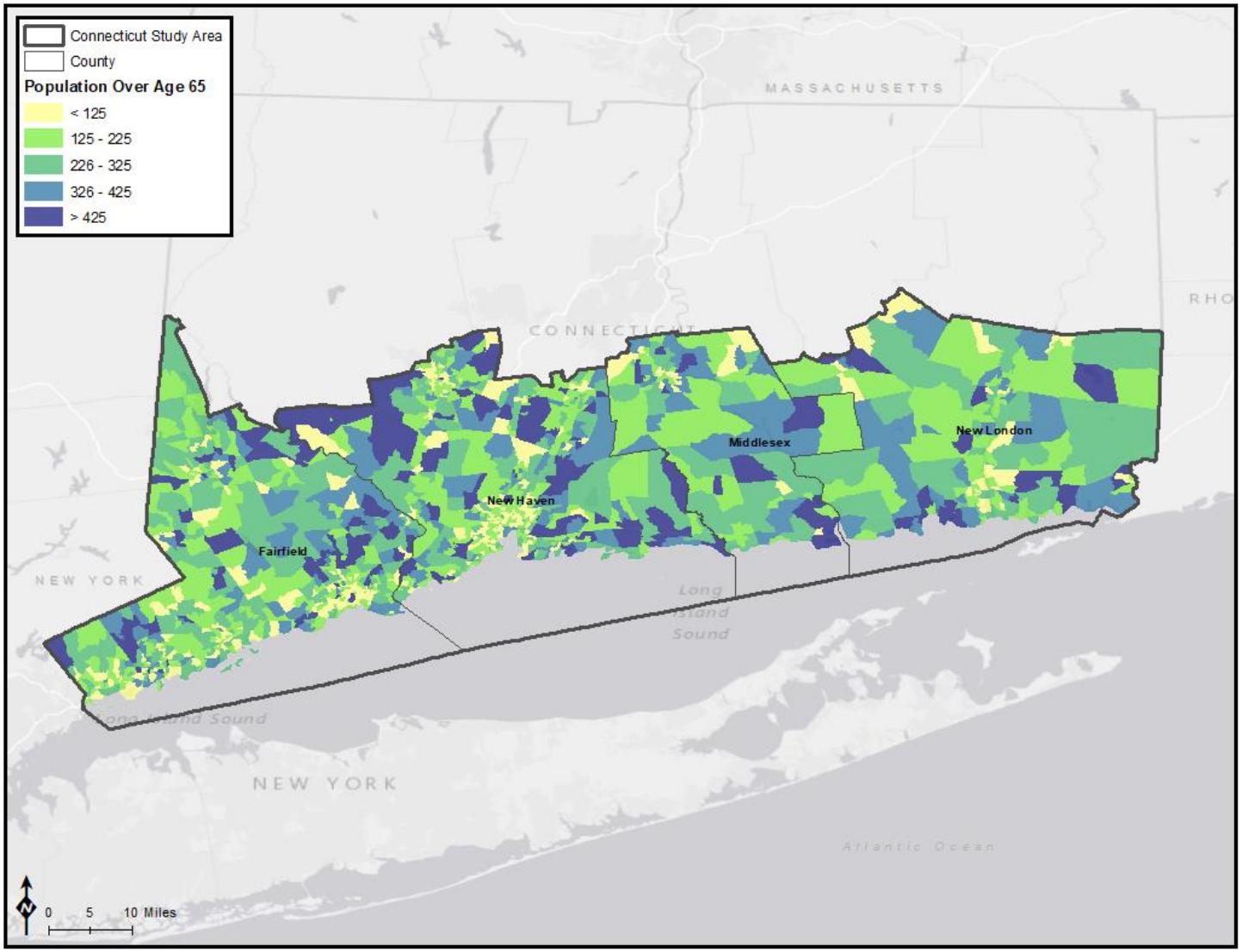
Source: CTSDC 2017

Figure 6-22. Overall Projected Population Change from 2017-2040 in the Connecticut Study Area by County



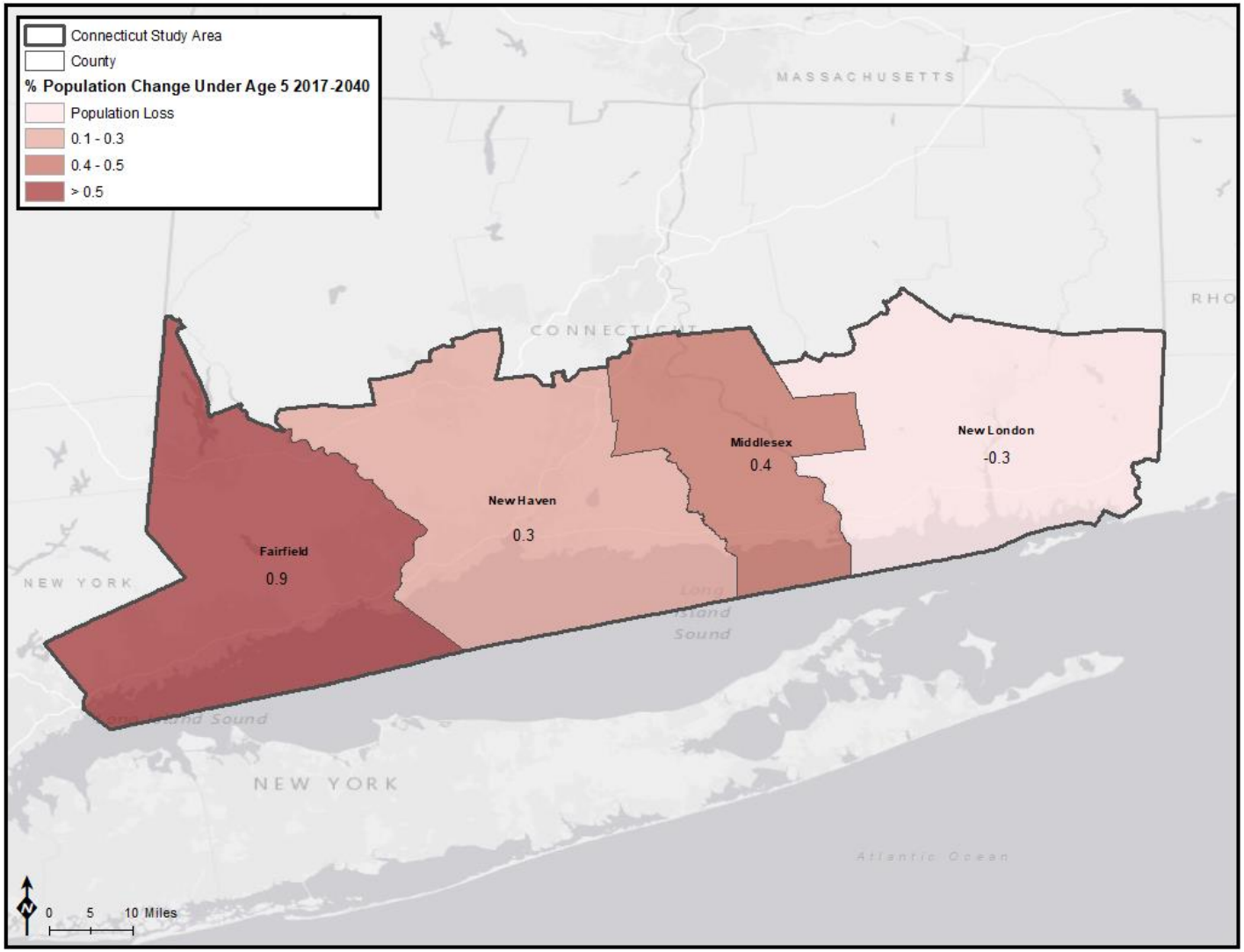
Source: USCB 2017r

Figure 6-23. Population Under Age 5 in the Connecticut Study Area by Census Block Group



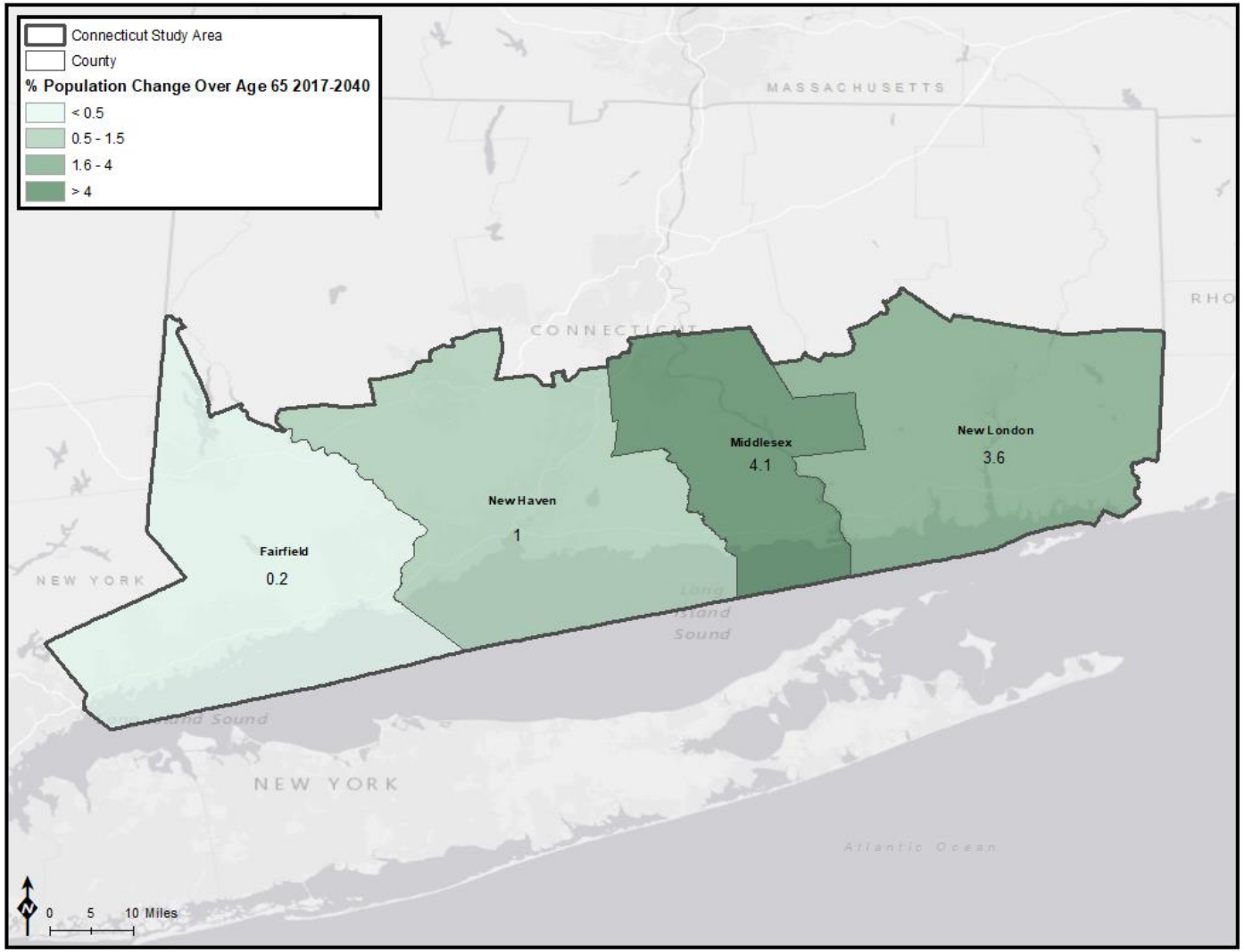
Source: USCB 2017r

Figure 6-24. Population Over Age 65 in the Connecticut Study Area by Census Block Group



Source: CTSDC 2017

Figure 6-25. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Connecticut Study Area by 2040



Source: CTSDC 2017

Figure 6-26. Projected Change in the Proportion of the Population for Individuals Over Age 65 from 2017-2040 in the Connecticut Study Area by 2040

Table 6-8. Population Under Age 5 and Over Age 65 in the Connecticut Study Area

Geographic Unit	2017 Estimates					Projected 2040				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Fairfield	947,328	53,055	5.6	140,926	14.9	905,219	58,969	6.5	136,583	15.1
Middlesex	164,110	7,042	4.3	30,196	18.4	163,365	7,738	4.7	36,699	22.5
New Haven	862,127	45,072	5.2	139,534	16.2	900,635	49,464	5.5	155,208	17.2
New London	270,772	13,625	5.0	45,184	16.7	276,187	13,123	4.8	56,145	20.3
Study Area Total	**2,244,337**	**118,794**	**5.3**	**355,840**	**15.9**	**2,245,406**	**129,294**	**5.8**	**384,635**	**17.1**
Connecticut	3,594,478	186,188	5.2	575,757	16.0	3,654,015	203,317	5.6	633,098	17.3
United States	321,004,407	19,853,515	6.2	47,732,389	14.9	373,528,000	21,106,000	5.7	80,827,000	21.6

Sources: CTSDC 2017, USCB 2017b, USCB 2018b

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population, 5.2% in Connecticut, and 5.3% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 6-8 shows the breakdown by county. Projections by the year 2040 indicate this group's decline to 5.7% in the Nation. State and Study Area projections reveal a divergent trend as both the number and percentage of young children as compared to the general population are expected to increase in the State (5.6%) and the Study Area (5.8%). For the study area, this is an overall increase of 0.5% in the proportion of the population under age 5 from 2017-2040 (USCB 2017b, USCB 2018b, CTSDC 2017).

According to 2017 estimates shown in Table 6-8, the elderly represented 14.9% of the U.S. population, 16.0% in Connecticut, and 15.9% in the Study Area. The population of elderly is projected to rise, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 17.3% in the State, and 17.1% in the Study Area. Three out of four counties in the Study Area project an increase in the elderly population, consistent with national trends. The sparsely populated Middlesex County had the largest percentage (18.4%) of elderly in 2017; a further increase to 22.5% is projected by 2040. Contrary to national trends, Fairfield County's elderly population is expected to decline 3.0% (from 140,926 in 2017 to 136,583) by 2040. For the study area, this is an overall increase of 1.2% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, CTSDC 2017).

6.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 6-9.

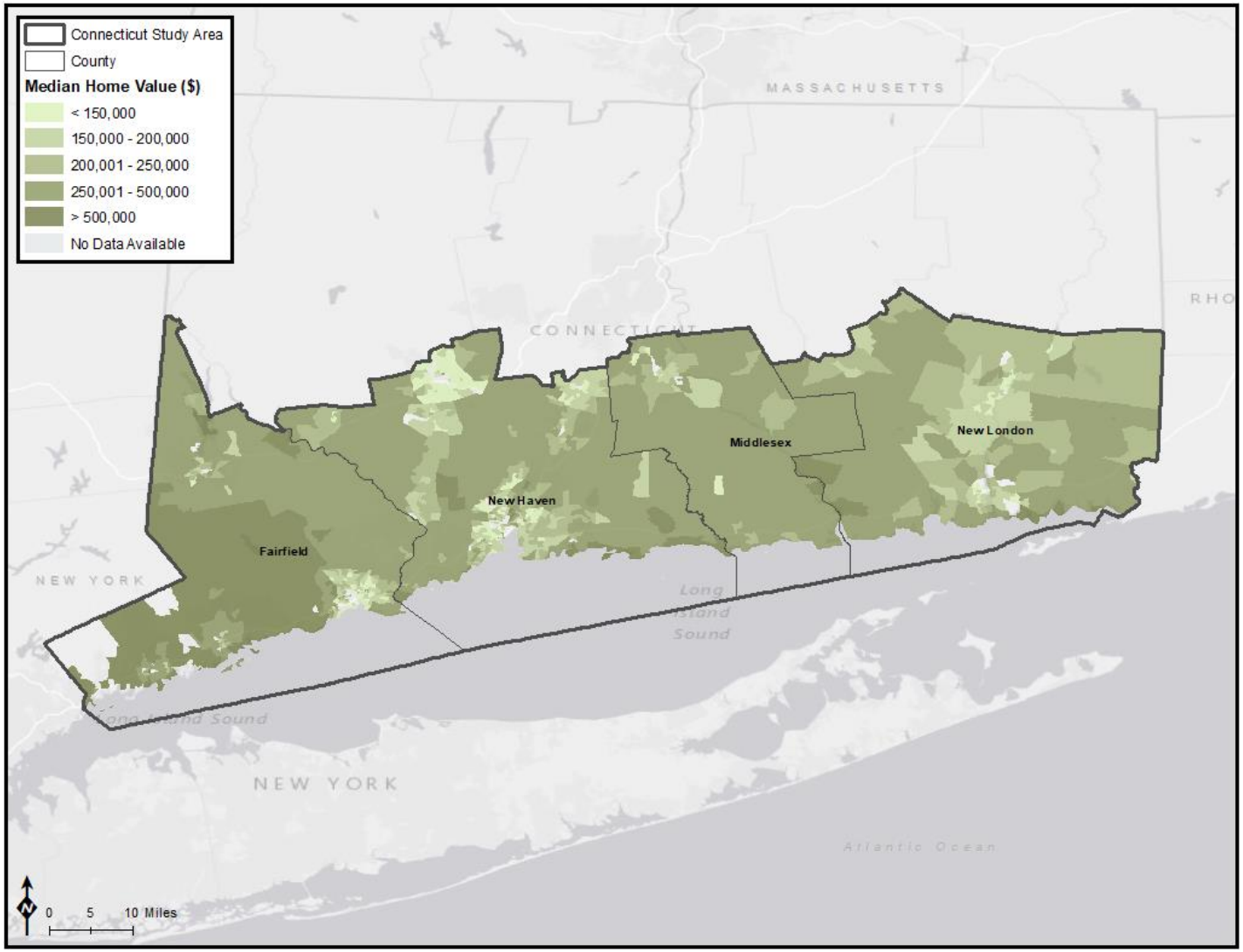
As shown in Table 6-9, in 2017 homeownership in Connecticut was 66.6%, higher than the Nation (63.8%) and the Study Area (66.0%). Renters comprised approximately 33.4% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was slightly higher (34.0%) (USCB 2017m).

In 2017, median home values were lower in the Study Area ($264,050) than the State ($270,100) but higher than the Nation ($193,500). Fairfield County had the highest median home value ($417,800); New London County had the lowest median home value ($238,900) (USCB 2017l). Figure 6-27 illustrates median home values in the Study Area (USCB 2017r).

Table 6-9. Housing Utilization and Vacancy Rates in the Connecticut Study Area

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Fairfield	369,044	337,678	31,366	8.5	228,666	67.7	109,012	32.3	$417,800	$1,439
Middlesex	75,938	66,599	9,339	12.3	49,088	73.7	17,511	26.3	$283,700	$1,132
New Haven	365,546	327,402	38,144	10.4	204,037	62.3	123,365	37.7	$244,400	$1,100
New London	122,599	107,193	15,406	12.6	71,447	66.7	35,746	33.3	$238,900	$1,071
Study Area Total	**933,127**	**838,872**	**94,255**	**10.1**	**553,238**	**66.0**	**285,634**	**34.0**	**$264,050**	**$1,116**
Connecticut	**1,507,711**	**1,361,755**	**145,956**	**9.7**	**906,798**	**66.6**	**454,957**	**33.4**	**$270,100**	**$1,123**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 6-27. Median Home Value in the Connecticut Study Area by Census Block Group

Home values in the State increased 0.9% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio; the prevalence of price cuts on home listings; and time-on-market (Zillow.com 2019l). The market temperature of the State is characterized as very hot, which indicates market conditions favorable to sellers (Zillow.com 2019l). In the 12-month period ending November 2019, metropolitan area market temperatures ranged from hot to very hot, despite decreasing at the following rates:

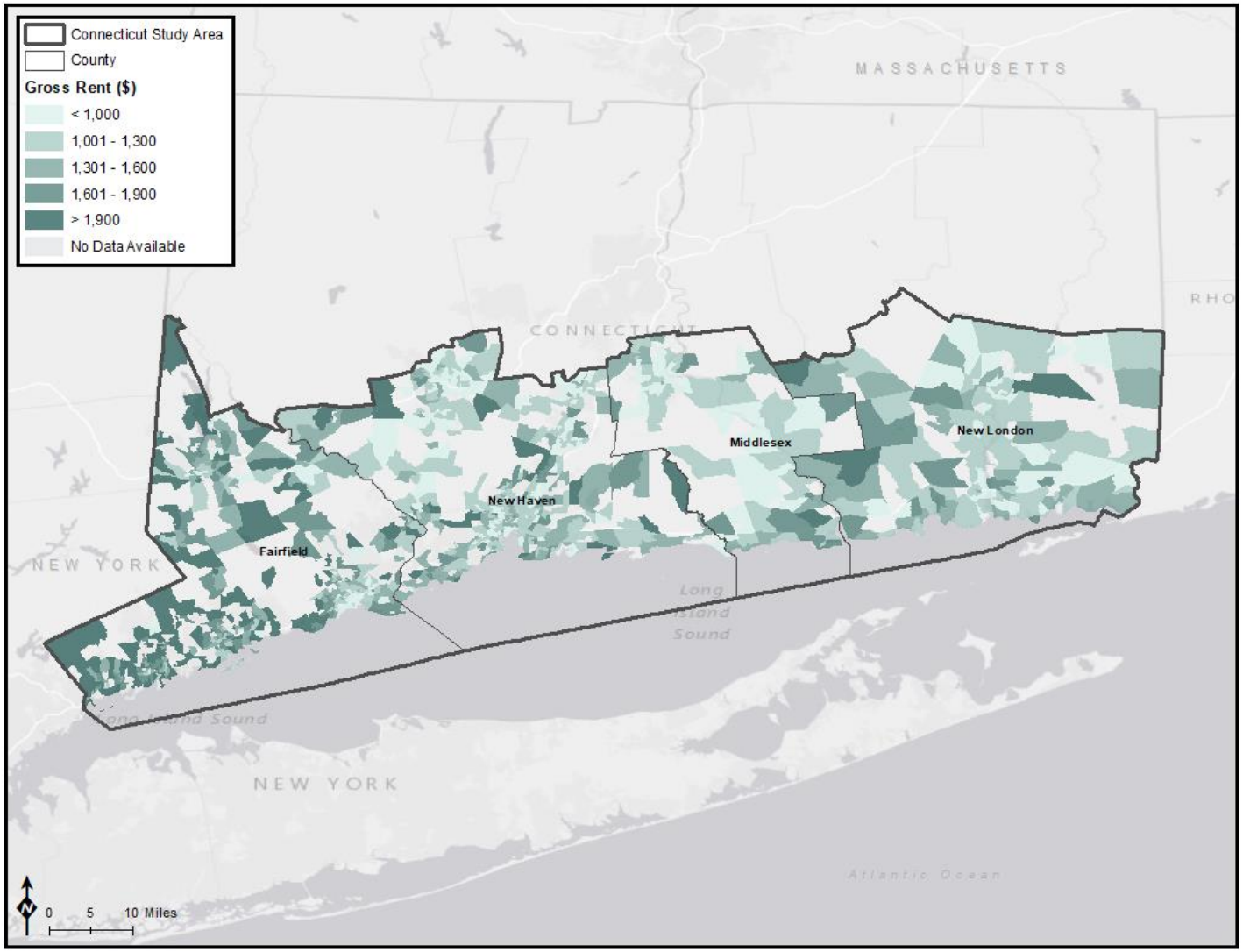
- Bridgeport-Stamford-Norwalk, CT – decreased 0.7%; hot (Zillow.com 2019m).
- New Haven-Milford, CT – decreased 1.2%; very hot (Zillow.com 2019n)
- Norwich-New London, CT – decreased 2.2%; very hot (Zillow.com 2019o).

Chapter 1.6.3 discusses additional home value trends across the overall Study Area, including Connecticut.

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

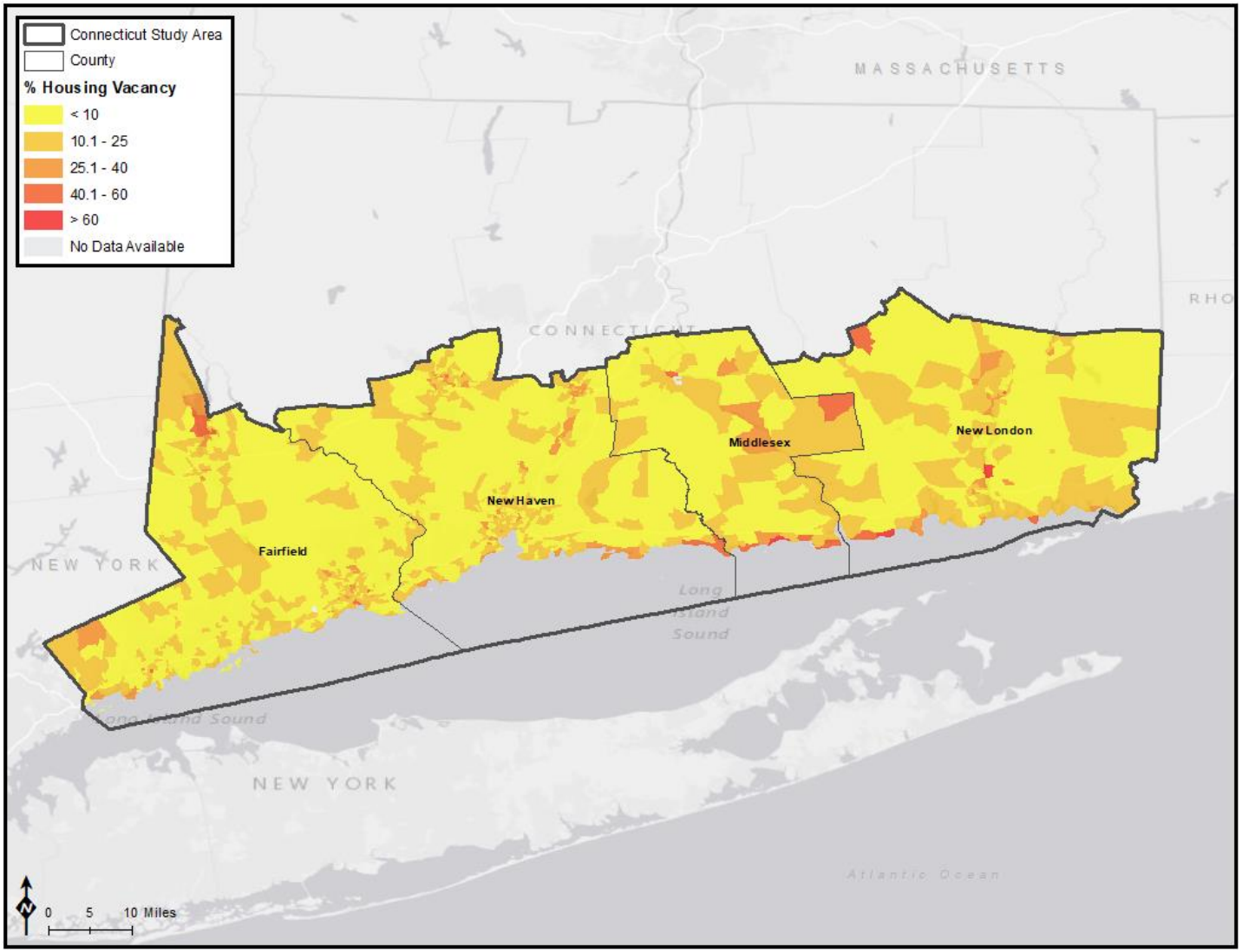
Figure 6-28 illustrates median gross rent in the Study Area. According to the National Low Income Housing Coalition, as of 2019, throughout Connecticut, fair market rent for a two-bedroom rental unit is $1,321. In these conditions, a minimum wage worker would have to work approximately 101 hours a week in order to afford a two-bedroom fair market rate home. Connecticut has a shortage of approximately 79,172 rental homes affordable and available to extremely low-income households. Approximately 128,178 (28%) of renter households in Connecticut are considered extremely low income; approximately 85,879 (67%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (36%), single caregivers (32%), and disabled (23%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

As shown in Table 6-9, home vacancy rates in Connecticut (9.7%) in 2017 were lower than the Nation (12.2%) and the Study Area (10.1%). Figure 6-29 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates in shoreline areas along the coast of New Haven, Middlesex, and New London Counties bordering Long Island Sound (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Many Connecticut municipalities have specific regulations and restrictions for short-term rentals (Kruse 2018).



Source: USCB 2017r

Figure 6-28. Median Gross Rent in the Connecticut Study Area by Census Block Group



Source: USCB 2017r

Figure 6-29. Housing Vacancy Rates in the Connecticut Study Area by Census Block Group

6.4.4 Employment

6.4.4.1 Types of Employment

Employment data by industry sector are presented in **Error! Not a valid bookmark self-reference.**. In 2017, the Study Area had a total employment of 1.1 million jobs, representing approximately 62.1% of the total jobs in Connecticut, and 0.7% of the total jobs in the U.S. (USCB 2017p).

Connecticut's 2018 Annual Gross Domestic Product was 275.7 billion, which represented 1.3% of the Nation's gross domestic product (BEA 2019).

Table 6-10. Census Bureau Labor and Industry Sector for the U.S., Connecticut, and the Connecticut Study Area (number of jobs)

Industry	United States	Percent (%)	Connecticut	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**1,805,086**		**1,121,817**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	7,166	0.4	3,508	0.3
Construction	9,564,541	6.4	104,122	5.8	66,663	5.9
Manufacturing	15,477,389	10.3	191,519	10.6	113,801	10.1
Wholesale trade	4,042,867	2.7	44,741	2.5	28,301	2.5
Retail trade	17,167,000	11.4	193,016	10.7	118,850	10.6
Transportation and warehousing, and utilities	7,681,579	5.1	68,926	3.8	41,875	3.7
Information	3,173,300	2.1	42,200	2.3	26,986	2.4
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	163,810	9.1	97,468	8.7
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	208,130	11.5	137,754	12.3
Educational services, and health care and social assistance	34,781,348	23.1	478,083	26.5	296,309	26.4
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	153,679	8.5	100,422	9.0
Other services, except public administration	7,371,226	4.9	82,538	4.6	51,720	4.6
Public administration	7,025,870	4.7	67,156	3.7	38,160	3.4

Source: USCB 2017p

Connecticut's economy today focuses on business with finance, insurance, and real estate being the largest industries. Connecticut is a leader in advanced manufacturing of products such as aerospace and other transportation equipment, chemicals, and fabricated metal products (Hoyt and Stolberg 2020, NAM 2020).

Table 6-10 and Figure 6-30 show the number of jobs each major industry sector for the U.S., the State, and the Study Area. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (26.4%); professional, scientific, and management, and administrative and waste management (12.3%); retail trade (10.6%); and manufacturing (10.1%). Generally, the dominant employment sectors in the Study Area are similar to those of the State. In the Study Area, 9.0% of people

work in arts, entertainment, and recreation, and accommodation and food services, more than the State (8.5%) but less than the U.S. (9.7%). Connecticut has a greater percentage of manufacturing jobs (10.6%) than the Nation (10.3%) and the Study Area (10.1%) (USCB 2017p). Figure 6-31 shows the location of jobs within the Study Area. The greater portion of jobs are located in Fairfield and New Haven Counties near the high-density MSAs of Bridgeport-Stamford-Norwalk and New Haven-Milford. Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the rural Middlesex County. Rural areas tend to have fewer locally available options and less economic development.

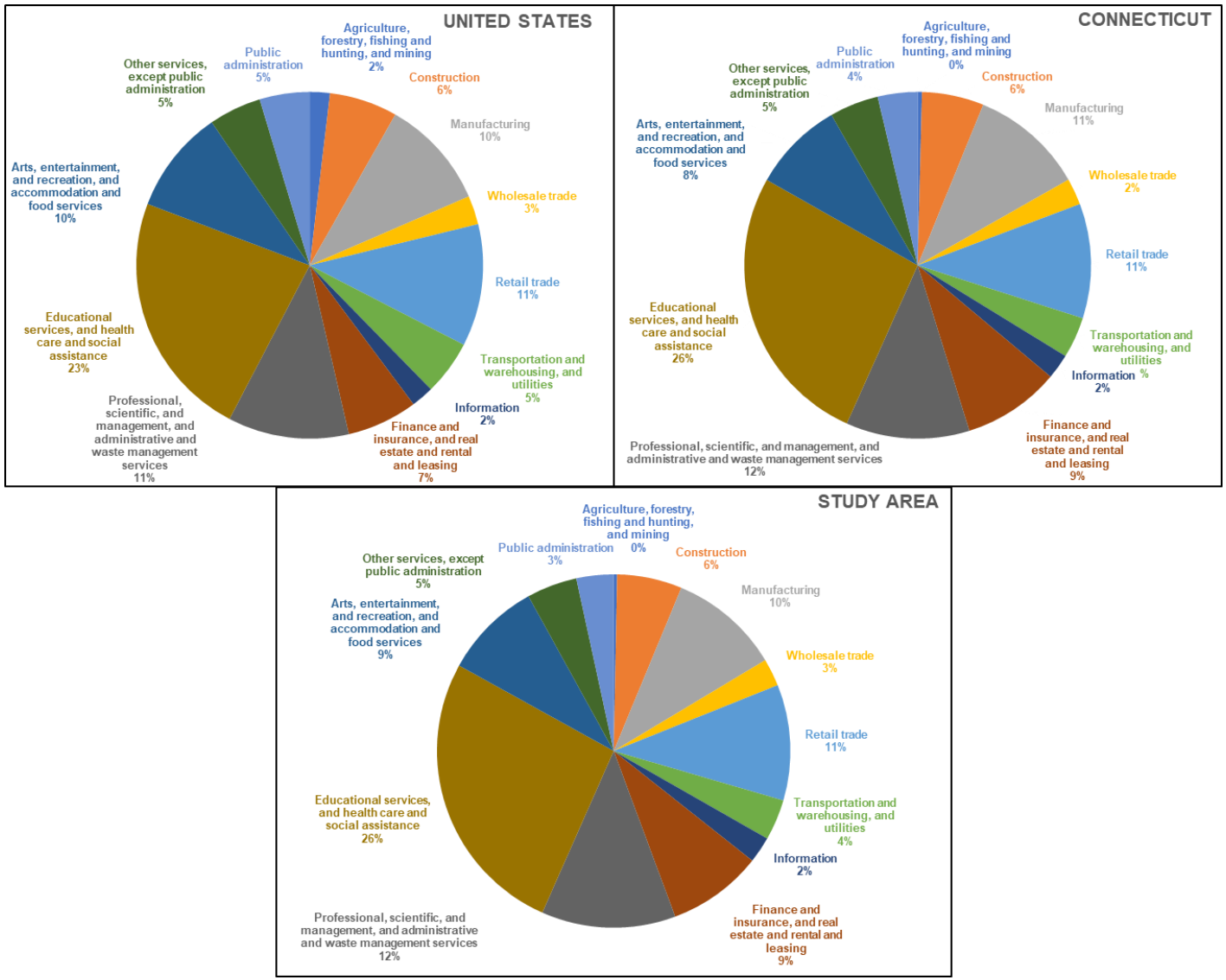
According to Connecticut Department of Labor, the State has recovered 86.1% of the 120,300 jobs lost in the Great Recession. Working age population growth in the State is low (CT DOL 2020). According to a 2017 article in *The Atlantic*, the economic and employment horizon in Connecticut is unfavorable due to a long list of ills: a $2 billion State budget deficit; high property, income, and sales tax; loss of high-paying jobs; gain of low-paying jobs; decline of prime working age population; and increasing income disparity between rich and poor. Additionally, corporations and corporate headquarters (Aetna and General Electric, for example) once attracted to Connecticut when big cities were dangerous and unappealing places to live and work, have left the State along with a steady stream of out-migrating residents (theatlantic.com 2017).

6.4.4.1.1 Connecticut's Ocean Economy

Overall, Connecticut's ocean economy ranked 15th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 6-11, Connecticut's ocean economy accounted for 56,299 maritime jobs in 2016, accounting for 3.4% of Connecticut's employment (NOAA 2016b, USCB 2017i). Within the State, Tourism and Recreation was the dominant sector, accounting for 70.4% (39,122) of maritime jobs. The Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

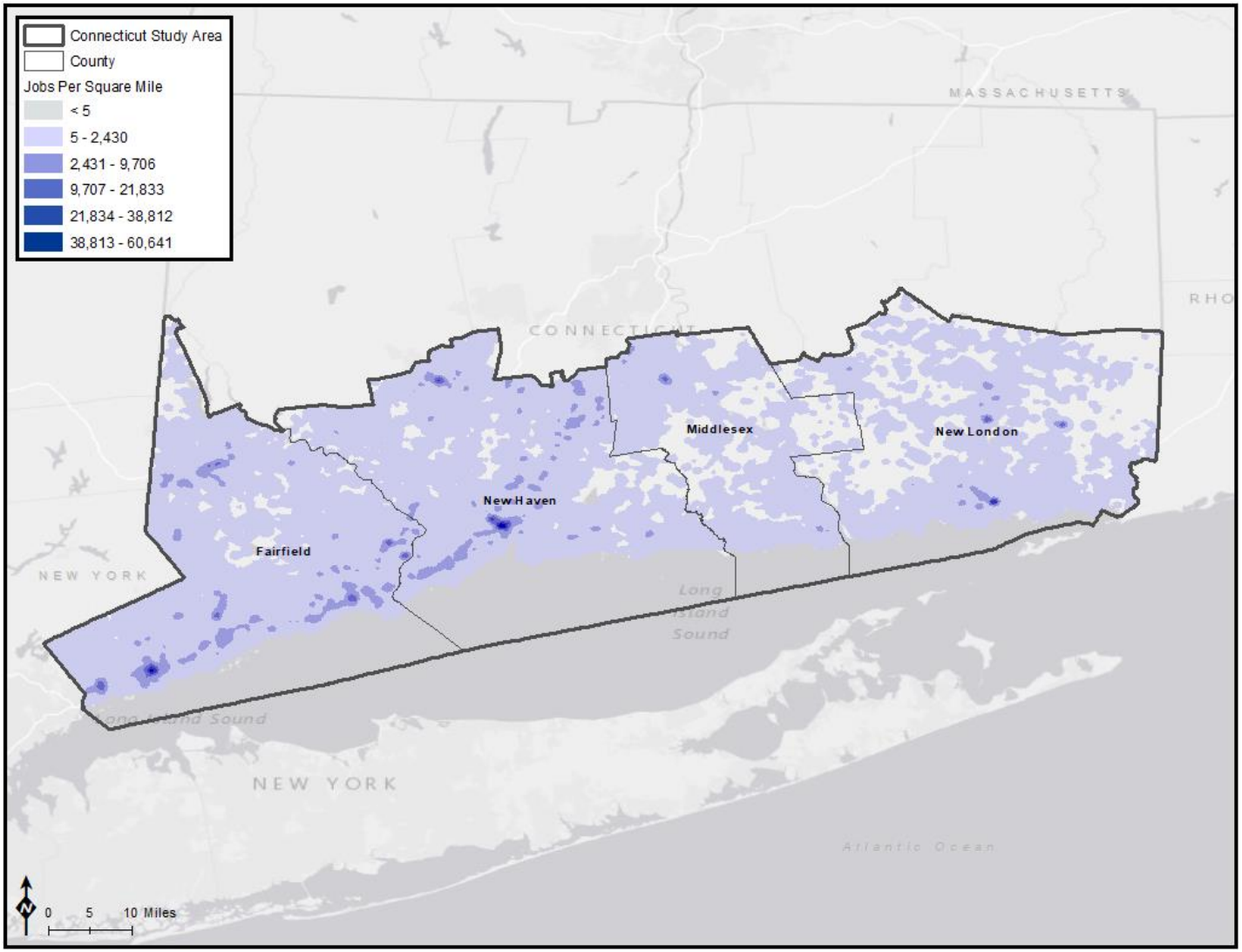
The Study Area had 55,985 maritime jobs, representing 99.6% of total maritime jobs in the State. New London County had the greatest number of maritime jobs (19,243), representing 34.4% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). Figure 6-32 shows the percent of maritime-related jobs to total jobs in each county in the Study Area (NOAA 2017b). The highest percentage of maritime jobs to overall county jobs was also in New London County (16.2%), indicative of less economic diversity in rural areas (NOAA 2016b).

Figure 6-32 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. New London County had a higher percentage of maritime-related jobs, reflecting its proximity to the ocean and maritime employment opportunities.



Source: USCB 2017p

Figure 6-30. Number of Jobs by Industry Sector for the U.S., Connecticut, and the Connecticut Study Area



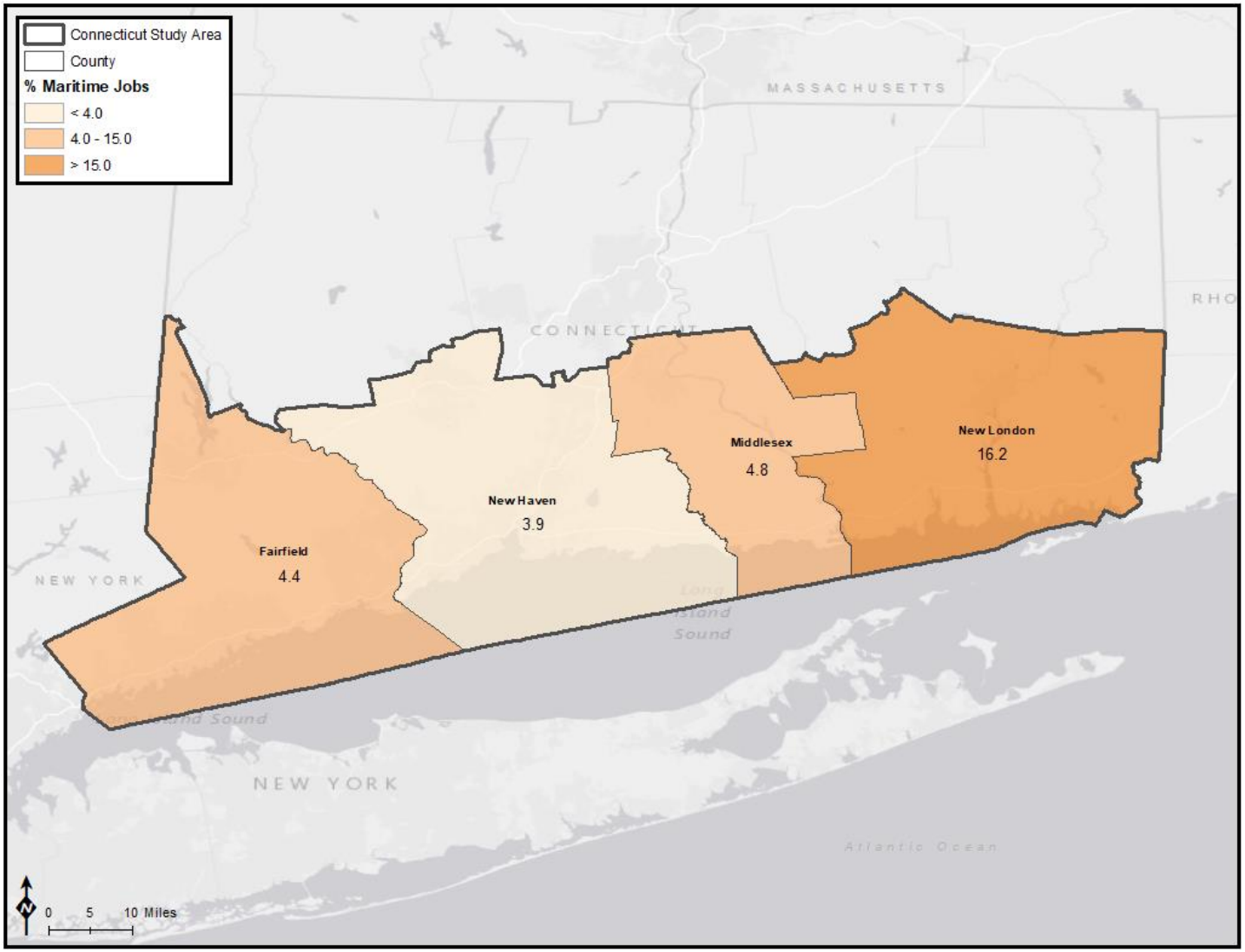
Source: USCB 2017r

Figure 6-31. Jobs Per Square Mile in the Connecticut Study Area by Census Block Group

Table 6-11. Employment Data in the Connecticut Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Geographic Unit	Total Labor Force (civilian and armed forces) (2017)[1]	Civilian Labor Force[1]	Employed (civilian labor force)[1]	Unemployed (civilian labor force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Fairfield	513,785	513,567	474,458	39,109	7.6	429,677	19,100	4.4	$89,773	$53,433
Middlesex	93,241	93,059	88,344	4,715	5.1	66,453	3,214	4.8	$81,673	$43,695
New Haven	461,085	460,606	425,229	35,377	7.7	373,102	14,428	3.9	$64,872	$35,085
New London	150,766	143,792	133,786	10,006	7.0	118,918	19,243	16.2	$69,411	$36,881
Study Area Total	**1,218,877**	**1,211,024**	**1,121,817**	**89,207**	**7.4**	**988,150**	**55,985**	**5.7**	**$75,542**	**$42,274**
Connecticut	**1,954,364**	**1,945,798**	**1,805,086**	**140,712**	**7.2**	**1,656,396**	**56,229**	**3.4**	**$73,781**	**$41,365**
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 6-32. Maritime Jobs in the Connecticut Study Area by County

6.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 6-11, in 2017 Connecticut had higher median household and per capita income than the U.S. According to the USCB, the U.S. had median income of $57,652, and per capita income of $31,177 in 2017. During the same period, Connecticut had median income of $73,781 (28.0% higher than the Nation's median income) and per capita income of $41,365 (32.7% higher than the Nation's per capita income). Median and per capita income in the Study Area was higher than the State at $75,542 and $42,274, respectively (USCB 2017k, USCB 2017n).

As shown in Table 6-11, in 2017 median household income in the Study Area ranged from $89,773 (Fairfield County) to $64,872 (New Haven County). In 2017, per capita income ranged from $53,433 (Fairfield County) to $35,085 (New Haven County). Figure 6-33 and Figure 6-34 show median household and per capita income in the Study Area. The figures portray high median household and per capita income near the high-paying jobs in Connecticut's metropolitan areas and nearby suburbs and lower paying jobs in rural areas (USCB 2017k, USCB 2017n).

Loss of residents due to domestic out migration trends impacts the State's economy. In 2018, the loss of wealth to other States totaled approximately $1.1 billion in adjusted gross income according to the Internal Revenue Service (Kramer 2020).

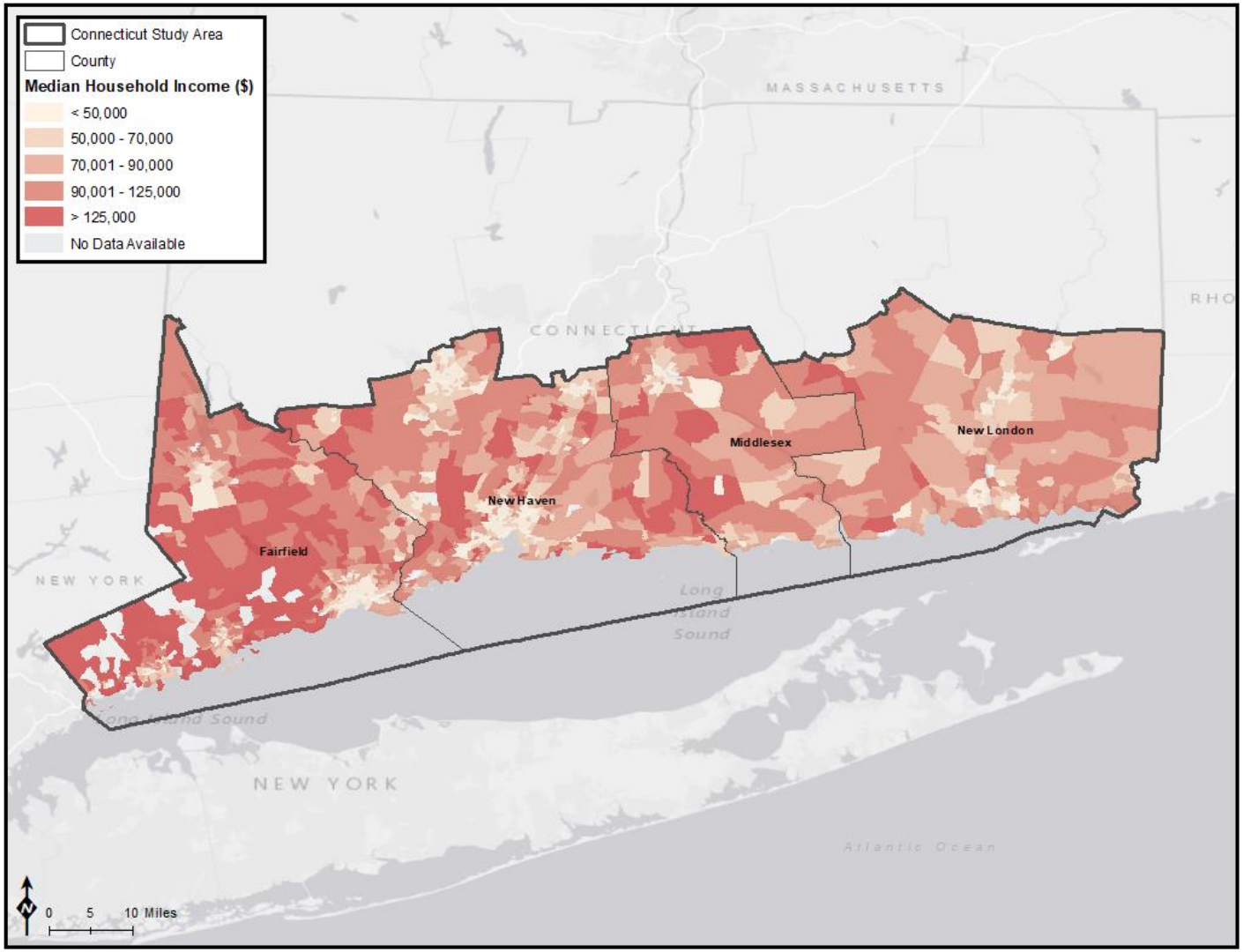
6.4.4.3 Unemployment Rates

Figure 6-35 shows the 2017 unemployment rates in the counties in the Study Area by census block group. Table 6-11 presents unemployment rates for each county in the Study Area. The average unemployment rate in the Study Area was 7.4%, similar to the State (7.2%) but more than the Nation (6.6%). Within the Study Area, unemployment rates ranged from 5.1% in Middlesex County to 7.7% in New Haven County in 2017 (USCB 2017h).

6.4.4.4 Educational Attainment

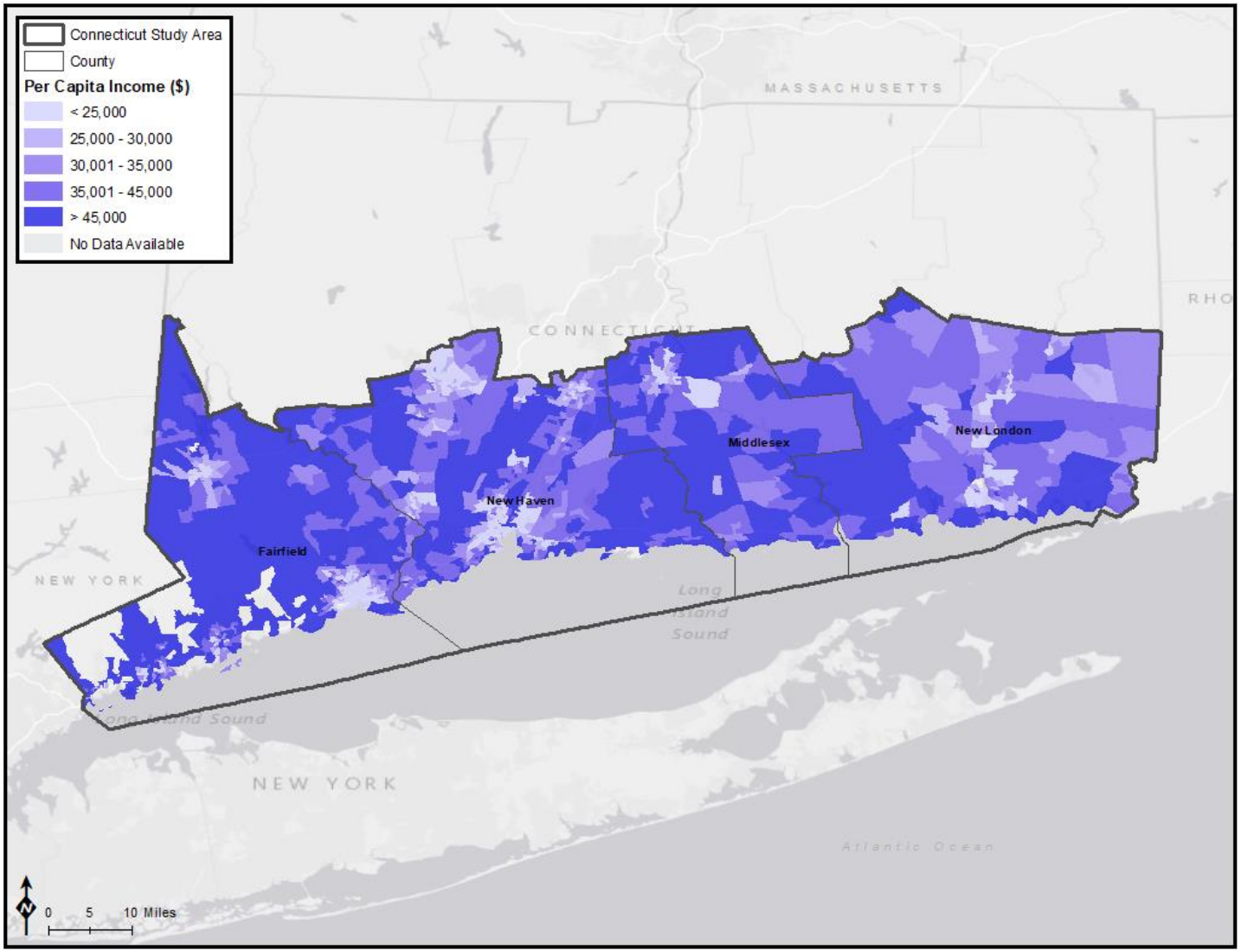
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 6-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State, and the Nation (USCB 2017t).



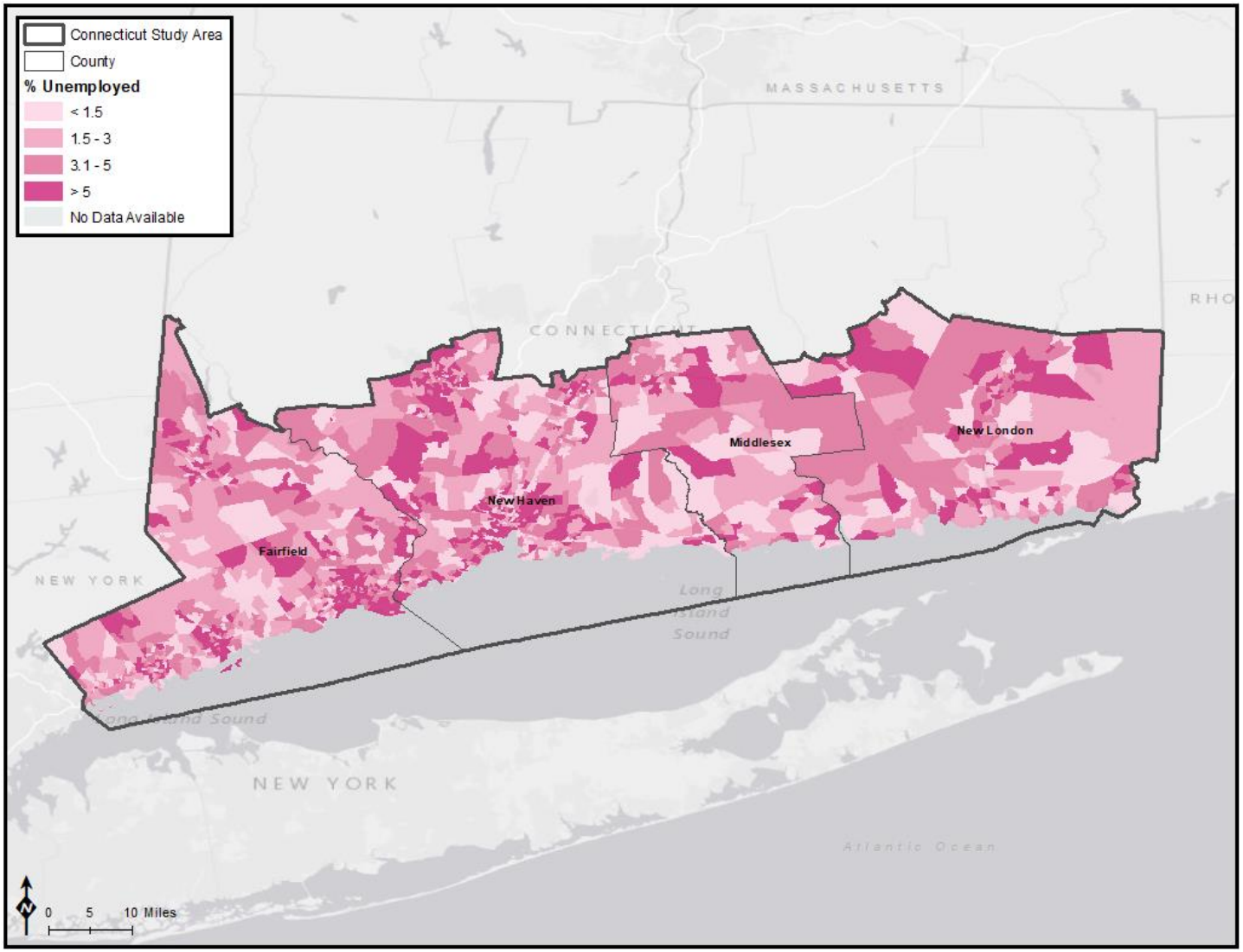
Source: USCB 2017r

Figure 6-33. Median Household Income in the Connecticut Study Area by Census Block Group



Source: USCB 2017r

Figure 6-34. Per Capita Income in the Connecticut Study Area by Census Block Group



Source: USCB 2017r

Figure 6-35. Unemployment Rates in the Connecticut Study Area by Census Block Group

Table 6-12. Educational Data for the Connecticut Study Area

Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Fairfield	35,410	44,062	163,853	130,323	39,156	182,319	132,570	**727,693**	4.9	6.1	22.5	17.9	5.4	25.1	18.2
Middlesex	2,888	5,492	36,343	27,154	10,904	29,132	21,324	**133,237**	2.2	4.1	27.3	20.4	8.2	21.9	16.0
New Haven	23,908	45,723	209,605	140,417	43,845	124,787	94,583	**682,868**	3.5	6.7	30.7	20.6	6.4	18.3	13.9
New London	4,899	12,820	67,058	50,239	16,030	37,541	28,033	**216,620**	2.3	5.9	31.0	23.2	7.4	17.3	12.9
Study Area Total	**67,105**	**108,097**	**476,859**	**348,133**	**109,935**	**373,779**	**276,510**	**1,760,418**	**3.8**	**6.1**	**27.1**	**19.8**	**6.2**	**21.2**	**15.7**
Connecticut	**102,064**	**174,471**	**776,073**	**567,420**	**201,193**	**593,869**	**430,816**	**2,845,906**	**3.6**	**6.1**	**27.3**	**19.9**	**7.1**	**20.9**	**15.1**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between district-level summarization and State-level summarization methods. Therefore, the district statistics are not one-to-one with the State statistics and do not match up exactly.

Figure 6-36 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associate's, bachelor's, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Connecticut, 27.3% of the working-age population earned only a high school diploma; 43.1% earned a college or advanced degree.
- In the Study Area, 27.1% of the working-age population earned only a high school diploma; 43.2% earned a college or advanced degree (USCB 2017q).

Figure 6-37 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

As shown on Table 6-12, percentages of workers with less than 9th grade, some high school, a high school diploma, some college, and an associate's degree are similar across all counties in the Study Area and are commensurate with national and State levels. Both Fairfield and Middlesex Counties have a higher percentage of workers with a bachelor's degree as compared to both the Nation and the State. All four counties have a higher percentage of workers with a graduate or professional degree as compared to the Nation, though only Fairfield and Middlesex are higher than the State.

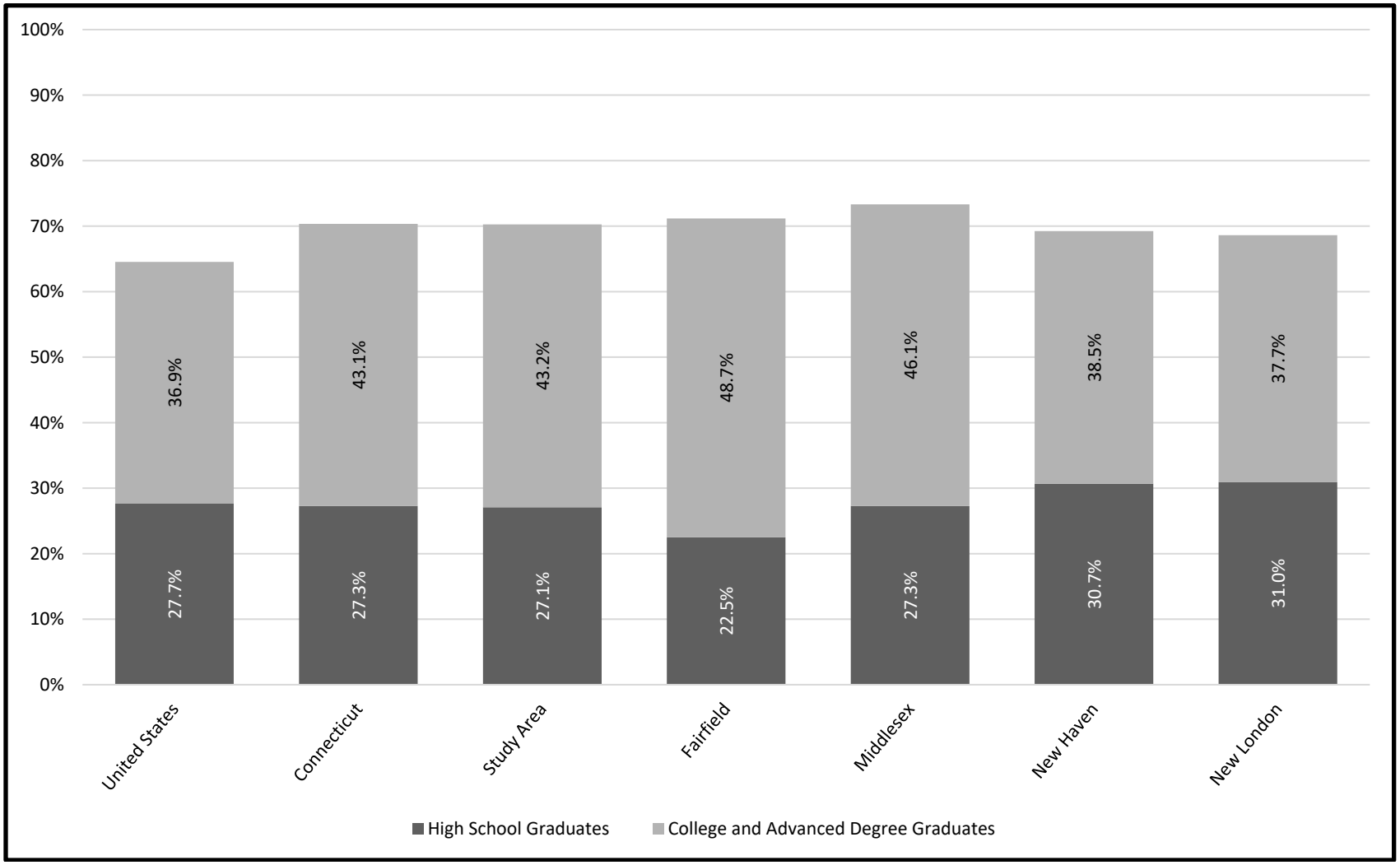
Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

6.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

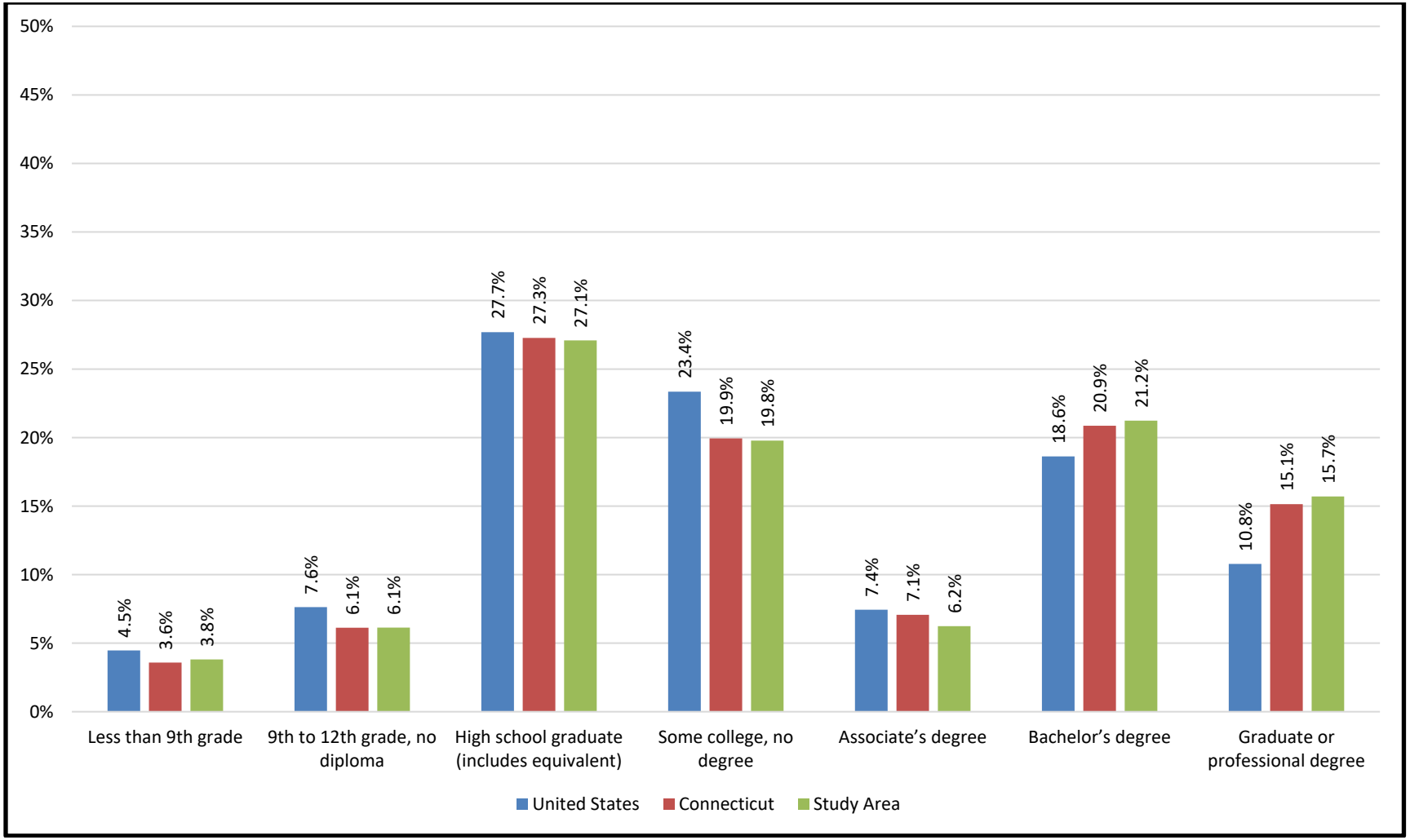
Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities and subsistence populations. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.



Source: USCB 2017q

Figure 6-36. High School, College, and Advanced Degree Graduate Rates in the Connecticut Study Area



Source: USCB 2017q

Figure 6-37. Educational Attainment in the Connecticut Study Area

6.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 6-38 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

6.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 6-13 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 2,244,337 people living in the Study Area, approximately 751,230 (33.5%) are minority. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 1,586 block groups in the Study Area, approximately 27.6% (438 block groups) are considered minority populations (USCB 2017f).

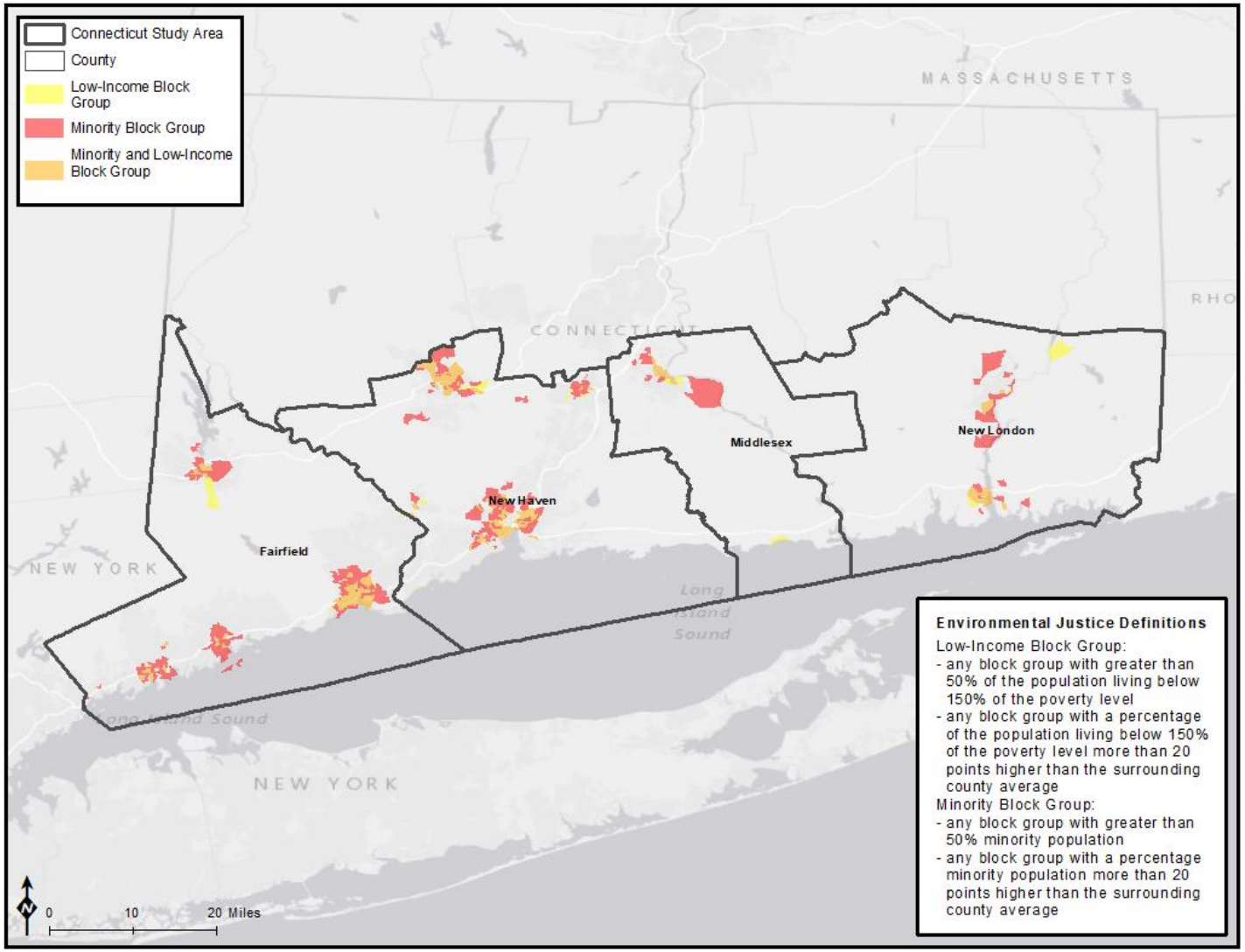
Each of the counties contain census block groups with high percentages of minority populations. As shown in Table 6-13, Fairfield and New Haven Counties had the highest percentage of minority block groups at 31.7% and 30.5%, respectively. This is consistent with State and national percentages. New London and Middlesex Counties had the lowest percentage of minority block group populations at 15.4% and 9.3%, respectively (USCB 2017f).

Within the Study Area, the largest minority group is Black or African-American (10.1%) followed by Hispanic or Latino (9.4%) (USCB 2017f).

6.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 6-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 2,182,505 people for whom poverty status is determined living in the Study Area, approximately 356,276 (16.3%) individuals have incomes less than 150% of the poverty level. This is similar to the State percentage (16.3%) but significantly lower than the Nation (23.7%). These would be sensitive populations subject to environmental justice consideration. Of the 1,586 census block groups in the Study Area, approximately 13.0% (206 block groups) are considered low-income populations (USCB 2017o).

Many counties contain census block groups with high percentages of low-income populations. As shown in Table 6-13, Fairfield and New Haven Counties have similar percentages of low-income block groups at 13.0% and 15.0%, respectively. New London and Middlesex counties have smaller percentages of low-income block groups (10.1% and 6.8%, respectively) (USCB 2017o).



Source: USCB 2017r

Figure 6-38. Minority and Low-Income Population in the Connecticut Study Area by Census Block Group

Table 6-13. Low-Income and Minority Populations in the Connecticut Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Fairfield	947,328	595,323	352,005	37.2	653	85	13.0	207	31.7	929,135	138,118	14.9
Middlesex	164,110	138,523	25,587	15.6	118	8	6.8	11	9.3	158,851	18,626	11.7
New Haven	862,127	553,000	309,127	35.9	627	94	15.0	191	30.5	835,945	157,793	18.9
New London	270,772	206,261	64,511	23.8	188	19	10.1	29	15.4	258,574	41,739	16.1
Study Area Total	**2,244,337**	**1,493,107**	**751,230**	**33.5**	**1,586**	**206**	**13.0**	**438**	**27.6**	**2,182,505**	**356,276**	**16.3**
Connecticut	**3,594,478**	**2,446,049**	**1,148,429**	**31.9**						**3,486,033**	**569,248**	**16.3**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

6.4.5.2 Socially Vulnerable Populations

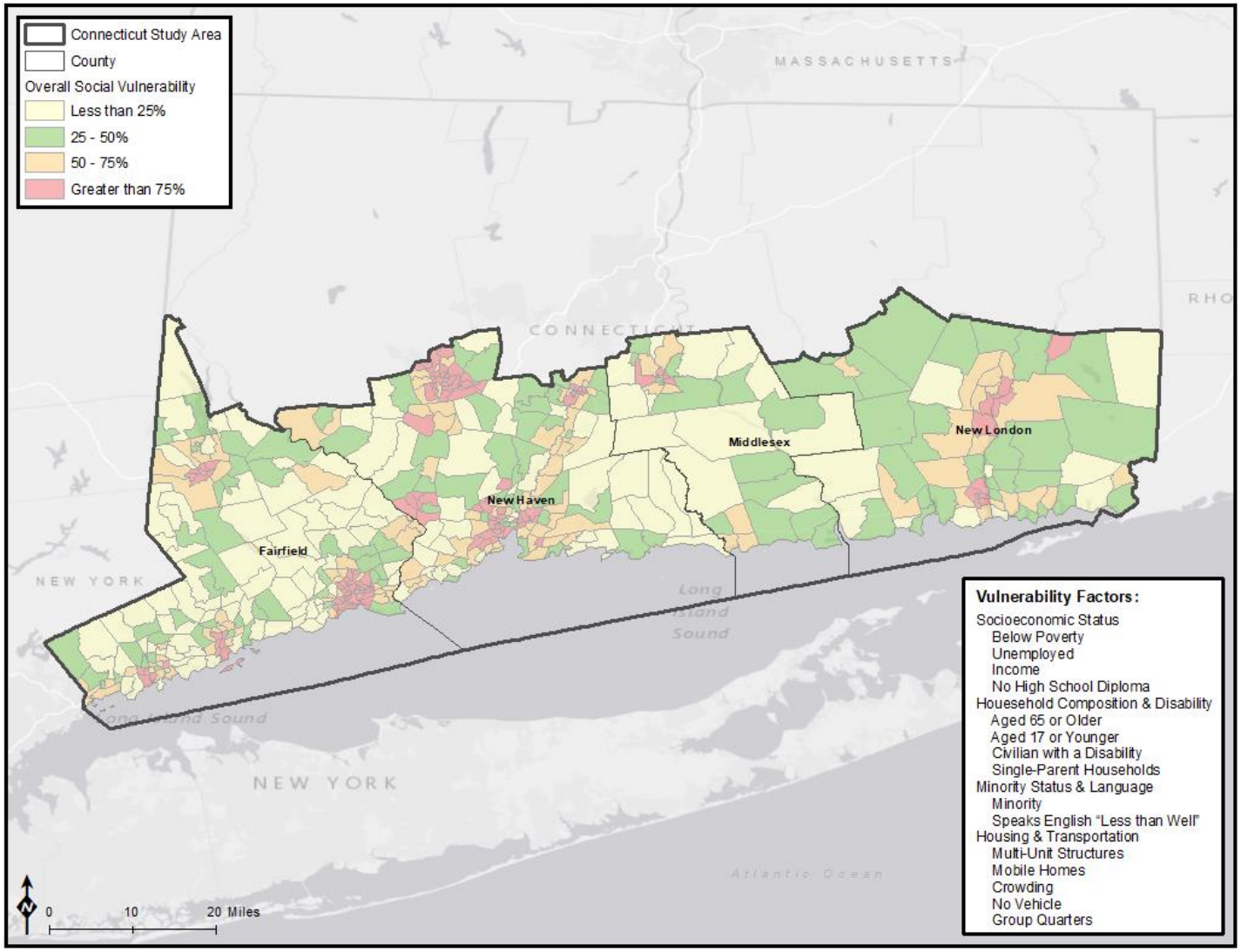
As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretation. As used in this chapter, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). The NOAA SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in "Fishing Communities" (Chapter 6.4.5.3.1).

The output of CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 6-39, for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 6-39, small areas within each of the Study Area counties have the highest vulnerability ranking within the Study Area (CDC 2016).

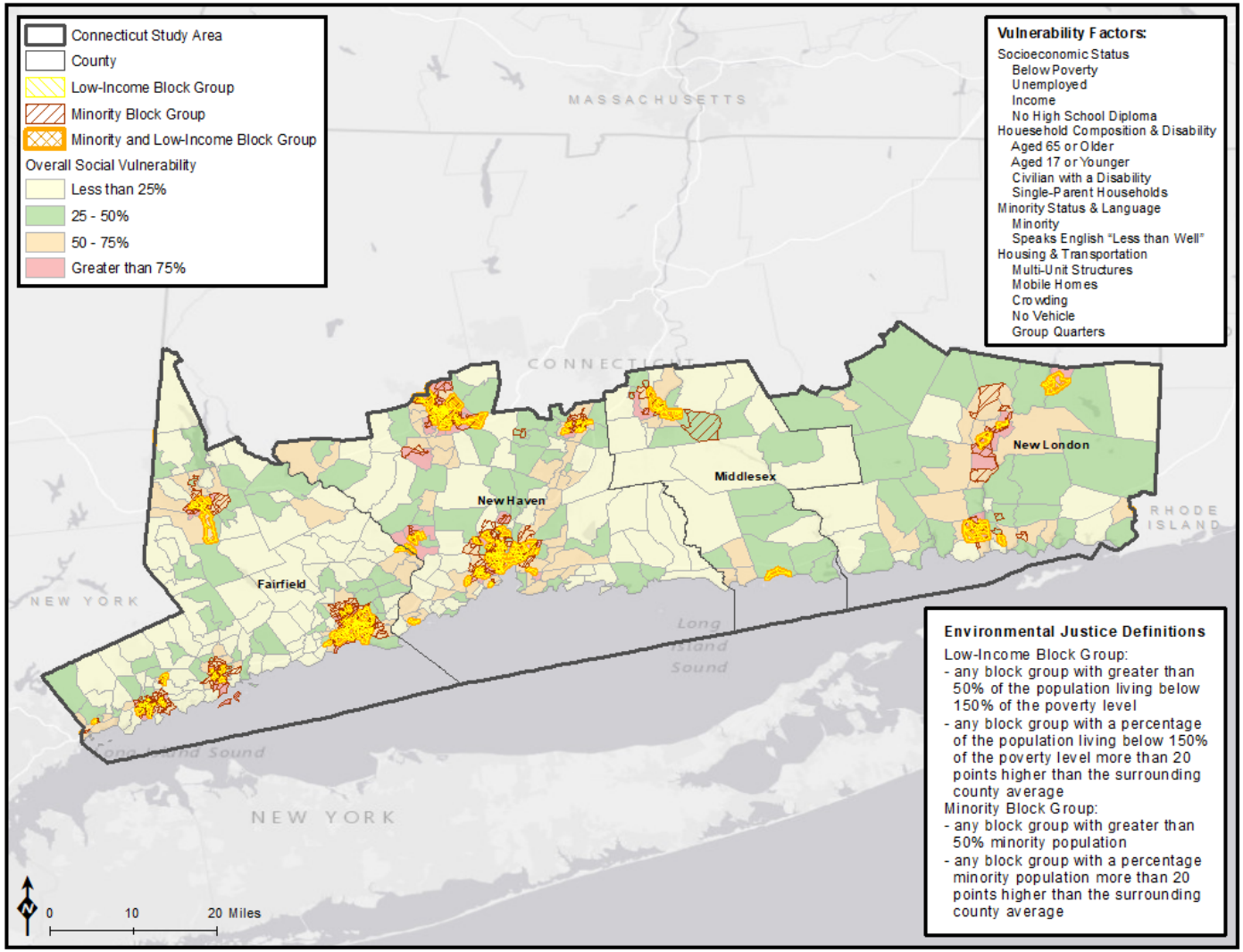
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 6-40 combines the CDC SoVI index (as shown in Figure 6-39) with minority and low-income populations (as shown in Figure 6-38) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; this is particularly notable in Fairfield and New Haven Counties.

Figure 6-41 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 6-41 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 6.2.2.2 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.



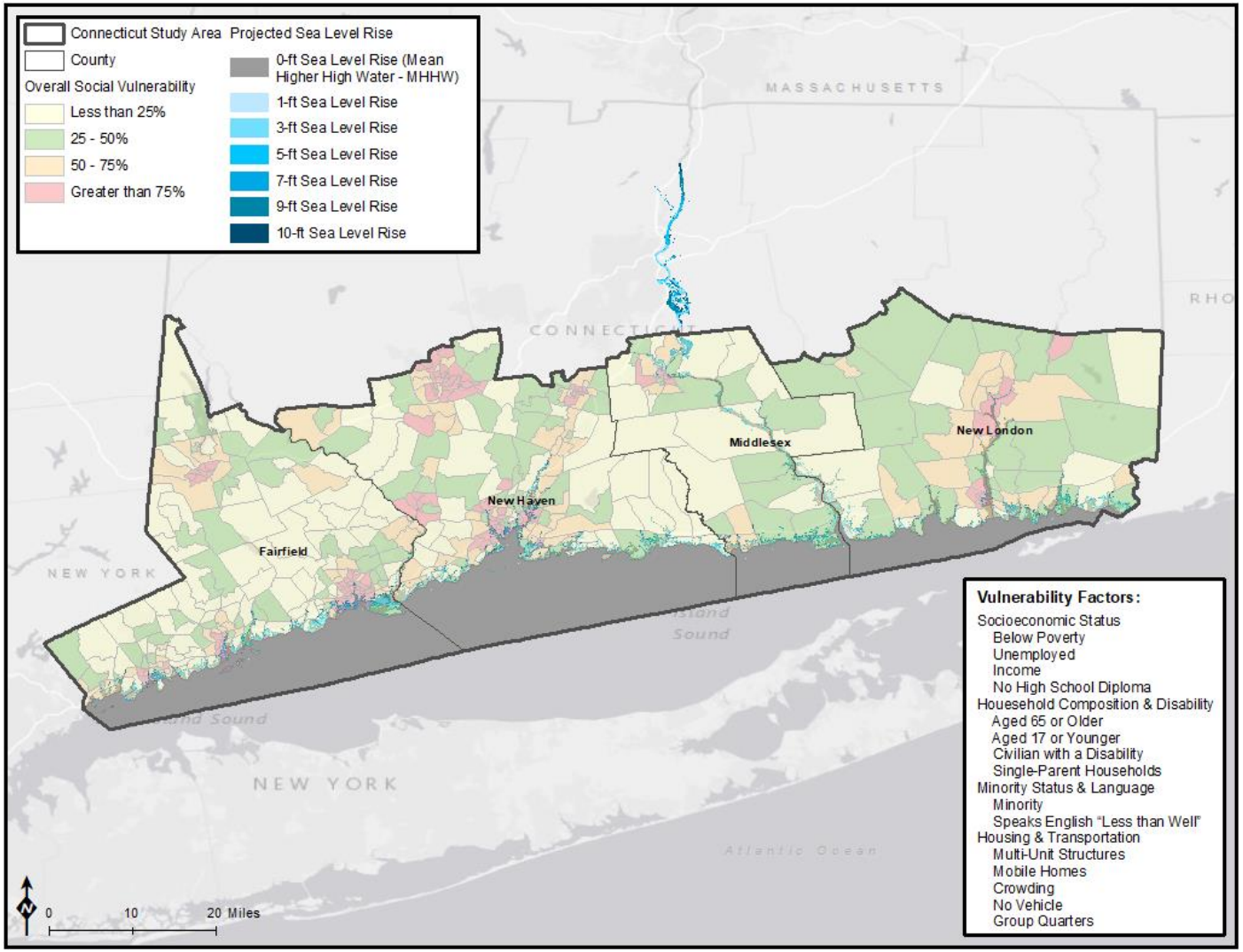
Source: CDC 2016

Figure 6-39. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Connecticut Study Area by Census Tract



Source: CDC 2016, USCB 2017r

Figure 6-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Connecticut Study Area



Source: CDC 2016, NOAA 2018a

Figure 6-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Connecticut Study Area by Census Tract

As discussed in Chapter 6.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that the location of socially vulnerable populations be considered when evaluating potential future OCS-related project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist in the metropolitan areas and along coasts of the Study Area (CDC 2016).

6.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.

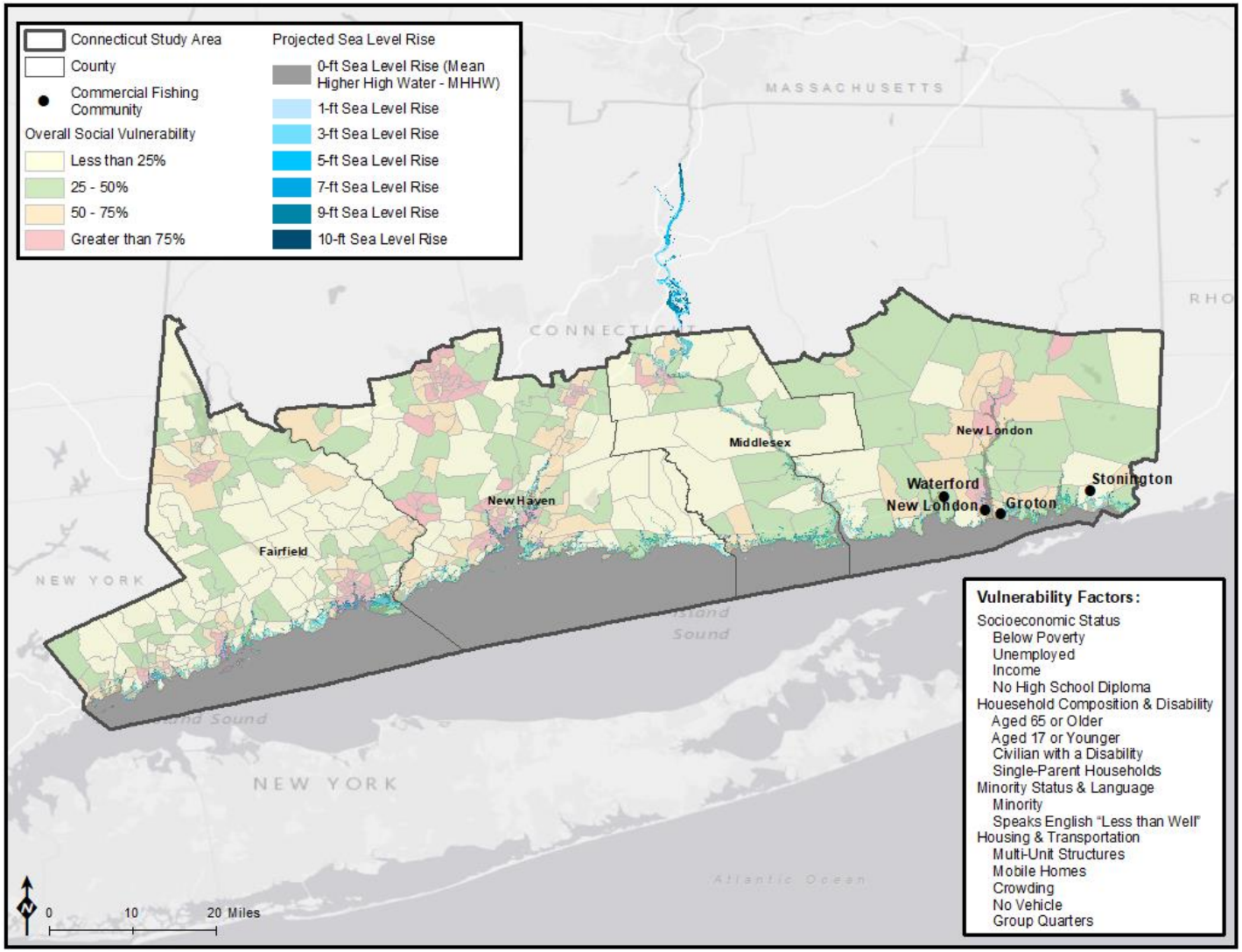
6.4.5.3.1 Fishing Communities

There are four fishing communities in the Study Area, all of which are located in New London County, as illustrated in Figure 6-42.

The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Groton, New London County
- New London, New London County
- Stonington, New London County
- Waterford, New London County

As can be seen in Figure 6-42, all four of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 6.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that the location of fishing communities be considered early in the OCS-related project analysis. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).



Source: NOAA 2018a, NOAA Fisheries 2019k

Figure 6-42. Potential Vulnerable Communities in the Connecticut Study Area by Census Tract

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

6.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, American Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 6-42). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources, may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

6.4.5.4 Tribes

Connecticut has six federally recognized tribes that have historical ties to Connecticut, of which two reside within the Study Area in New London County (Mashantucket (Western) Pequot Tribal Nation and Mohegan Tribe of Indians of Connecticut). There are also five State-recognized tribes in the State (Reinhart 2002), two of which are also federally recognized tribes. No non-recognized tribes were identified in the Study Area. Table 6-14 lists the federally and State-recognized tribes in Connecticut. Federally recognized tribal lands are shown in Figure 6-42.

Table 6-14. Federally and State-Recognized Tribes with Historical Ties to Connecticut

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Resident Tribes within the Study Area			
Golden Hill Paugussett	State	Yes	Hold a 0.25-acre State reservation in Trumbull (Fairfield County) and a 106-acre State reservation in Colchester (New London County).
Mashantucket (Western) Pequot Tribal Nation	Federal and State	Yes	Federal trust land on 1,400 acres in Ledyard (New London County) with the potential for a 2,300-acre Federal reservation under the settlement act and agreements. Federal tribes have historical ties and interests in all counties in the Study Area.
Mohegan Tribe of Indians of Connecticut	Federal and State	Yes	Federal trust land on 409 acres in Montville (New London County) and Norwich (New London County) with the potential for a 700-acre Federal reservation under the settlement act and agreements. Federal tribes have historical ties and interests in all counties in the Study Area
Paucatuck Eastern Pequot	State	Yes	Reside on a 225-acre State reservation in North Stonington (New London County).
Federal and State-Recognized Tribes Outside the Study Area			
Delaware Nation, Oklahoma	Federal	Yes	Tribal members currently reside outside of Connecticut (primarily in Oklahoma) but have historical ties to Fairfield County.
Delaware Tribe of Indians	Federal	Yes	Tribal members currently reside outside of Connecticut (primarily in Oklahoma) but have historical ties to Fairfield and New Haven Counties
Narragansett Indian Tribe	Federal	Yes	Tribal members currently reside outside of Connecticut (primarily in Rhode Island) but have historical ties to all four counties in the Study Area.
Schaghticoke	State	No	Tribal members reside outside of the Study Area, in New York, but they also reside on a 278-acre State reservation in Kent (Litchfield County).
Stockbridge Munsee Community, Wisconsin	Federal	No	Tribal members currently reside outside of Connecticut.

Source: Reinhart 2002

Five tribes have at least one reservation in Connecticut: Golden Hill Paugussett (who have two reservations); Mashantucket (Western) Pequot Tribal Nation; Mohegan; Paucatuck Eastern Pequot; and Schaghticoke. References to specific tribes and reservations are found in many statutes (Connecticut General Statutes §§ 47-63). In 1989, the Connecticut legislature adopted PA 89-368. This legislation established the legal relationship between the State government and all federally- and State-recognized tribes, exempted the tribes from certain taxes, and established permanent protection for tribal reservations. The law recognizes the five tribes as "self-governing entities with power and duties over tribal members and reservations," including the power to (1) determine tribal membership and residency on reservation

land, (2) determine the tribal form of government, (3) regulate trade and commerce on the reservation, (4) make contracts, and (5) determine tribal leadership under tribal practice and usage (Connecticut General Statutes §§ 47-59a).

The Golden Hill Paugussett tribal territory originally encompassed much of the coastal plain area from New Haven Harbor to the Saugatuck, Housatonic, and Naugatuck Rivers. The marine life of Long Island Sound (oysters, clams, fish, crabs, terrapin, waterfowl, and shad) provided a significant component of tribal member's diets. They also cleared land for agriculture with corn, beans, and squash as important crops. As was common throughout New England, when European settlers arrived the Native Americans in the area were gradually either forced out of their original territory onto much smaller reservations, forced out of the area completely, or decimated through disease and warfare. The Golden Hill Paugussett found their territory reduced and restricted throughout the 1600s, and by the 1760s tribal lands were reduced to around eight acres. In the early 1800s a neighboring landowner offered to help the tribe, but instead received permission to sell off the remaining land as payment for his legal assistance. Later in the 1800s, several tribal members worked to maintain the community and eventually managed to purchase a small parcel (0.25 of an acre), which became the Golden Hill Reservation. The tribe continues to pursue federal-recognition (Brilvitch 2020).

The Mashantucket (Western) Pequot Tribal Nation consider themselves a native Algonquin people. The tribe has historical ties to the Mashantucket area of southeastern Connecticut dating back thousands of years. Conflict arose with the arrival of European settlers leading to the Pequot War (1636-1638) during which many tribal members were killed or enslaved. Some remaining tribal members were placed with the Mohegans and the group became known as the Mashantucket (Wester) Pequots. Many members of the tribe now reside on the reservation in the Mashantucket area (Tribal History 2020).

The Mohegan Tribe of Indians of Connecticut were once members of the Pequot tribe until the arrival of the Europeans led to disputes within the tribe and a contingent left and became the Mohegan Tribe. The Mohegans fought on the side of the English during the Pequot War and they remained affiliated with the English for some time. Tribal member Samson Occom became one of the first Native Americans ordained as a Christian minster. He founded a New England Christian Indian School, which later moved to Hanover, New Hampshire and became Dartmouth College. The tribe currently resides on a reservation located between Norwich and New London (Mohegan Tribe 2017).

The Paucatuck Eastern Pequot Tribe has struggled for Federal recognition. In 2002, Federal recognition was granted to the Historical Eastern Pequot Tribe, which was composed of two groups who consider themselves separate tribes and had both petitioned for independent Federal status. Both groups reside on the same Lantern Hill Reservation in North Stonington in New London County. The Federal determination found that the historical evidence indicated these groups were representatives of a single tribe (Herszenhorn 2002). The Federal recognition of this combined group was revoked in 2005 after an appeal from the State and local communities (New Haven Register 2016). The tribe continues to strive for Federal recognition.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 6-42. Overall social vulnerability for Fairfield County is primarily less than 25% to 50%, with a few areas that range from 50 to greater than 75%, with some areas less than 25%, and other larger regions ranging from 50 to greater than 75% (CDC 2016). Also shown in Figure 6-42 is NOAA sea level rise data, indicating that all the counties in which tribal populations are present are subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

6.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

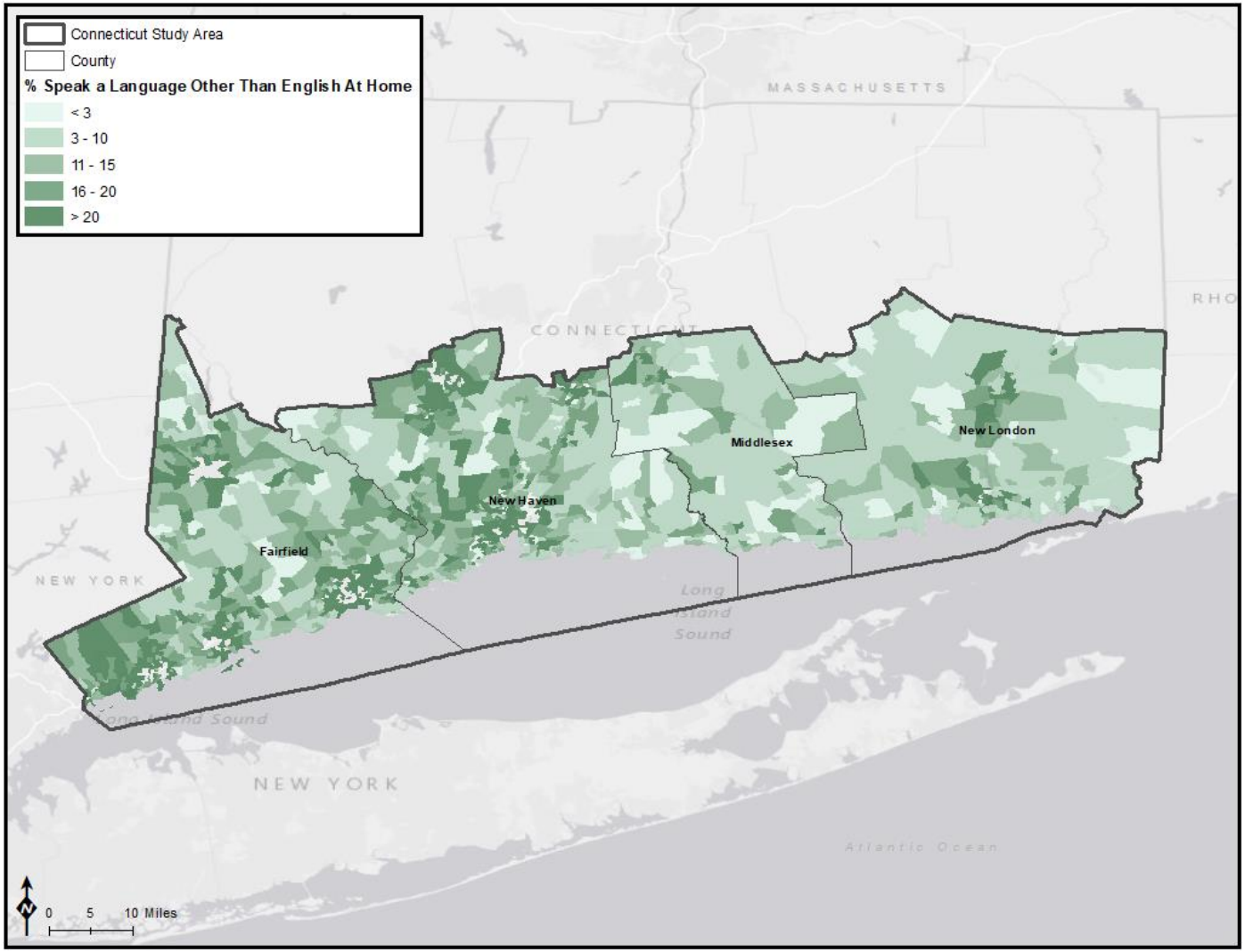
Table 6-15 provides an analysis people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speaks a language "other than English" at home. Within the Study Area, 23.1% of the population does not speak English at home. Fairfield County had the highest percentage (29.5%) of this population within the Study Area. Spanish is the language spoken by the majority (267,314 people or 12.6%) of non-English speakers at home within the Study Area population. Indo European languages were spoken at home by 152,515 people (7.2%) of the Study Area population (USCB 2017e).

Figure 6-43 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Fairfield (29.5%) and New Haven (21.7%). New Haven also has several block groups that have overall social vulnerability greater than 75%. Middlesex and New London Counties had the lowest percentages of limited-English populations (10.6% and 13.5%, respectively) (USCB 2017e).

Table 6-15. People who Speak a Language Other than English at Home in the Connecticut Study Area by Census Block Group

Geographical Unit	Total Population Over Age 5	Total Population Who Speak a Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Fairfield	894,273	263,470	29.5	140,980	88,691	24,277	9,522
Middlesex	157,068	16,615	10.6	6,228	7,433	2,276	678
New Haven	817,055	177,335	21.7	103,415	46,326	18,564	9,030
New London	257,147	34,596	13.5	16,691	10,065	6,853	987
Study Area Total	**2,125,543**	**492,016**	**23.1**	**267,314**	**152,515**	**51,970**	**20,217**
Connecticut	**3,408,290**	**752,209**	**22.1**	**398,297**	**239,028**	**81,587**	**33,297**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Source: USCB 2017r, USCB 2017e

Figure 6-43. Percent of People Who Speak a Language Other than English at Home in the Connecticut Study Area by Census Block Group

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations. These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

6.4.6 Summary – Demographics and Socioeconomics

Connecticut's population is increasing but at a very slow rate. The State's population grew 0.6% since the 2010 Census, having added approximately 20,381 people. During the same period, the population of the U.S. grew 4%. While Connecticut is affected by the nationwide trend of aging population, the State still gains population from natural increase. Much of the slowdown in the State's population growth is a result of domestic out-migration, an accelerating trend in the State, as more people are moving out of the State than into the State. In 2018, approximately 21,509 people moved out; this loss was partially offset by a gain of approximately 16,494 residents from international migration, resulting in an overall population loss of approximately 1,215 (USCB 2019b).

Northeastern States have higher senior populations as compared to southern and western States. Connecticut, as well as the neighboring States of New York and New Jersey, is experiencing high senior migration losses as a result of national migration pattern toward the southern and western parts of the United States. Other reasons for migration losses include a sluggish economy, long-term unemployed workers seeking new job opportunities, corporate relocations, and high property and income taxes (Governing.com 2018).

There are four counties (Fairfield, Middlesex, New Haven and New London) in the Study Area. Between 2010 and 2017, the population of the Study Area grew 1.1%. Fairfield County grew 3.3% due to New Yorkers seeking to lower housing costs and its commuting distance to New York City. Middlesex and New London Counties declined in population by 0.9% and 1.2%, respectively. Growth in New Haven County was flat. In comparison, the population of the State grew at 0.6% and the Nation at 4.0% (USCB 2017a, USCB 2017d).

The population density of the Study Area was 991 persons per square mile in 2017, greater than the State (742 persons per square mile) and the Nation (91 persons per square mile), signifying that the coastal counties comprising the Study Area are more densely populated (USCB 2017d, USCB 2017c). Population densities in the Study Area ranged from 407 persons per square mile in New London County to 1,516 persons per square mile in populous Fairfield County (which contains the Bridgeport-Stamford-Norwalk, Connecticut metropolitan area) (USCB 2017d, USCB 2017c). Two other metropolitan areas (New Haven-Milford, Connecticut and Norwich-New London, Connecticut) are located within the Study Area.

According to the Connecticut State Data Center, the State's population is projected to grow 1.7% (3.7 million residents) by 2040. However, population growth in the Study Area is stagnant (0.0%), which is contrary to the national trend (16.4%). As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Connecticut Study Area is the only Study Area with no projected growth.(USCB 2017d, USCB 2017c, USCB 2018b, CTSDC 2017).

The State and the Study Area are aging. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.2% in Connecticut, and 5.3% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Projections by the year 2040 indicate this group's decline to 5.7% in the Nation. State and Study Area projections reveal a divergent trend as both the number and percentage of young children as compared to the general population are expected to increase in the State (5.6%) and the Study Area (5.8%) (USCB 2017b, USCB 2018b, CTSDC 2017).

The elderly represented 14.9% of the U.S. population, 16.0% in Connecticut, and 15.9% in the Study Area. The population of elderly is projected to rise, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S.; 17.3% in the State, and 17.1% in the Study Area. Three out of four counties in the Study Area project an increase in the elderly population, consistent with national trends. The sparsely populated Middlesex County had the largest percentage (18.4%) of elderly in 2017; a further increase to 22.5% is projected by 2040. Contrary to national trends, Fairfield County's elderly population is expected to decline 3.0% (from 140,926 in 2017 to 136,583) by 2040 (USCB 2017b, USCB 2018b, CTSDC 2017).

Homeownership in Connecticut was 66.6%, higher than the Nation (63.8%) and Study Area (66.0%). In 2017, the percentage of households in renter-occupied housing units in the State was 33.4% in the State and 34.0% in the Study Area (USCB 2017m).

In 2017, median home values were lower in the Study Area ($264,050) than the State ($270,100) but higher than the Nation ($193,500). Fairfield County had the highest median home value ($417,800); New London county had the lowest ($238,900) (USCB 2017l).

Housing affordability for low- and moderate-income workers is a problem in Connecticut. A large proportion of the State (28%) is considered extremely low income, and of these households, 67% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

Home values increased in the State (0.9%) but decreased in the three metropolitan areas located within the Study Area. In spite of the decrease, the market temperature of the metropolitan areas was still characterized as "hot to very hot" by Zillow (Zillow.com 2019l). Home vacancy rates in the Connecticut Study Area were 10.1%, higher than the State (9.7%) and Nation (12.2%), which may be attributed to vacation homes and/or investment properties used as short-term rentals in popular summer tourist destinations along the State's shoreline (USCB 2017g).

The Study Area has a total employment of 1.1 million jobs, representing approximately 62.1% of the total jobs in the State and 0.7% of the total jobs in the U.S. The dominant employment categories in the Study Area are educational services, and health care and social assistance (26.4%); professional, scientific, and management, and administrative and waste management (12.3%); retail trade (10.6%); and manufacturing (10.1%). In the Study Area, 9.0% of people work in arts, entertainment, and recreation, and

accommodation and food services, more than the State (8.5%) but less than the Nation (9.7%). Connecticut has a greater percentage of manufacturing jobs (10.6%) than the Nation (10.3%) and the Study Area (10.1%) (USCB 2017p).

The greater portion of jobs are located in Fairfield and New Haven Counties near the high-density MSAs of Bridgeport-Stamford-Norwalk and New Haven-Milford.

Connecticut's ocean economy ranked 15th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy. The Study Area had 56,299 maritime jobs, representing 99.6% of total maritime jobs in the State. New London County had the greatest number of maritime jobs (19,243), representing 34.4% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). According to Connecticut Department of Labor, the State has recovered 86.1% of the 120,300 jobs lost in the Great Recession (CT DOL 2020).

In 2017, median and per capita income in the Study Area were higher than the State at $75,542 and $42,274, respectively. Median household income for the Study Area's counties ranged from $89,773 (Fairfield County) to $64,872 (New Haven County); per capita income ranged from $53,433 (Fairfield County) to $35,085 (New Haven County) (USCB 2017k, USCB 2017n). Population decline due to out-migration of high-income residents has resulted in loss of wealth for the State.

The average unemployment rate in the Study Area was 7.4%, more than the State (7.2%) and the Nation (6.6%). Within the Study Area, unemployment rates ranged from 5.1% in Middlesex County to 7.7% in New Haven County in 2017 (USCB 2017h).

Despite favorable income, employment, and housing metrics, the economic and employment current situation and horizon in Connecticut is unfavorable, according to an article in *The Atlantic*. The State is suffering from a $2 billion State budget deficit; high property, income, and sales tax; loss of high-paying jobs; gain of low-paying jobs; decline of prime working age population; and increasing income disparity between rich and poor. Additionally, corporations and corporate headquarters (Aetna and General Electric, for example) once attracted to Connecticut when big cities were dangerous and unappealing places to live and work, have left the State along with a steady stream of out-migrating residents (theatlantic.com 2017).

In the Study Area, 27.1% of the working-age population earned only a high school diploma; 43.2% earned a college or advanced degree. These rates are similar to the national only high school graduation rate (27.7%) but exceeds the Nation's college and advanced degree rate of 36.9 (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 2,244,337 people living in the Study Area, approximately 751,230 (33.5%) are minority. Of the 1,586 block groups in the Study Area, approximately 27.6% (438 block groups) are considered minority populations. Each of the counties contain census block groups with high percentages of minority populations. Fairfield and New Haven Counties had the highest percentage of minority block groups at 31.7% and 30.5%, respectively. New London and Middlesex Counties had the lowest percentage minority block group populations at 15.4% and 9.3%, respectively. Within the Study Area the largest minority group is Black or African-American (10.1%) followed by Hispanic or Latino (9.4%) (USCB 2017f).

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 2,182,505 people for whom poverty status is determined living in the Study Area, approximately 356,276 (16.3%) individuals have incomes less than 150% of the poverty level. Of the 1,586 census block groups in the Study Area, approximately 13.0% (206 block groups) are considered low-income populations. Fairfield and New Haven Counties have

similar percentages of low-income block groups at 13.0% and 15.0%, respectively. New London and Middlesex Counties have smaller percentages of low-income block groups (10.1% and 6.8%, respectively) (USCB 2017o).

Resource-dependent populations include four fishing communities and subsistence populations in the Study Area (NOAA Fisheries 2019g). Connecticut has two federally recognized tribes in New London County (Mashnantucket (Western) Pequot Tribal Nation and Mohegan Tribe of Indians of Connecticut) and three other State-recognized tribes(Golden Hill Paugussett, Paucatuck Eastern Pequot, and Schaghticoke) (Reinhart 2002). All but the Schaghticoke are located within the Study Area.

The output of the CDC SoVI indicates that all counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area and less densely populated inland areas. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Fairfield and New Haven Counties. Many communities along the coast are at risk for sea level rise and other coastal hazards (CDC 2016, USCB 2017f, USCB 2017o).

Populations that speak a language other than English are present within the Study Area. In the Study Area, 23.1% of the population does not speak English at home. Spanish is the language spoken by the majority (267,314 people or 12.6%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 152,515 people (7.2%) of the Study Area population (USCB 2017e). Fairfield County had the highest percentage (29.5%) of this population within the Study Area. Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future OCS-related project analysts during their site planning process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise, storm surge are felt at the local level (by changing drainage, patterns of land use, etc.) (Siegel et al. 2001).

6.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

6.5.1 Regional Observations

Water resources in the Study Area include Long Island Sound, rivers, floodplains, and wetlands. These water bodies provide critical habitat for the Atlantic sturgeon (USFWS 2019i, USFWS 2019j). The water resources in the Study Area provide valuable ecosystem services and potable water for the community and are also frequently recreation destinations.

Sea level rise is a cause for concern in the Study Area. There are already over 7,000 properties at risk from frequent tidal flooding in Connecticut. CIRCA recommends that Connecticut plan for up to 20 inches (1.67 feet) of sea level rise higher than the national tidal datum in Long Island Sound by 2050 and that it is likely that sea level will continue to rise after that date (O'Donnell 2019). In Bridgeport and other coastal Connecticut cities, nuisance flooding is already an issue in association with high lunar cycle tides that are typically over 1.5 feet higher than normal high tides. As sea levels rise, the frequency of nuisance flooding will also increase, and it is anticipated that flooding could occur on a monthly basis in some areas (Bonsack 2018, SeaLevelRise.org 2019). Hurricanes and nor’easters also contribute to

flooding via storm surge, which when combined with sea level rise and/or high lunar cycle tides can further exacerbate flooding issues.

The predominant land cover type within the Study Area is a combination of forest and urban development. Fairfield and New Haven Counties are a combination of forest and urban development, while Middlesex and New London Counties are primarily forest. As described previously, "Forest" land cover in the State of Connecticut could range from natural forested areas to neighborhoods in suburban areas. These are likely indicative of wooded suburban landscapes.

In Connecticut, the State's Office of Responsible Growth is responsible for preparing a State Plan of Conservation and Development every 5 years. This plan provides the policy framework for decisions regarding future growth and development in the State (CT OPM 2019a, CT OPM 2019b). However, there are no county governments. Counties serve only as dividing lines for the State's judicial systems; thus, towns are responsible for all local government activities. There are Regional Councils of Governments that address regional issues concerning infrastructure, land use, and economic development, typically outlined in a regional conservation and development plan. These designated planning regions provide a geographical framework whereby municipalities can address and coordinate common interests with State plans and programs. The State's Office of Policy and Management can designate or re-designate the boundaries of a logical planning region; thus, the municipalities within each Regional Council of Government can vary (CT OPM 2019c). Each Regional Council of Government has their own Conservation and Development Plan.

Multiple business opportunities and incentives exist in the Study Area through Connecticut State agencies DECD and DRS. These services aim to provide businesses a positive and competitive business climate that also promotes the entirety of the Connecticut business economy. The CBIA is a collection of businesses and companies across industries that promote Connecticut businesses and advocate at local and State government for a positive business climate.

A variety of transportation resources are available throughout the Study Area including roadways, railroads, airports, and ports. Surface transportation routes in the Study Area are influenced by the area's shape and the large total of coastline miles compared to the area's size. Interstate 95 and a railroad traverse the entire coastline of the Study Area and effectively connects to major markets in both New York, New York and Boston, Massachusetts. The East Coast Greenway runs parallel along the western half of Interstate 95. U.S. Highways 6 and 7 cross the northwestern section of the Study Area. Interstates 684, 91, and 395 all traverse north to south and split the Study Area into thirds. Other railroads run along the several rivers found in the Study Area; the rivers flow in a north to south direction.

Northeastern States have higher senior populations as compared to southern and western States. Connecticut, as well as the neighboring States of New York and New Jersey, is experiencing high senior migration losses as a result of national migration pattern toward the southern and western parts of the U.S. According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather (Frey 2019). Many people moving out have incomes of $150,000 and up, are nearing retirement, and are seeking warmer climate and lower taxes (Realprocity.com 2019). Other reasons for migration losses include a sluggish economy, long-term unemployed workers seeking new job opportunities, corporate relocations, and high property and income taxes (Maciag 2016). Population decline due to out-migration of high-income residents has resulted in loss of wealth for the State.

Population growth in the Study Area is stagnant (0.0%), illustrating an opposing pattern to that of the State (1.7%) and Nation (16.4%). Fairfax and Middlesex Counties are projected to have small population

losses while New Haven and New London Counties are projected to have small population increases over the same period (USCB 2017d, USCB 2017c, USCB 2018b, CTSDC 2017).

Connecticut has a shortage of approximately 79,172 rental homes affordable and available to extremely low-income households (National Low Income Housing Coalition 2019a)

Despite favorable income, employment, and housing metrics, the economic and employment current situation and horizon in Connecticut is unfavorable, according to an article in *The Atlantic*. The State is suffering from a $2 billion State budget deficit; high property, income, and sales tax; loss of high-paying jobs; gain of low-paying jobs; decline of prime working age population; and increasing income disparity between rich and poor. Additionally, corporations and corporate headquarters (Aetna and General Electric, for example) once attracted to Connecticut when big cities were dangerous and unappealing places to live and work, have left the State along with a steady stream of out-migrating residents (theatlantic.com 2017).

6.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Future project analysts should consider the compatibility of projects with the appropriate Regional Council of Government's Conservation and Development Plan once site-specific information is known.
- The business opportunities and incentives through Connecticut State agencies DECD and DRS and the CBIA should be considered during potential future project analysis. Several Opportunity Zones are located within the Study Area, and these areas could be receptive to potential future projects.
- Given the reported challenges the State's economy has experienced in recent years and the out-migration that has resulted in a loss of wealth for the State, it is possible that potential future projects that would offer opportunities for economic stimulus and increased jobs could be well received in the State.
- Fishing communities in the Study Area are concentrated in New London County; however, they likely fish areas throughout Long Island Sound and in the Atlantic Ocean. The proximity of potential future projects to these communities should be considered during analysis to minimize potential impacts to these communities.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 7

NEW YORK

7 New York

7.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of New York to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS-related planning areas. Chapter 1 of this document provides additional background, National, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

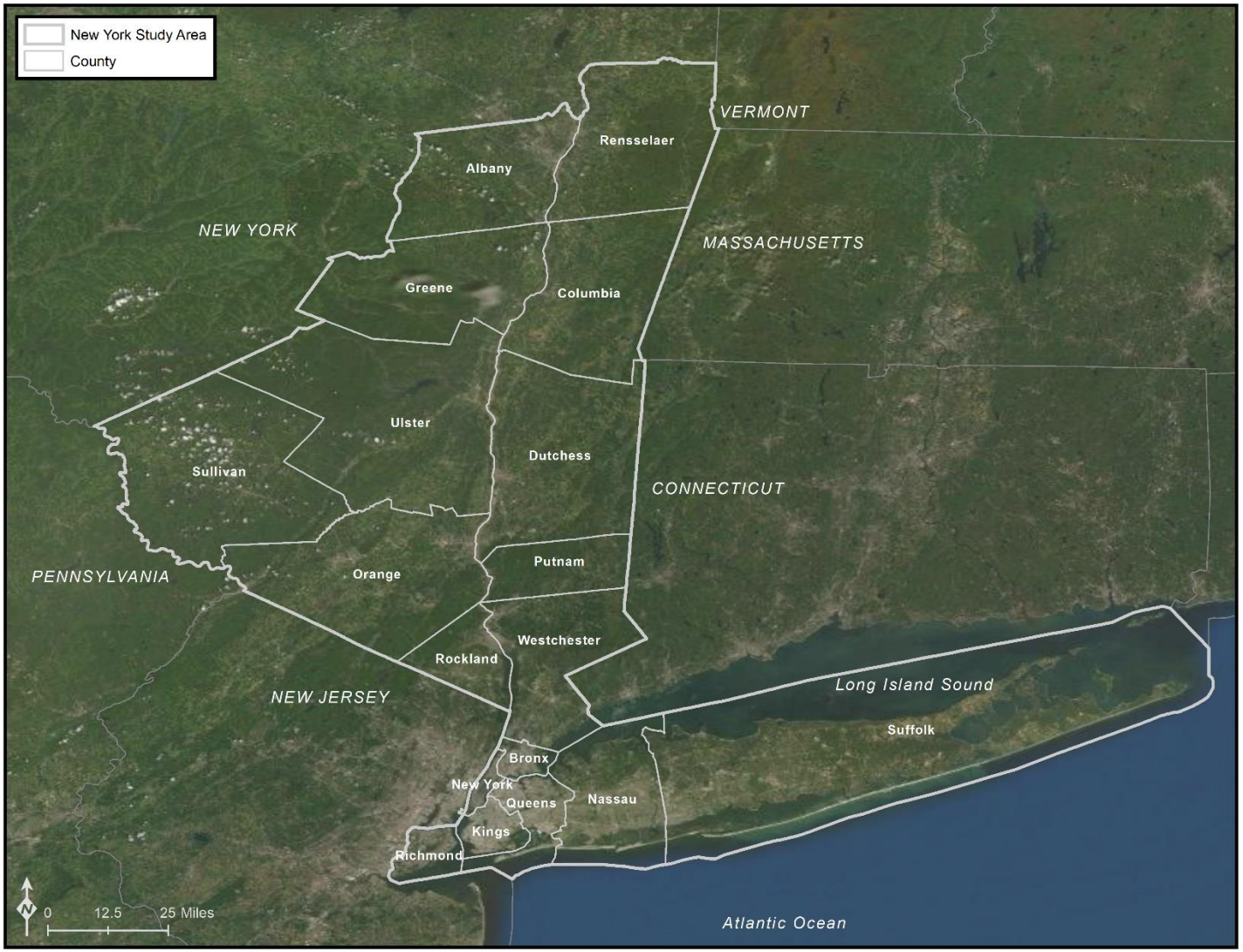
New York is located near the Mid-Atlantic Planning Area. A total of 18 counties are located within the New York Study Area (Study Area) along the New York coastline. Counties range in population size from around 61,481 in Columbia County to almost 3 million (2,860,664) in Kings County. New York City, with a population of over 8.5 million, is the only city in the Study Area with a population over 250,000. Other cities with populations over 100,000 are Yonkers with a population of 204,204 and Albany with a population of 100,742 (ESRI 2019a). New York cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. The State of New York has a unique coastline characterized by dense urban development and protected by Long Island and Long Island Sound. The New York coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes 18 counties located within the State of New York. The Study Area is shown in Figure 7-1 and Figure 7-2 and includes the following counties:

- Albany
- Bronx
- Columbia
- Dutchess
- Greene
- Kings
- Nassau
- New York
- Orange
- Putnam
- Queens
- Rensselaer
- Richmond
- Rockland
- Suffolk
- Sullivan
- Ulster
- Westchester

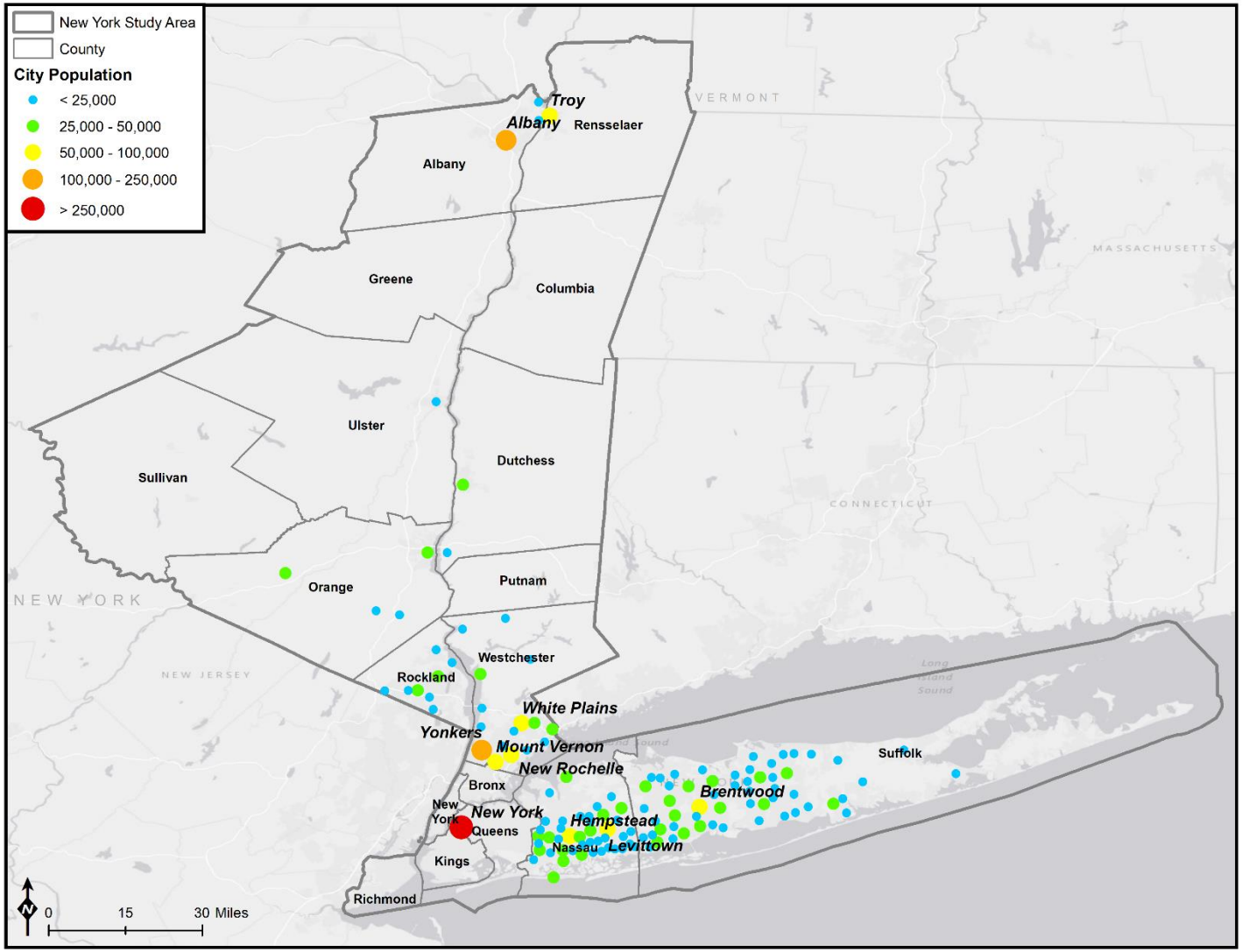
7.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of New York are described below.



Source: ESRI 2019a

Figure 7-1. State of New York Study Area



Source: ESRI 2019a

Figure 7-2. Cities in the New York Study Area

After canvasing all Nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- New York State Geographic Information System Clearinghouse
- New York Office of Planning and Development
- New York Bureau of Research and Information Services
- New York State Department of Environmental Conservation

The metadata database for New York-specific State, county, and local data sources is included in Appendix A.

7.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

7.2.1 Water Resources

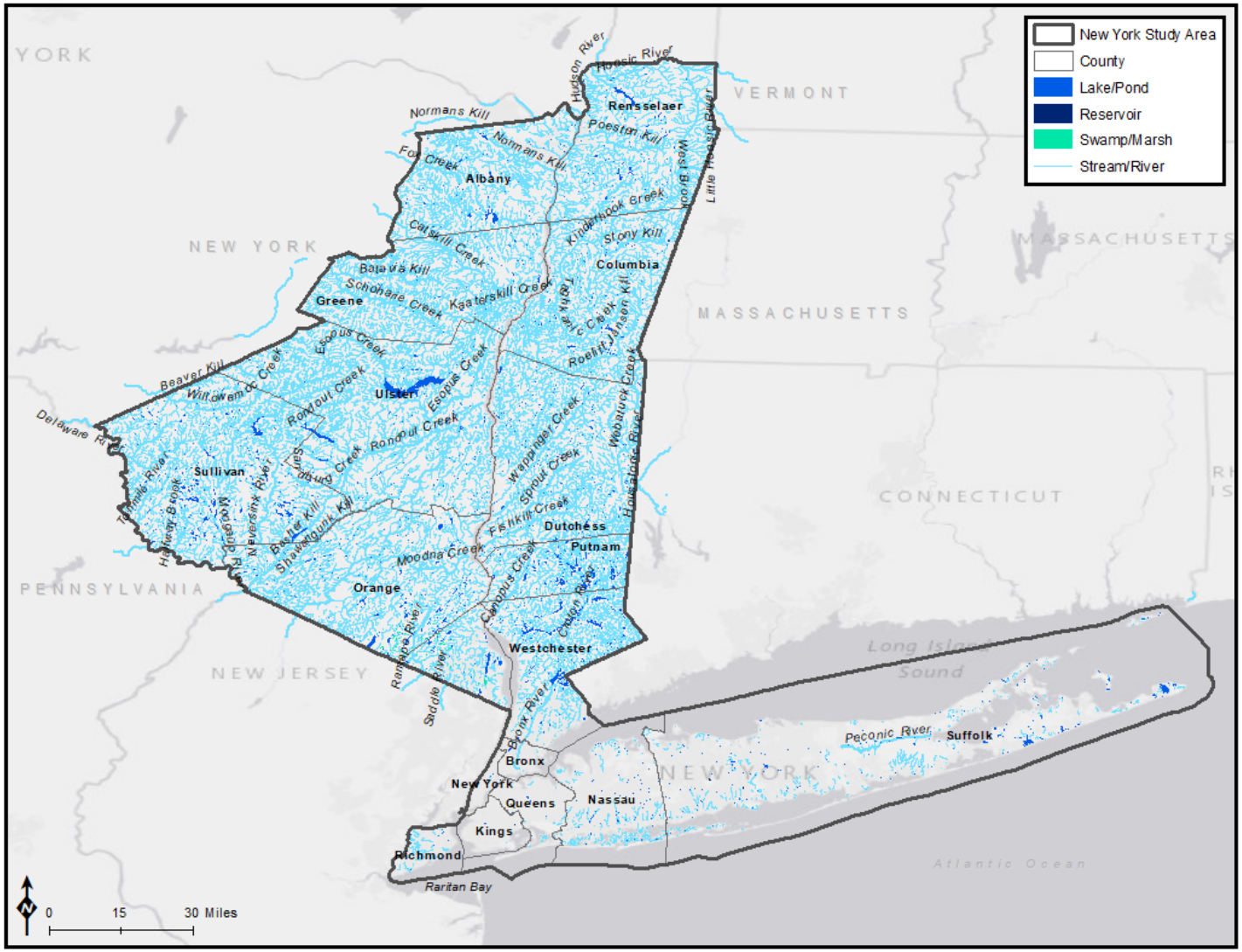
New York's water resources include Long Island Sound, rivers and reservoirs, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

7.2.1.1 Bays

Long Island Sound (the Sound), shown in Figure 7-3, is one of New England's largest estuaries, which is a body of water where fresh and salt water mix. Located in one of the most populated areas of the U.S., and in both New York and Connecticut, the Sound is a narrow water body about 110 miles long and up to 21 miles wide. The Sound, along with the Peconic Estuary of Long Island and the New York-New Jersey Harbor, are part of the National Estuary Program. The Sound's 1,320-square mile embayment averages 63 feet in depth, overall receiving 90% of its fresh water from the Thames, Housatonic, and Connecticut Rivers (NYSDEC 2019a, NYSDEC 2019b, NYSDEC 2019C, NYSDEC 2019d, CT DEEP 2015, LISS 2020a, LISS 2020b, LISS 2010).

Protected by land on three sides, the Sound nourishes a wealth of estuarine ecosystems where fresh and salt water mix providing rich, diverse habitats along with pollution mitigation and erosion control. Concerns for the health of these systems include pollution along with loss and degradation of habitat (CT DEEP 2015, LISS 2020a, NYSDEC 2019a).

Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Dead zones may result from a confluence of tides and currents, along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. The dead zone in Long Island Sound occurs in bottom waters from mid-July through September with more severe hypoxia in the stratified, nutrient-rich western waters of the Sound. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (NYSDEC 2019b, USEPA 2017).



Source: USGS 2019e

Figure 7-3. Hydrography in the New York Study Area

Raritan Bay is adjacent to the southern side of the Study Area. Fed by the Raritan River in northern New Jersey and located between Middlesex and Monmouth Counties and Staten Island, New York, Raritan Bay is an important urban estuary. Greater Raritan Bay, encompassing Raritan Bay, both New York and New Jersey shores, and Sandy Hook Bay to the east, stretches over 109 miles with 33,500 acres of inshore bays. The Arthur Kill tidal strait joins Newark Bay to the north to Raritan Bay, making the Bay an important waterway to the Atlantic Ocean. Because the natural bay is less than 20 feet deep, dredged shipping channels range from 80 to 1400 feet wide and between 10 and 35 feet deep (USFWS 1997a).

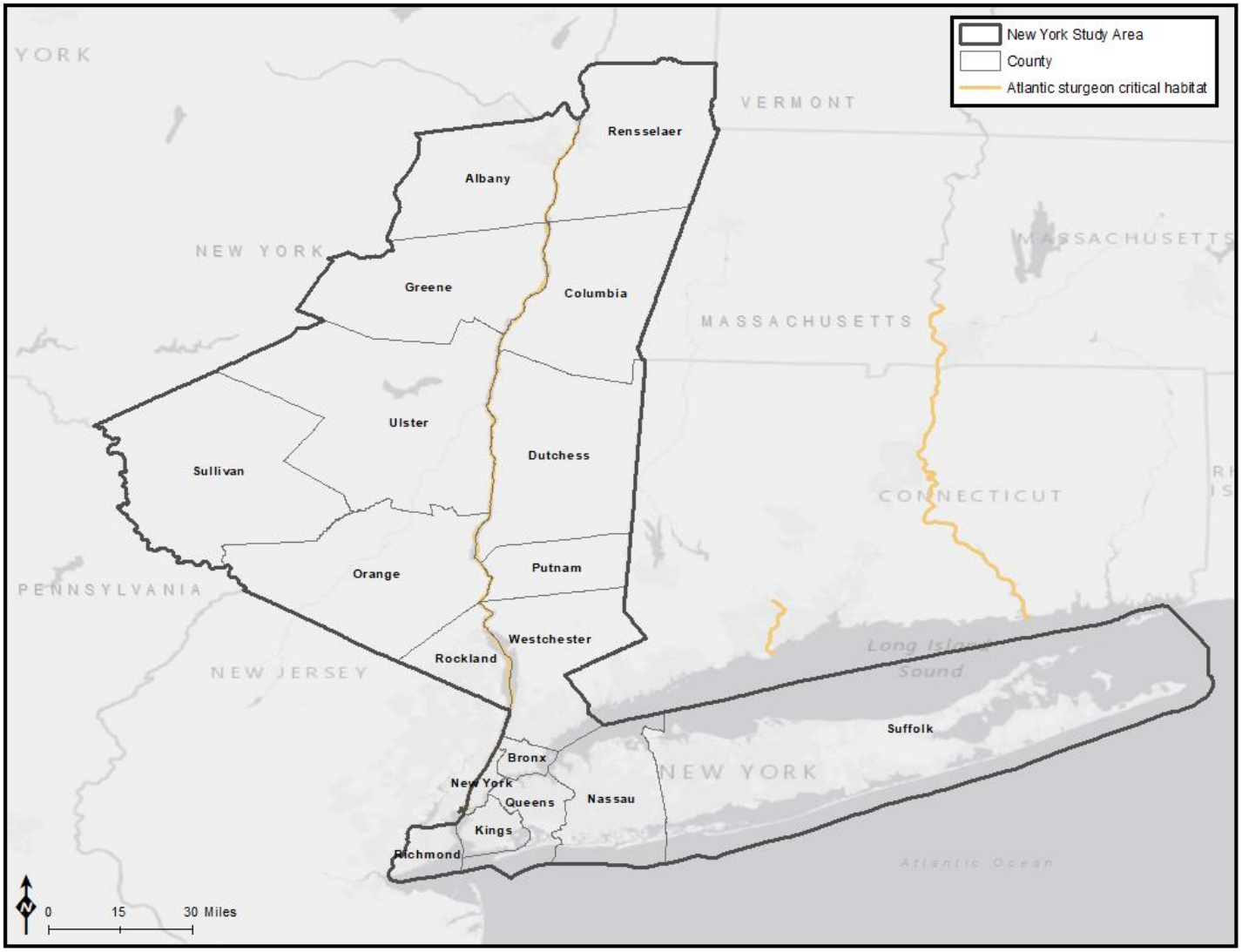
Restoration efforts in Raritan Bay to help remediate effects from toxins released from historic waste sites and spills in the interconnected bays, rivers, and straits along with plans to prepare and swiftly respond to spills further improve this ecological and economic resource. Although restrictions on the consumption of some seafood remain in place, a variety of pollution reduction programs has improved the health of the estuary. As a result of this improvement, the Bay is home to more than 200 species of fish, including species using the Bay to migrate between the rivers and the ocean. In addition, the greater Bay, including Staten Island and Sandy Hook, hosts more than 20,000 migrant shorebirds with peaks in June and August and with sanderling, ruddy turnstone, and semipalmated sandpiper comprising about 85% of these migratory shorebirds. An important part of the Atlantic Flyway, the Bay hosts over 60,000 migratory and mid-winter waterfowl including greater scaup, Canada goose, American black duck, and mallard (USFWS 1997a, NOAA 2019f).

As shown in Figure 7-4, the New York coastal area within the Study Area includes designated critical habitats for the New York Bight distinct population segment of the Atlantic sturgeon in the Hudson River. Figure 7-4 (USFWS 2019i, USFWS 2019j). The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In New York, the designated critical habitat of the Atlantic sturgeon is in the Hudson River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

7.2.1.2 Rivers and Reservoirs

Within the Study Area, the major drainage basins include the Mohawk River, the Hudson River Estuary, the Delaware River, the New York-New Jersey Estuary, the Peconic River, the South Shore Estuary, and the New York City Watershed, and the Arthur Kill tidal strait; all ultimately flowing into the Atlantic Ocean. Figure 7-3 shows the major surface water bodies within the Study Area. Major rivers in the Study Area include the Hudson and the Delaware (NYSDEC 2019e).

Designated as a National Heritage River in 1998, the Hudson River is a major river in the Study Area. Flowing southward from the Adirondacks on its 315-mile journey to the New York-New Jersey Harbor and the Atlantic Ocean, the Hudson is joined by the easterly flowing Mohawk River about 10 miles above the State capital of Albany. Reaching Albany, the remaining 153 miles of the Hudson River are an estuary, a tidally influenced body with influx from both salt and fresh water. The USACE dredges and maintains the shipping channel south of Albany. USACE operations on the Hudson also include the construction and maintenance of a lock and dam at Troy, connecting the Hudson River with Lake Erie. The Hudson River Estuary usually has two daily sets of tides, two high and two low tides. With nutrients from the land and varying degrees of salinity, the Hudson River Estuary is rich with tidal wetlands and biological diversity (NYSDEC 2019f, NYSDEC 2019g, USACE 2017b). In addition, as shown in Figure 7-4, the Hudson River also provides critical habitat for the Atlantic sturgeon in the Study Area.



Sources: USFWS 2019i, USFWS 2019j

Figure 7-4. Critical Habitat within the New York Study Area

Another major river in the Study Area is the Delaware River. Flowing south 330 miles from the Catskill Mountains of New York through Pennsylvania, New Jersey, and Delaware to enter the Atlantic at Delaware Bay, the Delaware River is the longest un-dammed river in the U.S. east of the Mississippi. More than 2,000 tributaries feed into the Delaware, including the Schuykill. The Delaware provides water for over 15 million people (USGS 2020). Management of this important, multistate resource is managed through the Delaware River Basin Commission. Composed of the four State governors and a Federal representative, the Delaware River Basin Commission manages releases from reservoirs with consideration of water supply, water quality, and ecosystem sustainability while managing flooding risk and damage (NYSDEC 2019h).

Over 8 million people in New York City receive their water supply, including 1.2 billion gallons a day of drinking water, from a system of 19 connected reservoirs; much of it from the Delaware River Basin. Located northwest of the Study Area in Delaware County, the Cannonsville and Pepaction Reservoirs are joined by water tunnels to the Roundout Reservoir in Sullivan County. The Neversink Reservoir in Sullivan County is also connected by a water tunnel to the Roundout, which is in turn connected via an aqueduct to the West Branch Reservoir in Putnum County, which is in turn connected via an aqueduct to the Kensico Reservoir and then to the New York distribution system. Releases to the Delaware River from the Cannonsville, Pepaction, and Neversink Reservoirs via the West Branch Delaware, East Branch Delaware, and Neversink Rivers, respectively, are managed by the DRBC (NYSDEC 2019h, NYSDEC 2019i, NYSDEC 2019j).

The Arthur Kill tidal strait is a 10-mile shipping channel connecting Newark Bay to Raritan Bay flowing along the border between New Jersey to the west and Staten Island, New York to the east. Because waterborne, fine-grained sediments regularly accumulate interfering with safe navigation, the channel is regularly dredged to maintain a 600-foot wide, 40-foot deep channel for ocean going vessels. Ports include the Staten Island New York Container Terminal and the New Jersey Conoco Phillips Oil Terminal. Average flushing time for the strait is two weeks with an average diurnal tidal range of more than 5 feet. Although surrounded by densely populated and highly industrial areas, the Arthur Kill retains natural stretches supporting significant wildlife populations. Marshlands and wetlands along the Arthur Kill include important nesting and foraging areas for egrets, herons, ibises, and gulls along with migratory stops for songbirds and raptors (USFWS 1997a, NJCF 2018, USACE 2018b).Another source of water in New York comes from groundwater, with the most productive aquifers located in unconsolidated sand and gravel. About a quarter of Queens, New York receives their drinking water from groundwater. The Long Island Aquifer, spanning the complete island, supplies the majority of the island and is one of the most productive aquifers in the U.S. (NYSDEC 2019h, NYSDEC 2019i, NYSDEC 2019k).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of New York has approximately 51,790 miles of river, only 73.4 miles, ascribed by the Upper Delaware River along the Pennsylvania border, are designated wild and scenic rivers; there are no designated wild and scenic rivers in the Study Area (USFWS 2019a).

7.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to

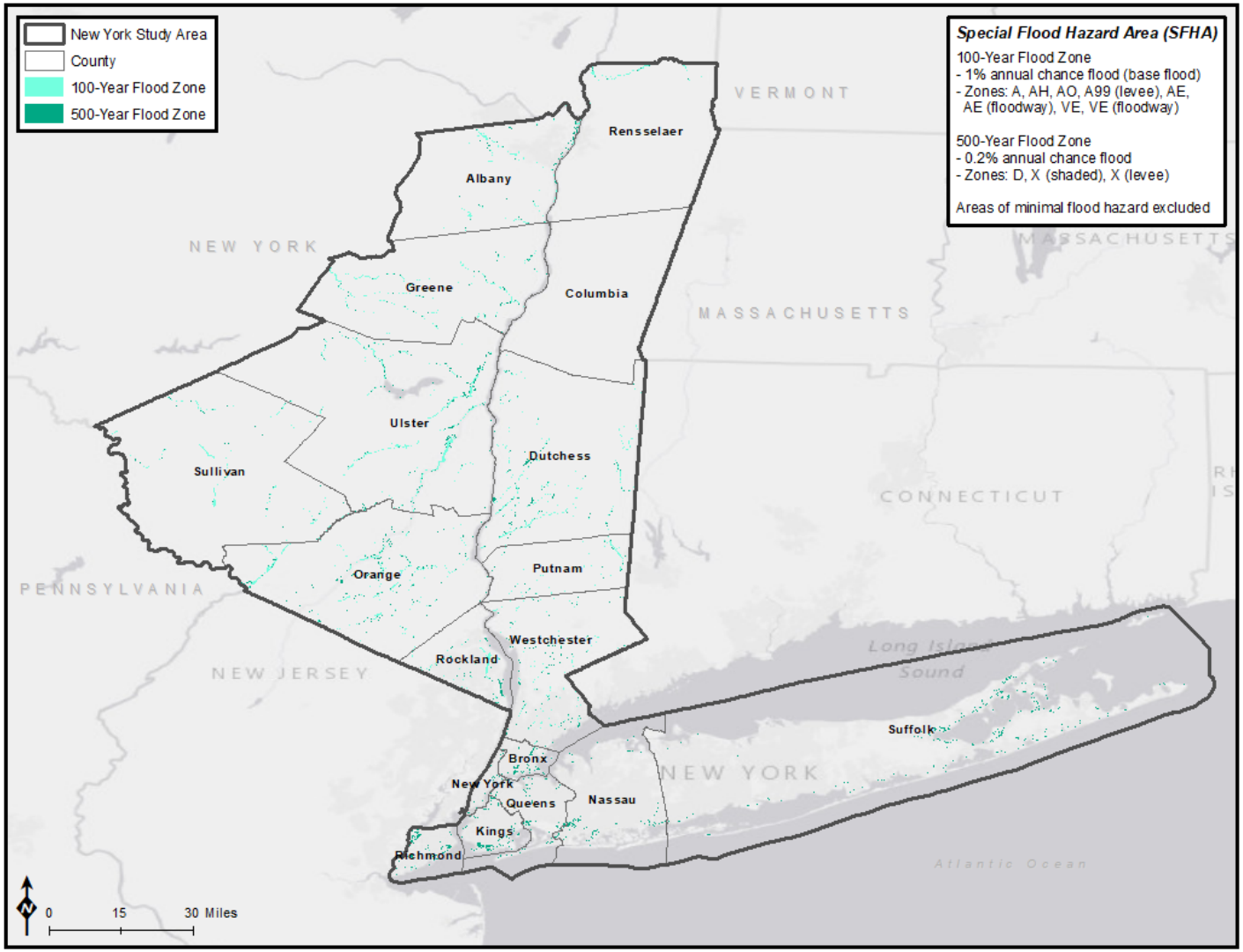
EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 7-5, floodplains comprise a small portion of land area in most counties in the Study Area. Table 7-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 7-1. Floodplains in the New York Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Albany	20,158	6.0	1,839	0.5
Bronx	4,678	17.4	1,932	7.2
Columbia	56	0.0	0	0.0
Dutchess	47,858	9.4	3,644	0.7
Greene	21,667	5.2	1,776	0.4
Kings	6,931	15.6	2,759	6.2
Nassau	50,775	27.9	2,470	1.4
New York	5,334	36.8	943	6.5
Orange	55,066	10.6	4,718	0.9
Putnam	13,780	9.3	497	0.3
Queens	11,913	17.1	2,335	3.4
Rensselaer	8,249	2.0	421	0.1
Richmond	8,628	23.4	2,587	7.0
Rockland	20,533	18.5	1,394	1.3
Suffolk	116,120	19.9	7,213	1.2
Sullivan	35,627	5.7	1,347	0.2
Ulster	58,188	8.1	4,282	0.6
Westchester	44,297	16.1	3,099	1.1
Study Area Total	**529,859**	**9.8**	**43,256**	**0.8**

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: FEMA 2019b

Figure 7-5. Floodplains of the New York Study Area

7.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands) and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 7-6, wetlands are a large part of the land area in many of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 7-2 details the wetland acreage in the Study Area along with other water resources (FGDC 2013, USFWS 2019c).

Providing a rich mix of fresh and salt water, New York estuaries include a wealth of wetlands. In addition to Long Island Sound, unique estuary systems in New York include the Peconic Bay, the Long Island south shore bays, the New York-New Jersey Harbor, and the Hudson River Estuary. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as habitat restoration (NYSDEC 2019a, NYSDEC 2019b, NYSDEC 2019C, NYSDEC 2019d, NYSDEC 2019l, PEP 2019, PEP 2020). As such, these are important natural and cultural resource within the Study Area.

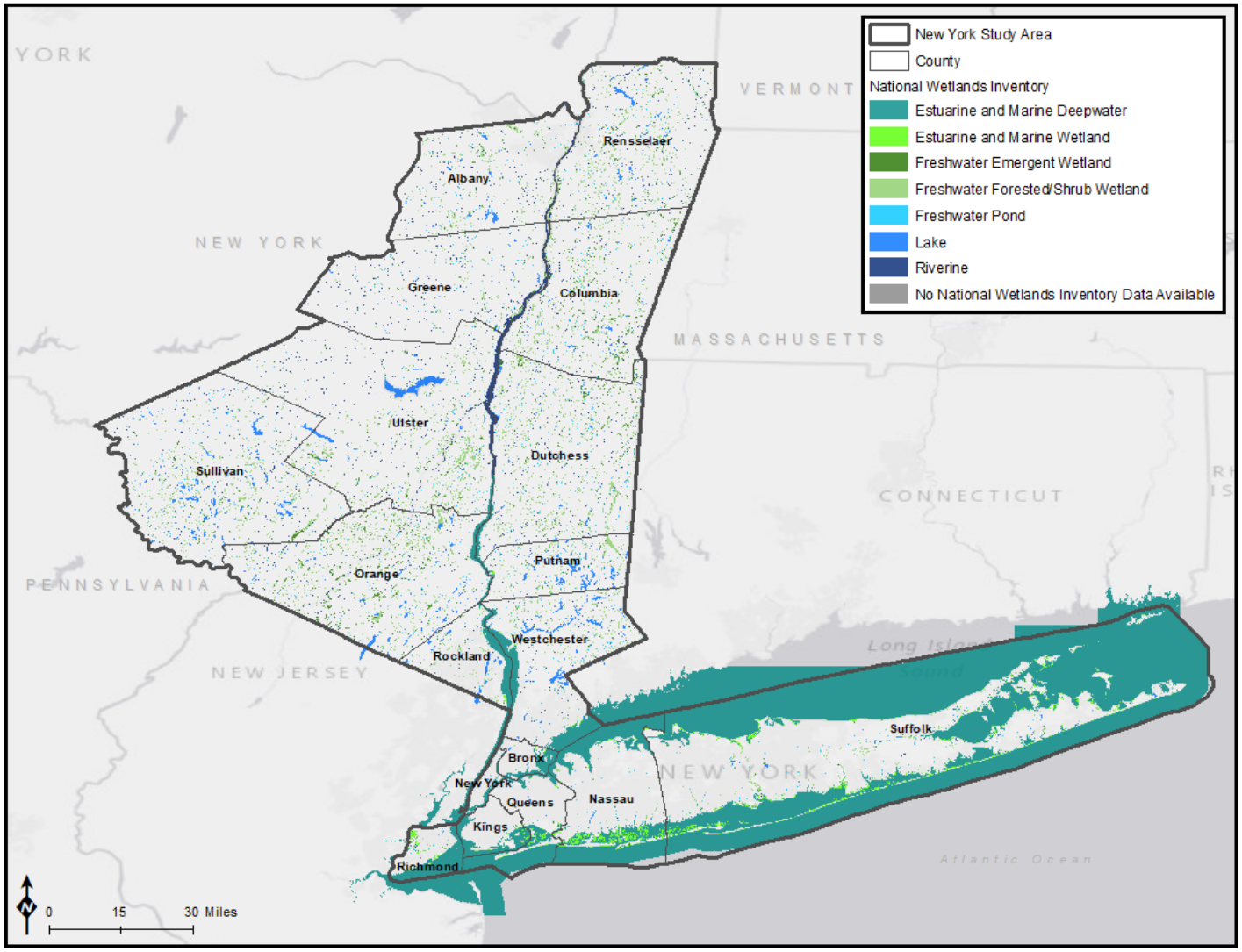
7.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods because higher seas raise the launch pad for storm surge (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in New York coastal areas reflects the National trend for increasing population growth in the coastal areas. The socioeconomic impacts of this relationship are discussed in Chapter 7.4. Further, land subsidence increases the rate of relative sea level rise in areas with certain geological characteristics (Eggleston and Pope 2013).

7.2.2.1 Sea Level Rise

Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.12 inches/year (NOAA 2019b). Figure 5-6 shows NOAA's results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in New York primarily along the southern side of Long Island, at the Lower and Upper Bays to the Hudson River, and along the Hudson River north almost to Vermont (NOAA 2018a). These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels.



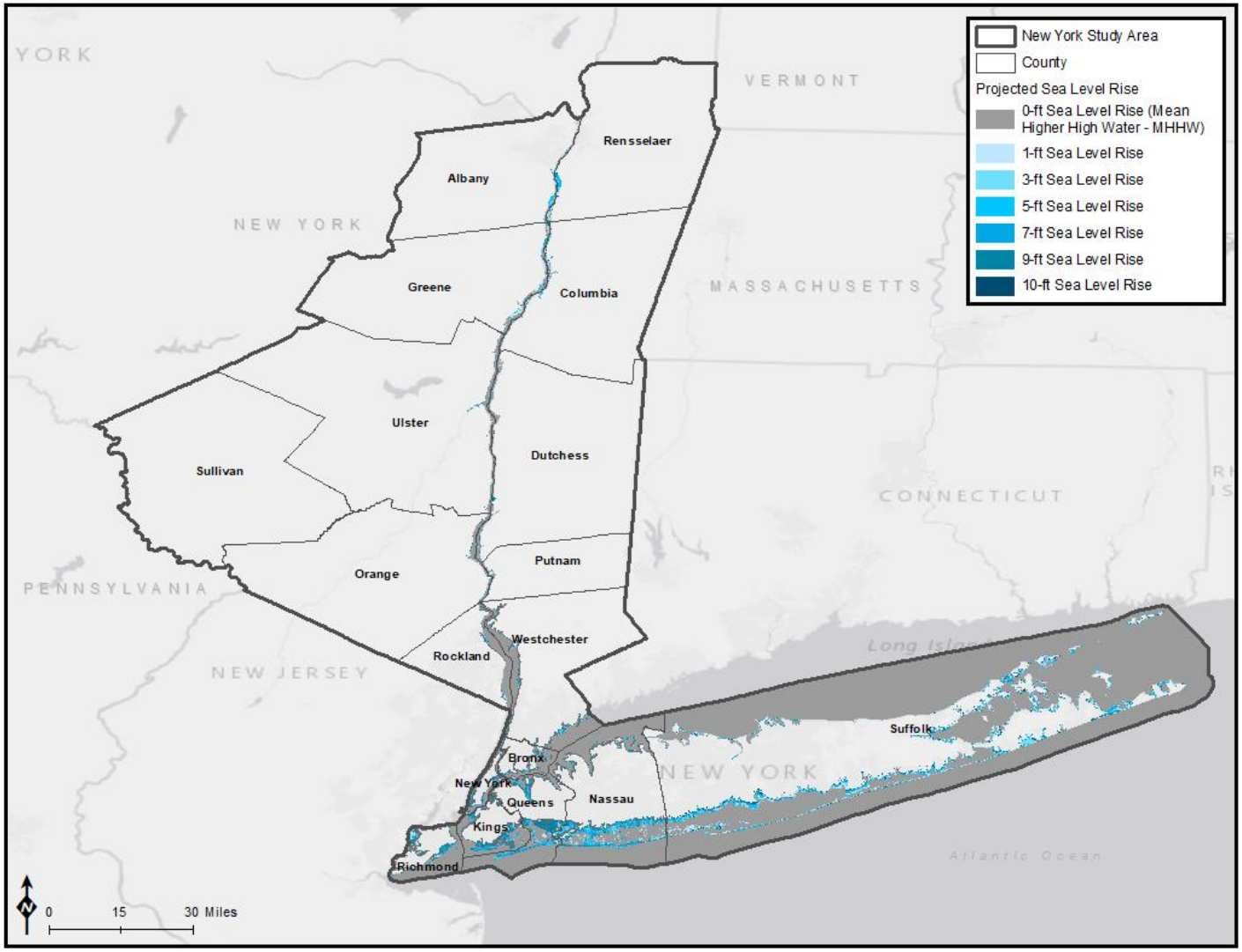
Source: USFWS 2018a

Figure 7-6. Wetlands in the New York Study Area

Table 7-2. Wetlands in New York Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Albany	21,096	0	2,511	7,789	0	4,073	1,848	4,875
Bronx	10,460	272	21	45	9,953	96	41	32
Columbia	38,529	0	7,446	16,268	0	2,194	2,911	9,712
Dutchess	56,005	45	7,911	23,769	5,074	3,373	4,172	11,660
Greene	19,629	0	1,878	4,087	0	1,306	2,073	10,285
Kings	18,654	1,009	21	18	17,543	45	16	2
Nassau	114,709	10,208	243	866	101,779	405	895	314
New York	7,094	20	0	0	6,938	95	40	1
Orange	54,338	51	10,951	23,068	4,921	7,597	3,537	4,214
Putnam	20,014	281	888	7,299	1,420	7,440	1,303	1,384
Queens	45,506	2,256	119	73	42,746	163	119	31
Rensselaer	33,488	0	4,494	14,714	0	5,201	2,305	6,775
Richmond	32,228	2,334	244	595	28,677	50	207	120
Rockland	21,439	493	504	2,857	13,481	2,840	582	682
Suffolk	953,418	20,790	966	7,491	918,941	1,940	2,510	780
Sullivan	46,788	0	4,246	18,613	0	13,896	3,425	6,608
Ulster	58,443	7	4,873	22,034	1,465	11,305	3,414	15,345
Westchester	56,429	553	634	8,073	32,424	9,902	2,445	2,397
Study Area Total	**1,608,267**	**38,318**	**47,950**	**157,660**	**1,185,362**	**71,919**	**31,842**	**75,215**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.



Source: NOAA 2018a

Figure 7-7. Projected Sea Level Rise throughout the New York Study Area

Sea level rise in the Study Area is complicated by subsidence and ocean currents. Land subsidence in the New York City area has been roughly 3-4 inches per century, which is primarily due to the Earth's crust rebounding from the last Ice Age. The relative strength of the Gulf Stream contributes to local variations in ocean surface elevation that also affects sea level rise. As a result, the New York rate of sea level rise is relatively high (Kahn 2012). New York has experienced at least a foot of sea level rise since 1900 (averaging 0.101 inches/year), mostly due to expansion of warming ocean water (NYSDEC 2019m). Currently, rates of sea level rise on New York State's coastlines have ranged across the region from 0.86 to 1.5 inches per decade, averaging 1.2 inches per decade since 1900 (0.12 inches/year) (NYSERDA 2011).

Based on conservative Intergovernmental Panel on Climate Change (IPCC) report methods, NOAA projects 12-23 inches of sea level rise by 2080, which is between 0.176 and 0.338 inches per year. Factoring in observations of accelerated ice sheet melt and paleoclimate data, the projection increases to 41-55 inches of sea level rise by 2080, which is between 0.603 and 0.809 inches per year (Kahn 2012). A different report projects a sea level rise of 37-55 inches by the 2080s while accounting for accelerated ice melt (NYSERDA 2011). Projections of sea level rise are obviously highly variable depending on the factors considered in the modelling methods. By another account, by 2100, scientists project sea levels 18-50 inches higher than today along New York's coastlines and estuaries, though a rise as high as 75 inches could occur (NYSDEC 2019m).

The New York State Sea Level Rise Task Force (Task Force), established in 2007, assessed sea level rise impacts and identified the greatest threats to coastal communities and natural resources in its Final Report issued early in 2011. The Task Force was charged with summarizing what is known about the impact of sea level rise and recommending actions that will both protect coastal ecosystems and help human coastal communities to increase resilience and adapt to rising sea levels. Because of the highly developed nature of the coast in New York State, a considerable portion of population, private property, and infrastructure will be potentially at risk of enhanced inundation and flooding due to sea level rise. (NYSDEC 2019m, NYSERDA 2011, NYSSLRTF 2010). The following is a summary of the identified threats.

- Increased frequency and intensity of severe flooding and storm surge damage, not only to communities and infrastructure but also to critical ecosystems that buffer against floods, protect drinking water and provide habitat for important species. Flooding at the level currently associated with the 100-year flood may occur about four times as often by the end of the century, based on the more conservative IPCC-based, sea level rise scenario.
- Increased erosion of beaches, barrier islands, and bluffs, resulting in changes to sediment supply pathways.
- Frequent or permanent inundation of low-lying areas, including flooding of wetlands and other valuable coastal habitats.
- Saltwater infiltration of surface waters, aquifers, and infrastructure.
- Possible compromise of low-lying sewage, wastewater, transportation, communication, and energy infrastructure and systems. Many of the entrances to bridges and tunnels, segments of the highways and railroads, and similarly, many wastewater treatment plants and sewer outfall systems lie at or below the 10-foot contour and are potentially vulnerable to severe present-day coastal storm flooding, let alone projected higher future levels.

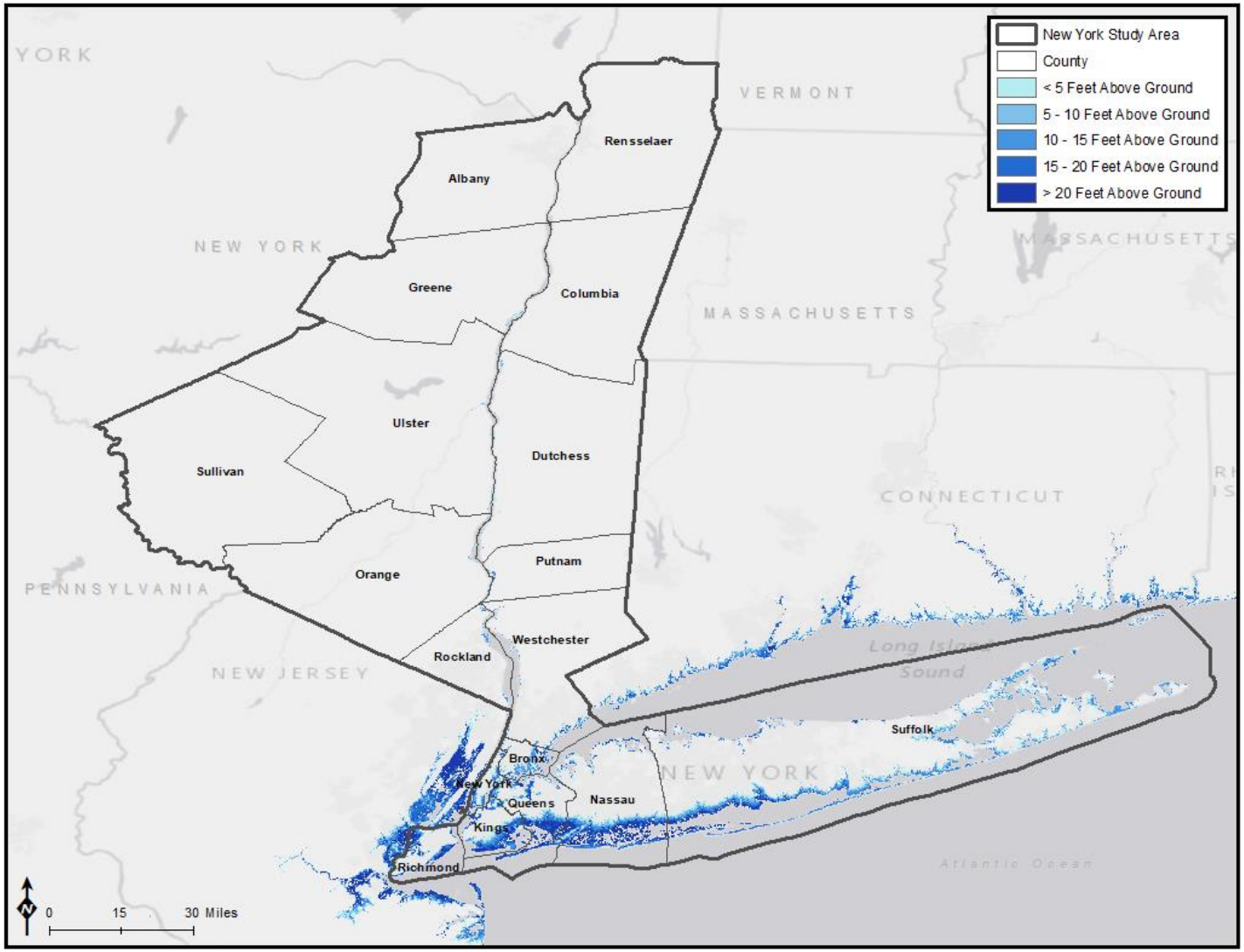
7.2.2.2 Storm Surge

Storm surges from coastal storms increase the impacts of sea level rise. The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b).

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Figure 5-7 shows NOAA's projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the New York coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. Storm surge is projected to impact areas in New York similar to those affected by sea level rise, but more so on the immediate coast and less so along the Hudson River past New York City.

According to the Task Force, the likelihood that powerful storms will hit New York State's coastline, threatening human life and coastal infrastructure, is very high. This vulnerability will increase in area and magnitude over time (NYSSLRTF 2010). Areas within the Study Area most likely to experience storm surge impacts are primarily around New York City and coastal Long Island, which is less than 16 feet above mean sea level. Storm surge is enhanced in this region by the relatively shallow continental shelf and the southward bend in the coast from Long Island to New Jersey, which can funnel water toward the New York City Harbor area when there are low-level easterly winds (Colle et al. 2010). These areas experience both summer tropical storms (hurricanes) and winter nor'easters; these storm systems are described in greater detail in Chapter 1.4.2.2.

The impacts from storm surge cause extreme flooding events that threaten human life and vital infrastructure in New York City. Water levels during the December 1992 nor'easter event peaked at 8 feet above mean sea level, flooding the subways in New York City (Colle et al. 2010). During Hurricane Sandy, a storm surge of 12.65 feet and 9.4 feet above normal high tide was reported at Kings Point on the western end of Long Island Sound and the Battery at the southern tip of Manhattan, respectively. Flood depths due to the storm tide were as much as 9 feet in Manhattan, Staten Island, and other low-lying areas within the New York Metropolitan Area (USACE 2019i). The height of future storm surges may incrementally increase as a result of sea level rise. A research study for the New York City area analyzed the frequency of minor surge events, moderate surge events, and coastal flood events (surge plus tide) from 1959 to 2007. The results indicated that rising sea level may already be enhancing the number of nuisance flooding (coastal flood advisory) events around New York City (Colle et al. 2010).



Source: NOAA 2020a

Figure 7-8. Projected Storm Surge throughout the New York Study Area for a Category 4 Hurricane

In response to the threat of storm surge and the resulting loss of coastal marshes, the USACE has proposed to build flood barriers to protect coastal New York (NYSSLRTF 2010, USACE 2019i). In February 2019, the USACE released an interim report for its New York and New Jersey Harbor and Tributaries Focus Area Feasibility Study. The report presents five different alternatives to address sea level rise around New York City, including structural features, nonstructural actions, and natural and nature-based features. Each of these proposals would cost billions of dollars and would dramatically impact the coastline of the city (Kensinger 2019). Structural alternatives include seawall/revetment, groins, detached breakwaters, berms/levees, floodwalls/bulkheads, and tide gates for major water bodies. Non-structural actions include acquisition/buyouts, early warning systems, elevating structures, floodproofing, emergency response systems, stormwater management, and relocating utilities and critical infrastructure. Natural features include freshwater wetlands, vegetated dunes/beaches, salt marshes, maritime forests/shrubs, oyster reefs, and barrier island restoration (USACE 2019i). Natural shoreline features, such as wetlands, aquatic vegetation, dunes, and barrier beaches, currently provide large-scale services, such as flood protection, storm buffering, fisheries habitat, recreational facilities, and water filtration. However, many of these natural shoreline features are being degraded and lost to sea level rise and other coastal processes. The services offered by these natural features would be prohibitively expensive to replicate with human-built systems. Over the long term, cumulative environmental and economic costs associated with structural protection measures, such as seawalls, dikes, and beach nourishment, may be more expensive and less effective than non-structural measures, such as elevation of at-risk structures and planned relocation away from the coastal shoreline, especially in less urbanized areas. Also, structural features along the State's coastline may limit public access to beaches as the publicly accessible intertidal zone is eliminated. The proposed solutions for urban areas, therefore, may require a mixed approach of structural and non-structural solutions (NYSSLRTF 2010).

7.2.3 Summary – Physical Characteristics

Major water resources in the Study Area include Long Island Sound, the Hudson and Delaware Rivers, other rivers, a system of reservoirs, groundwater, floodplains, and wetlands. The Hudson River provides critical habitat for the Atlantic sturgeon. The Hudson River is also a major transportation system. The Delaware River and its series of reservoirs are the major source of potable water for New York City and its 8.5 million residents. Groundwater resources also provide potable water in some areas. Floodplains and wetlands throughout the Study Area provide valuable ecosystem services.

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. Sea-level rise is projected to impact areas in New York primarily along the southern side of Long Island, at the Lower and Upper Bays to the Hudson River, and along the Hudson River north almost to Vermont (NOAA 2018a). Sea-level rise in the Study Area is exacerbated by subsidence and ocean currents. As a result, the New York rate of sea level rise is higher than the global average rate (Kahn 2012). The rate of sea level rise in New York has averaged between 0.101 inches/year and 0.12 inches/year since 1900 (NYSDEC 2019m, NYSERDA 2011). Projections of sea level rise by 2080 are conservatively predicted at between 0.176 and 0.338 inches per year and between 0.603 and 0.809 inches per year when factoring in observations of accelerated ice sheet melt and paleoclimate data (Kahn 2012).

Because of the highly developed nature of the coast in New York State, a considerable portion of population, private property, and infrastructure will be potentially at risk of enhanced inundation and flooding due to sea level rise. The State Sea Level Rise Task Force (Task Force) has identified the threats below to coastal communities and natural resources as a result of sea level rise impacts (NYSDEC 2019m, NYSERDA 2011, NYSSLRTF 2010).

- Increased frequency and intensity of severe flooding and storm surge damage, not only to communities and infrastructure but also to critical ecosystems that buffer against floods, protect

drinking water and provide habitat for important species. Flooding at the level currently associated with the 100-year flood may occur about four times as often by the end of the century, based on the more conservative IPCC-based, sea level rise scenario.
- Increased erosion of beaches, barrier islands, and bluffs, resulting in changes to sediment supply pathways.
- Frequent or permanent inundation of low-lying areas, including flooding of wetlands and other valuable coastal habitats.
- Saltwater infiltration of surface waters, aquifers, and infrastructure.
- Possible compromise of low-lying sewage, wastewater, transportation, communication, and energy infrastructure and systems. Many of the entrances to bridges and tunnels, segments of the highways and railroads, and similarly, many wastewater treatment plants and sewer outfall systems lie at or below the 10-foot contour and are potentially vulnerable to severe present-day coastal storm flooding, let alone projected higher future levels.

The height of future storm surges may incrementally increase as a result of sea level rise. Storm surge is projected to impact areas in New York similar to those affected by sea level rise, but more so on the immediate coast and less so along the Hudson River past New York City. Increasingly powerful storms are predicted to hit New York State's coastline with increasing area and magnitude, threatening human life and coastal infrastructure (NYSSLRTF 2010). Areas within the Study Area most likely to experience storm surge impacts are primarily around New York City and coastal Long Island, from both summer tropical storms (hurricanes) and winter nor'easters. The impacts from storm surge cause extreme flooding events that threaten human life and vital infrastructure in New York City, including vital infrastructure and transportation resource flooding. Currently, natural shoreline features provide flood protection and storm buffering. But they are being degraded and lost to sea level rise and other coastal processes. In response to the threat of storm surge and the resulting loss of coastal marshes, the USACE has proposed structural, non-structural, and natural alternatives to protect coastal New York (NYSSLRTF 2010, USACE 2019i). Each of these proposals would cost billions of dollars and would dramatically impact the coastline of the city (Kensinger 2019).

In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic region.

7.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

7.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a National dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available for future assessments.

Figure 5-8 displays the NLCD data for the Study Area based on the 2016 data release. Table 5-3 presents the NLCD data for each county within the State by acreage. Table 5-4 presents the NLCD data for each county within the State by percentage and presents a summary of the overall land cover for each geographic unit. Open water land use was excluded in Table 5-4 because this type of land cover would not be considered in future industrial development. Each county was then categorized based on its land cover trend as shown in Table 5-4 and Figure 7-10. The following section discusses the key findings of this analysis.

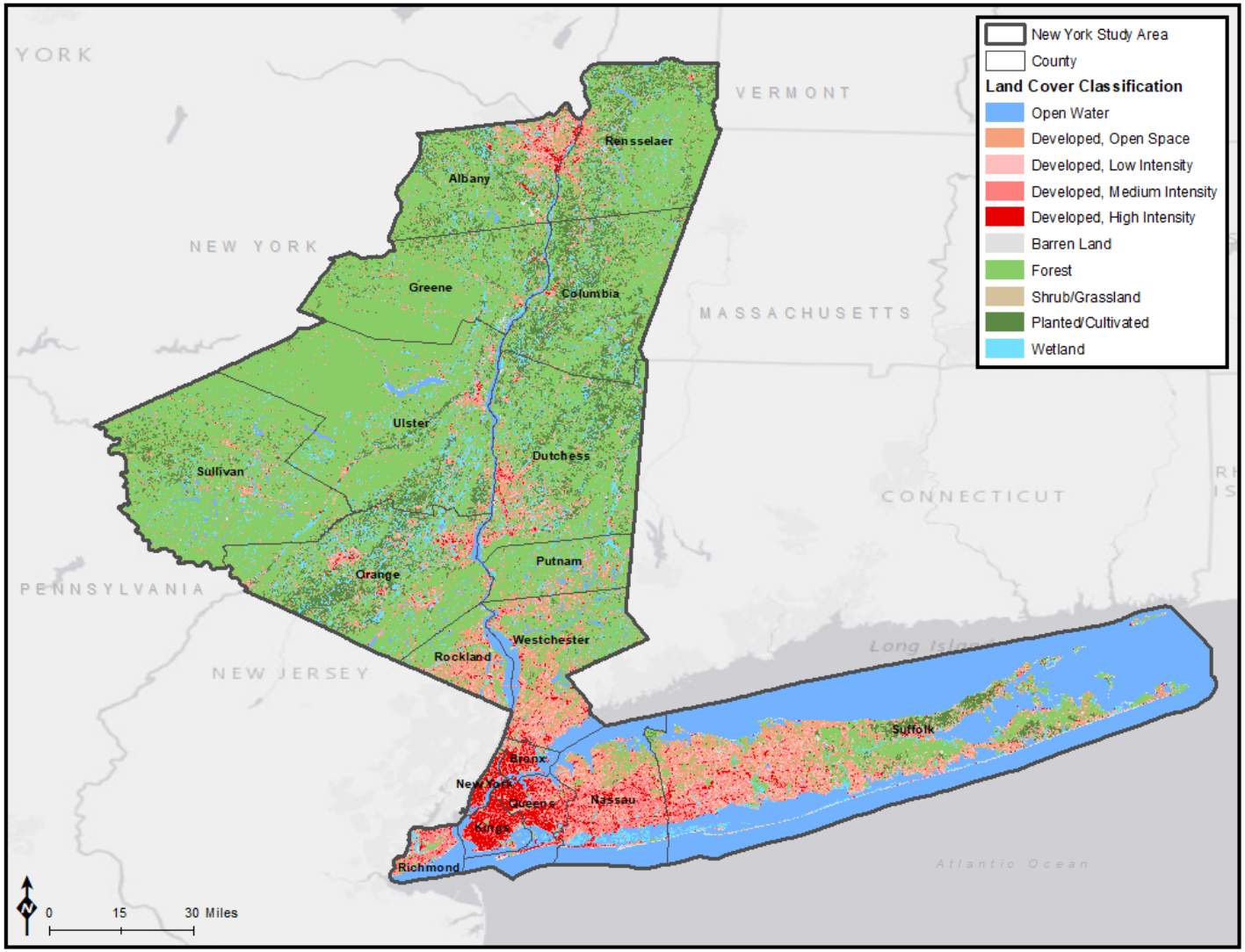
The general land cover within the 18 counties within the Study Area is primarily forest, with significant urban areas. It is important to note that, because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serve as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of New York may be classified as forest, they could actually range from suburban areas to National forests. Therefore, the classification of "Forest" could be very broad.

Table 5-4 presents an assessment of the general land cover for each of the 18 counties in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 7-5, Figure 7-10 shows the majority land cover type within each county in the Study Area.

As shown in Table 5-3, 18 of the counties within the Study Area are predominantly covered by forest, urban development, or a combination of the two. One county (Columbia) is a mix of forest and agricultural land. As described previously, "forest" land cover in the State of New York could range from natural forested areas to neighborhoods in suburban areas. Half of the counties in the Study Area are either predominantly forest (7 units) or urban (6). Counties with dense urban development tend to be those closest to New York City, such as at the Bronx, Kings, New York, and Queens. Geographic units with dense urban development mixed with forest tend to be along the Hudson River either approaching major cities, either New York City (Rockland, Suffolk, Westchester) or Albany. These are likely indicative of wooded suburban landscapes. Other counties are likely rural in nature (NLCD 2016a).

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). A total of 2.7% of the land cover in the Study Area changed at least once. Figure 7-11 and Table 7-6 show the land cover change within the Study Area from 2001 to 2016. Rockland County experienced the most significant land cover change at 6.1%. The majority of this change appears to be from or to the developed land cover types. Queens County experienced the least land cover change at 0.9% (MRLC 2016).

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types, if there is adequate space. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. However, the density of existing development in these areas could leave inadequate space for new development. It is likely that future industrial development would want to avoid primarily forested counties, which are much less developed and have a larger proportion of agricultural and undisturbed land covers (excluding the areas counted as open water).



Source: NLCD 2016a

Figure 7-9. National Land Cover in the New York Study Area

Table 7-3. Acres of Land Cover by NLCD Classifications in New York Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Albany	341,313	31,721	21,426	12,225	6,577	71,949	2,147	180,409	7,727	50,464	22,730	5,888
Bronx	36,719	2,562	2,906	8,047	10,811	24,326	183	1,785	308	25	593	9,499
Columbia	414,851	18,332	9,364	3,469	821	31,985	861	237,885	3,749	101,230	30,702	8,438
Dutchess	528,221	38,620	23,444	14,273	3,969	80,306	2,117	292,722	6,717	86,666	44,405	15,290
Greene	421,152	19,805	4,742	1,659	573	26,780	1,565	334,805	3,381	31,482	16,127	7,013
Kings	61,967	1,254	2,585	10,103	27,369	41,311	360	1,009	1,248	73	897	17,068
Nassau	290,154	36,084	34,792	60,299	17,981	149,156	2,501	19,991	797	595	11,741	105,372
New York	21,556	868	1,109	3,430	8,206	13,613	121	758	284	40	68	6,672
Orange	536,711	50,184	22,571	12,240	4,553	89,548	846	278,034	5,215	90,040	58,920	14,108
Putnam	157,601	16,323	6,500	3,078	697	26,598	276	107,140	1,328	2,938	10,277	9,044
Queens	113,655	2,882	7,367	23,876	30,050	64,175	1,186	1,482	713	160	2,184	43,756
Rensselaer	425,858	20,704	13,334	9,471	2,367	45,875	1,366	263,229	8,401	73,873	25,174	7,940
Richmond	65,464	3,665	5,683	14,411	3,484	27,243	620	4,089	1,010	94	3,898	28,510
Rockland	127,521	31,473	12,587	7,262	1,948	53,270	666	49,761	1,121	917	5,692	16,096
Suffolk	1,518,788	132,875	112,755	68,240	18,935	332,805	15,473	156,342	10,694	37,270	31,938	934,266
Sullivan	637,902	34,189	6,317	2,285	683	43,474	1,271	504,976	7,151	36,907	27,195	16,929
Ulster	742,886	38,673	11,758	4,439	1,603	56,473	2,085	553,932	5,269	55,153	48,761	21,214
Westchester	319,996	67,592	32,318	24,085	8,911	132,906	433	127,173	2,251	5,256	9,577	42,399
Study Area Total	6,762,316	547,807	331,556	282,893	149,538	1,311,794	34,076	3,115,520	67,363	573,182	350,879	1,309,502

Source: NLCD 2016a
Note: Due to the vast quantity of data involved, land cover calculations are not provided at the State or National level.

Table 7-4. Percentage of Land Cover by NLCD Classification (excluding open waters) and Predominant Classification for Counties/Cities in the New York Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Albany	9.5	6.4	3.6	2.0	21.5	0.6	53.8	2.3	15.0	6.8	Urban/Forest
Bronx	9.4	10.7	29.6	39.7	89.6	0.7	6.6	1.1	0.1	2.2	Urban
Columbia	4.5	2.3	0.9	0.2	7.9	0.2	58.5	0.9	24.9	7.6	Forest/Agricultural
Dutchess	7.5	4.6	2.8	0.8	15.7	0.4	57.1	1.3	16.9	8.7	Forest
Greene	4.8	1.2	0.4	0.1	6.5	0.4	80.8	0.8	7.6	3.9	Forest
Kings	2.8	5.8	22.5	61.0	92.1	0.8	2.3	2.8	0.2	2.0	Urban
Nassau	19.5	18.8	32.6	9.7	80.8	1.4	10.8	0.4	0.3	6.4	Urban
New York	5.8	7.5	23.0	55.1	91.7	0.8	5.1	1.9	0.3	0.5	Urban
Orange	9.6	4.3	2.3	0.9	17.1	0.2	53.2	1.0	17.2	11.3	Forest
Putnam	11.0	4.4	2.1	0.5	17.9	0.2	72.1	0.9	2.0	6.9	Forest
Queens	4.1	10.5	34.2	43.0	91.9	1.7	2.1	1.0	0.2	3.1	Urban
Rensselaer	5.0	3.2	2.3	0.6	11.0	0.3	63.0	2.0	17.7	6.0	Forest
Richmond	9.9	15.4	39.0	9.4	73.9	1.7	11.1	2.7	0.3	10.6	Urban
Rockland	28.3	11.3	6.5	1.8	47.9	0.6	44.7	1.0	0.8	5.1	Urban/Forest
Suffolk	22.7	19.3	11.7	3.2	57.0	2.7	26.8	1.8	6.4	5.5	Urban/Forest
Sullivan	5.5	1.0	0.4	0.1	7.0	0.2	81.3	1.2	5.9	4.4	Forest
Ulster	5.4	1.6	0.6	0.2	7.8	0.3	76.8	0.7	7.6	6.8	Forest
Westchester	24.4	11.6	8.7	3.2	47.9	0.2	45.8	0.8	1.9	3.5	Urban/Forest
Study Area Total	**10.1**	**6.1**	**5.2**	**2.7**	**24.1**	**0.6**	**57.1**	**1.2**	**10.5**	**6.4**	Urban/Forest

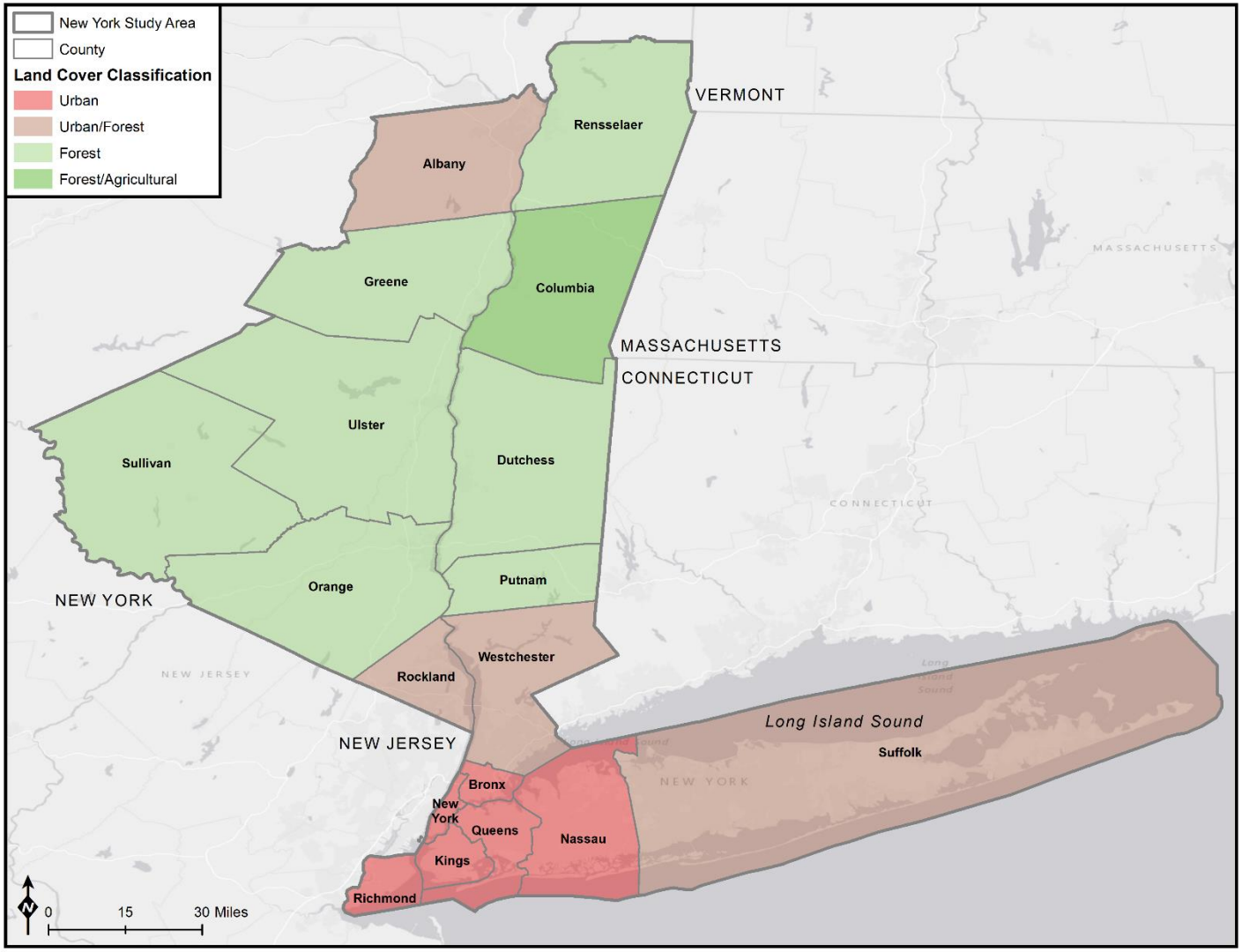
Percentage	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

Table 7-5. Major Land Cover within Each County in the New York Study Area

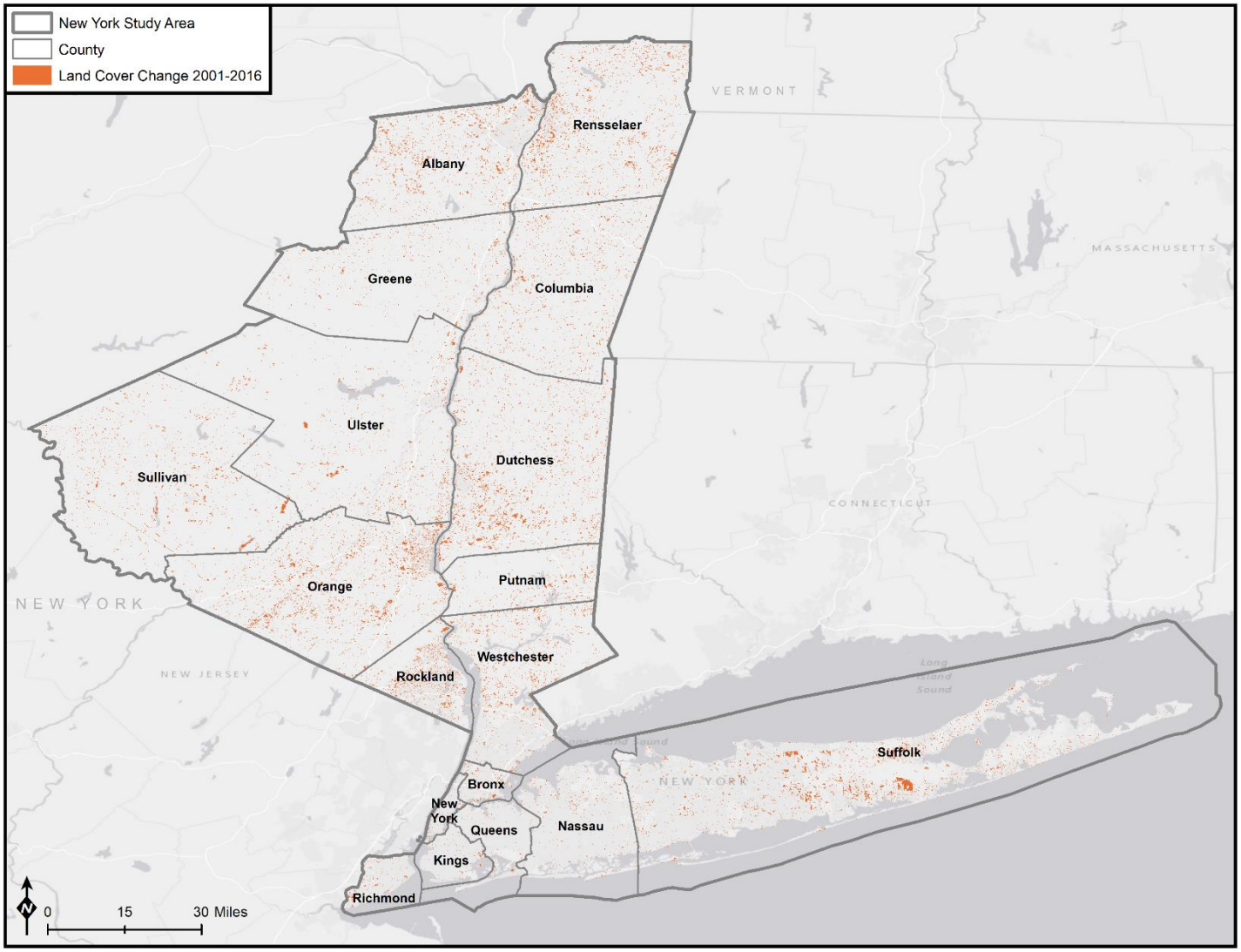
Predominant Land Cover Type(s)	Count	Geographic Units
Forest	7	Dutchess, Greene, Orange, Putnam, Rensselaer, Sullivan, Ulster
Urban	6	Bronx, Kings, Nassau, New York, Queens, Richmond
Urban/Forest	4	Albany, Rockland, Suffolk, Westchester
Forest/Agricultural	1	Columbia

Source: NLCD 2016a



Source: NLCD 2016a

Figure 7-10. Summary of Major Land Cover Classification for the New York Study Area



Source: NLCD 2001-2016

Figure 7-11. Land Cover Change in the New York Study Area

Table 7-6. Land Cover Change for the New York Study Area

Geographic Unit	County - Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Albany	341,313	15,468	4.5
Bronx	36,719	1,259	3.4
Columbia	414,851	11,437	2.8
Dutchess	528,221	23,239	4.4
Greene	421,152	6,007	1.4
Kings	61,967	1,000	1.6
Nassau	290,218	3,471	1.2
New York	21,556	581	2.7
Orange	536,711	23,863	4.4
Putnam	157,600	4,249	2.7
Queens	113,941	1,046	0.9
Rensselaer	425,858	19,013	4.5
Richmond	65,465	1,369	2.1
Rockland	127,521	7,775	6.1
Suffolk	1,518,821	25,820	1.7
Sullivan	637,902	13,245	2.1
Ulster	742,886	12,097	1.6
Westchester	319,996	11,653	3.6
Study Area Total	**6,762,699**	**182,591**	**2.7**

Source: NLCD 2001-2016

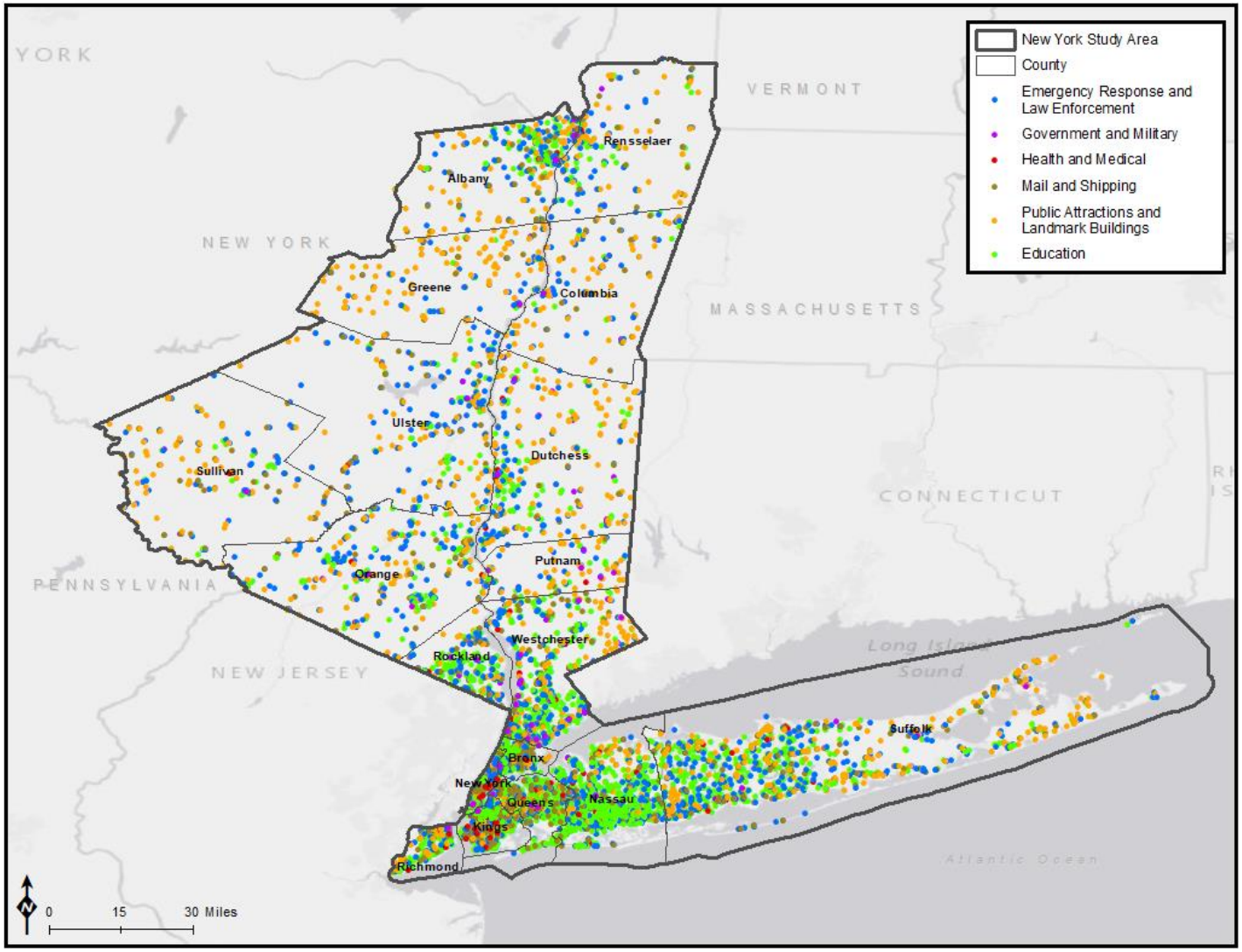
Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including Nassau, Suffolk, and Westchester, as well as counties along the Hudson River with growing urban centers would be the most suitable counties to accommodate future industrial coastal projects.

7.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

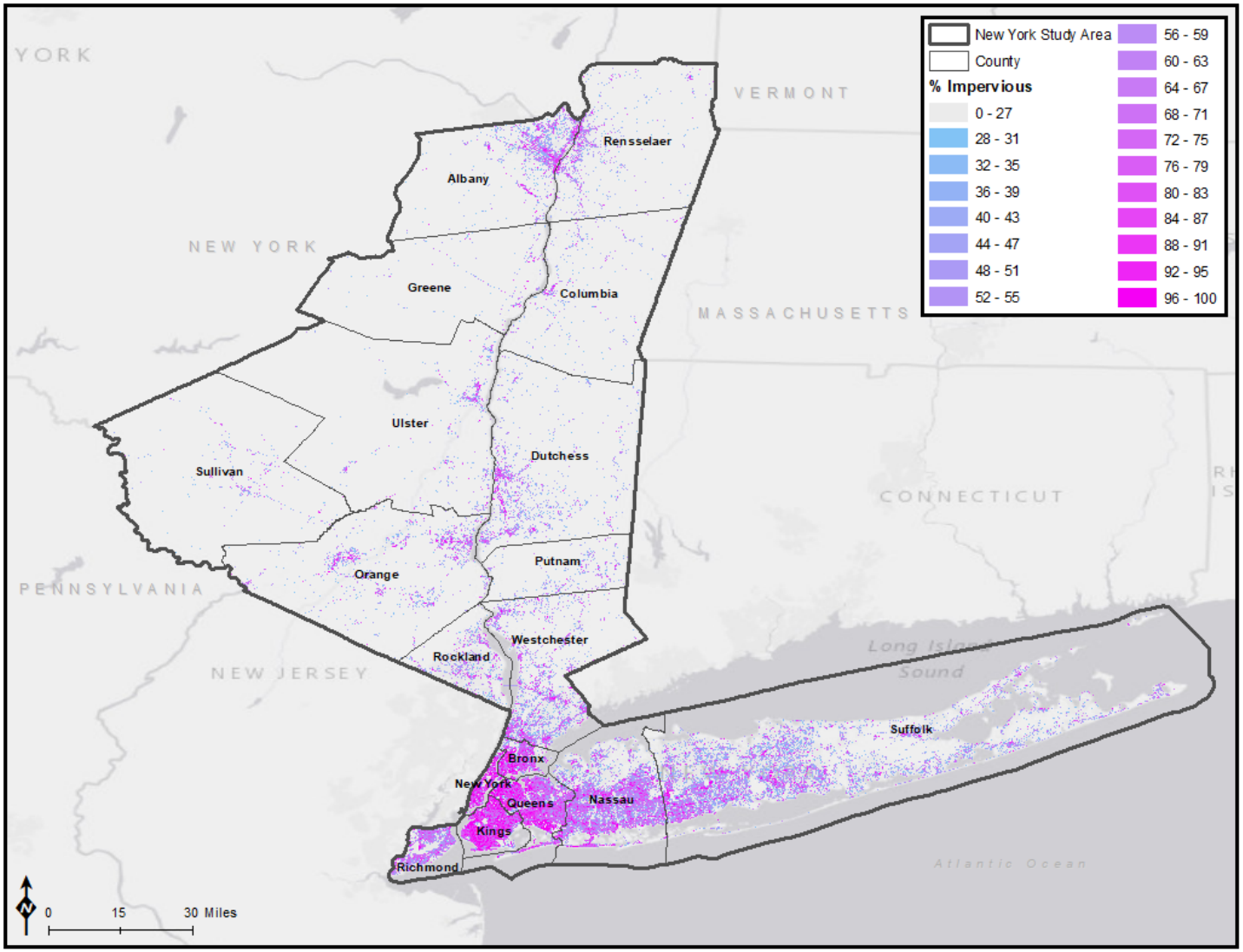
7.3.2.1 Existing and Future Land Use

The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 7-12 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 7-13 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis that identified developed areas in Chapter 7.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 7-12. Select Existing Land Uses within the New York Study Area



Source: NLCD 2016b

Figure 7-13. Impervious Surfaces within the New York Study Area

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Individual counties within the Study Area may have a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to project future changes in land use. Some, though not all, of these include publicly available GIS data that support the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 7.3.2.2.

In summary, existing land use data show there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data show the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses.

New York State is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New York State has recommended 514 census tracts to the U.S. Department of the Treasury for designation as Opportunity Zones. Maps of Opportunity Zones are available at https://esd.ny.gov/opportunity-zones (NYSESD 2018). There are also 14 Free Trade Zones in the State of New York (USEC 2019).

Future OCS-related projects should investigate resources such as the Opportunity Zones and Federal Trade identified sites that have already targeted areas for potential development (see Chapter 7.3.2.4 for additional organizations). Additionally, future OCS-related project analysis should evaluate and consider local comprehensive plans (or equivalent) for the county once site-specific information is available. Counties and cities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

7.3.2.2 Zoning

As the Study Area covers multiple municipalities within multiple counties, there are a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area..

New York requires that zoning decisions be in coordination with a comprehensive plan. Further, the New York State Environmental Quality Review Act has a State environmental review process to evaluate environmental impacts. Adoption or amendment of zoning laws must be evaluated for potential adverse environmental impacts the action may have (NYSDS 2015). Syracuse University created a guidebook for local officials in the process of a developing a comprehensive plan for their municipality (SUEFC 2015).

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

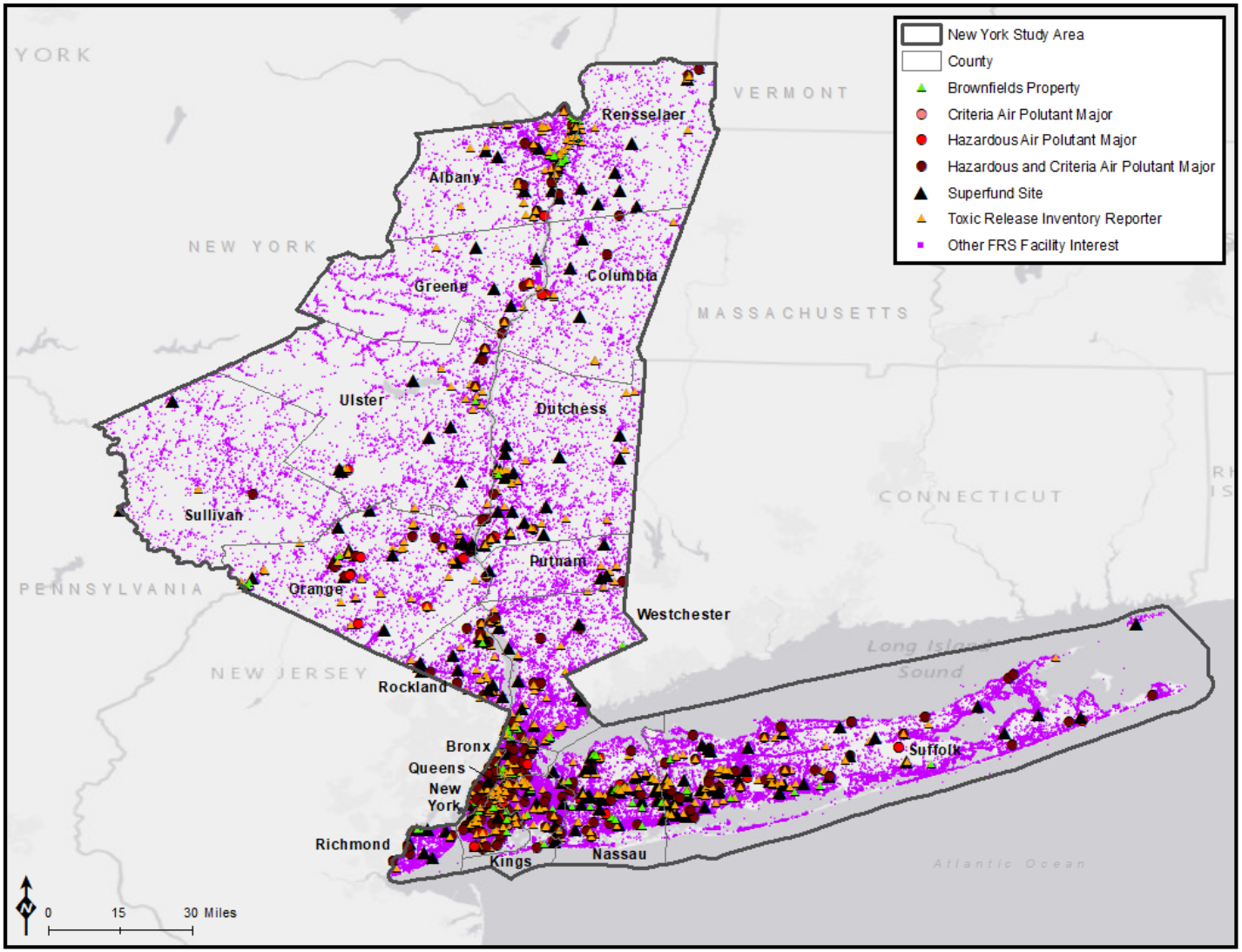
7.3.2.3 Industrial Incentives

New York has a number of organizations dedicated to encouraging development throughout the State. The Start-Up NY Program creates tax-free zones for businesses on college campuses. The Recharge New York Program allows long-term, 7-year, low-cost energy contracts for manufacturers and other qualifying businesses. An investment tax credit is available to manufacturers. An employment incentive credit is available for companies creating new jobs. Industrial development agencies have been created to assist development of industrial, manufacturing, civic facilities, and other industries. Tax credits are available for remediating a Brownfield site for development. The NYCIDA Industrial Program has several benefits including lowered project costs, stabilized building taxes, and abated land taxes for development (NYCEDC 2019).

Some incentives are dependent on whether a project is located within an industrial business zone (NYCEDC 2019). Land taxes may be fully abated and there are discounts to city, State, and mortgage taxes if your project is in an industrial business zone (NYCEDC 2019). As of 2011 there were 16 industrial business zones throughout New York City, including the East New York industrial business zone, which is located in the Brooklyn, New York area (NYCEDC 2019, Davis 2018).

7.3.2.4 Industry

A variety of industry is present throughout the Study Area. The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 7-14 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:



Source: USEPA 2018a

Figure 7-14. USEPA Facility Register Service Record for the New York Study Area

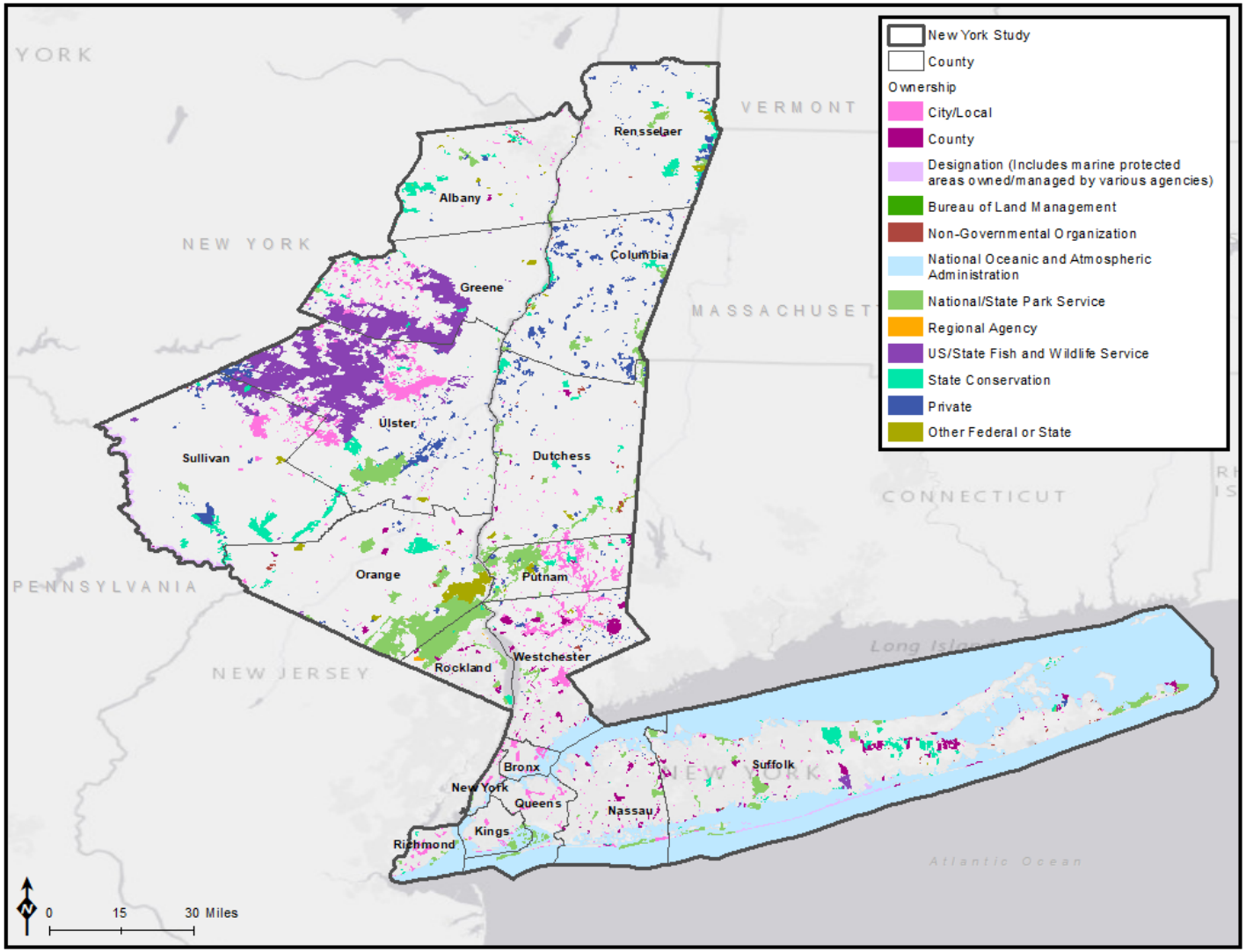
- *Brownfields Properties:* A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major:* Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major:* Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major:* Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter:* Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory-listed chemical.
- *Superfund Site:* Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

As described above, industrial sites are frequently concentrated in industrial zones or near other industrial properties. When purchasing property, particularly existing industrial property, developers will frequently conduct a Phase I Environmental Site Assessment to research the current and historical uses of a property and determine if the current or historic uses of the property may have impacted or pose a threat to the environment and/or human health. Based on Figure 7-14, industrial development tends to mirror urban land cover within the Study Area. As such, industry is concentrated in counties in and around New York City, as well as counties along the Hudson River, with growing urban centers. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties that may be similar in nature or that may provide services relevant to the new site; therefore, a Phase I Environmental Site Assessment is often a useful evaluation to conduct during the site-selection and planning process. Chapter 7.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

7.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official National inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier, as well as to provide a more complete picture of recreational opportunities (USGS 2019f). This will also lead to a better understanding of land use change over time. Figure 7-15 presents the protected areas within the Study Area.

As can be seen in Figure 7-15, in addition to the many protected areas scattered throughout the Study Area, there are significant areas of protected lands across Sullivan, Ulster, and Greene Counties and at the border of Orange and Rockland Counties. The “designation” category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, USFWS, and NPS. These large areas contain a wide variety of State and Federal resource areas, as discussed in Chapter 7.3.2.7. A large portion of the southern coastal side of Kings and Queens Counties contains Gateway National Recreation Area (USGS 2019f). Gateway is an urban park with 27,000 acres of green space and beach habitat containing wildlife, outdoor recreation, historic structures, and cultural landscapes. This park receives 9.2 million annual visitors (NPS 2019e). Analysis of future potential OCS-related projects will need to consider protected areas to consider potential impacts to nearby protected areas for project construction and operations.



Source: USGS 2019f

Figure 7-15. Protected Areas within the New York Study Area

7.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

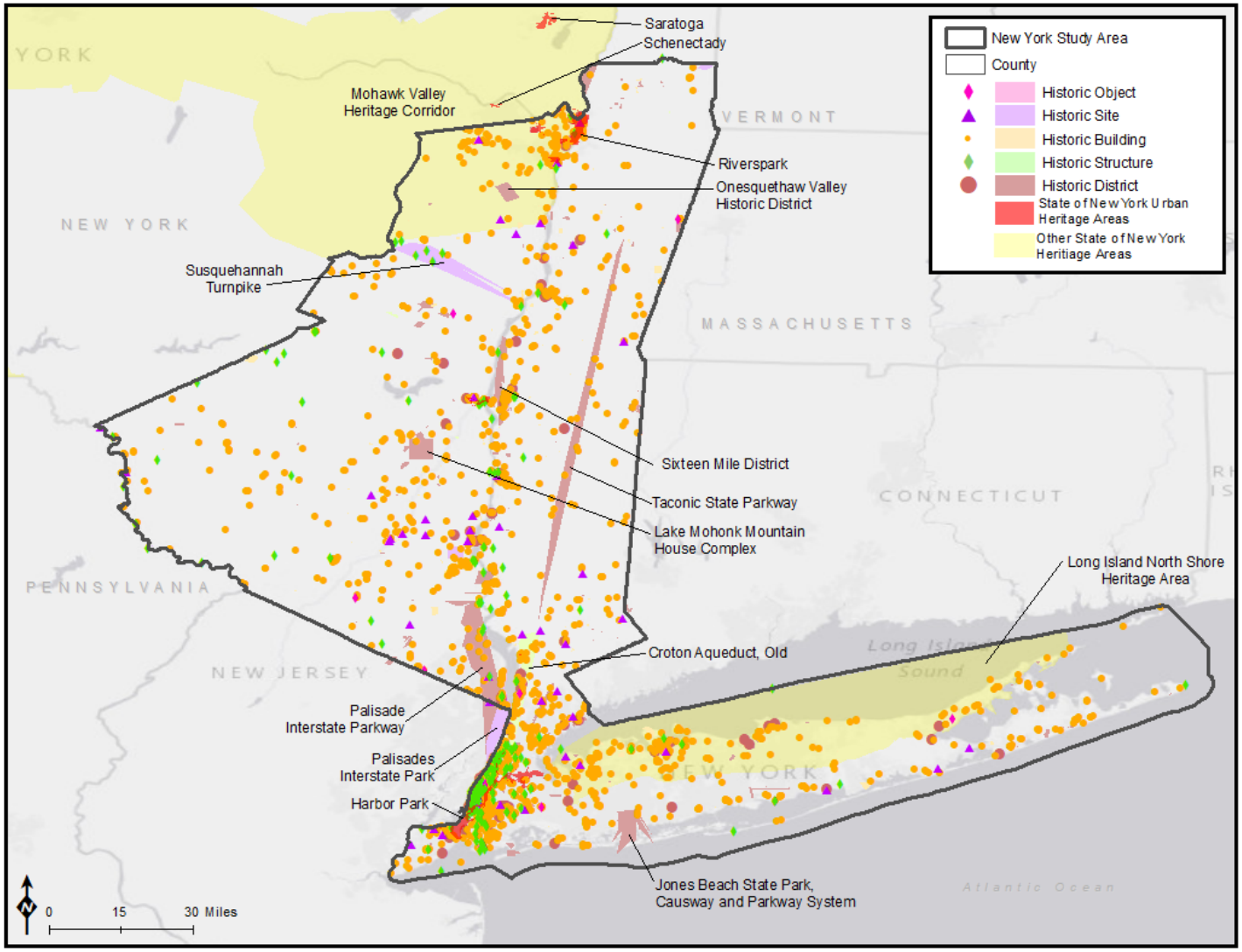
The early inhabitants of the region, now referred to as New York, resided in the area long before the era of European exploration. Prior to the European exploration of New York, the area was inhabited by the Iroquois and the Algonquian peoples. The Iroquois formed an alliance of tribes called the Five Nations of the League of the Iroquois, which included the Mohawk, Oneida, Cayuga, Onondaga, and the Seneca. Most of these nations are located in central New York with the Mohawk people being the most easterly tribe. The Tuscarora tribe, the Sixth Nation, migrated from the south to central New York beginning in 1722 and later migrated to western New York in the early 1800s..

In 1524, Giovanni Verrazano, an Italian explorer, visited the New York Harbor. In 1609, Henry Hudson, an English explorer, was the first to explore the Hudson River. In 1624, the Dutch first settled in the colony of New Netherland, which extended from Albany to northern Delaware (including parts of Connecticut, New Jersey, Pennsylvania, and Rhode Island). But in 1664, the Dutch surrendered Fort Amsterdam on Manhattan Island to the English, whereby the colony was renamed New York.

Several battles during the French and Indian War (1754-1763) were fought in New York because the French allied with the Algonquian tribes and the English allied with the Iroquois. Similarly, some of the largest and most important battles of the Revolutionary War took place in New York, including the Battle of Long Island (August 27, 1776) and the Battle of Saratoga (September and October 1977). On July 26, 1788, New York ratified the U.S. Constitution and became the 11th state to join the Union. Albany became the state capital in 1797 (Nelson 2019). The end of the War of 1812 resulted in a great economic expansion, as New York became a leading commercial center for textiles and the dairy industry by the mid-1820s. The Erie Canal which ran from the Hudson River in Albany to Lake Erie in Buffalo, was completed in 1825. The Erie Canal brought additional prosperity to upstate New York and greatly enhanced the importance of the port of New York. The Erie Canal became part of the New Your State Barge Canal (an interconnected canal system comprised of several canal systems), which was completed in 1918 (NYS 2019c).

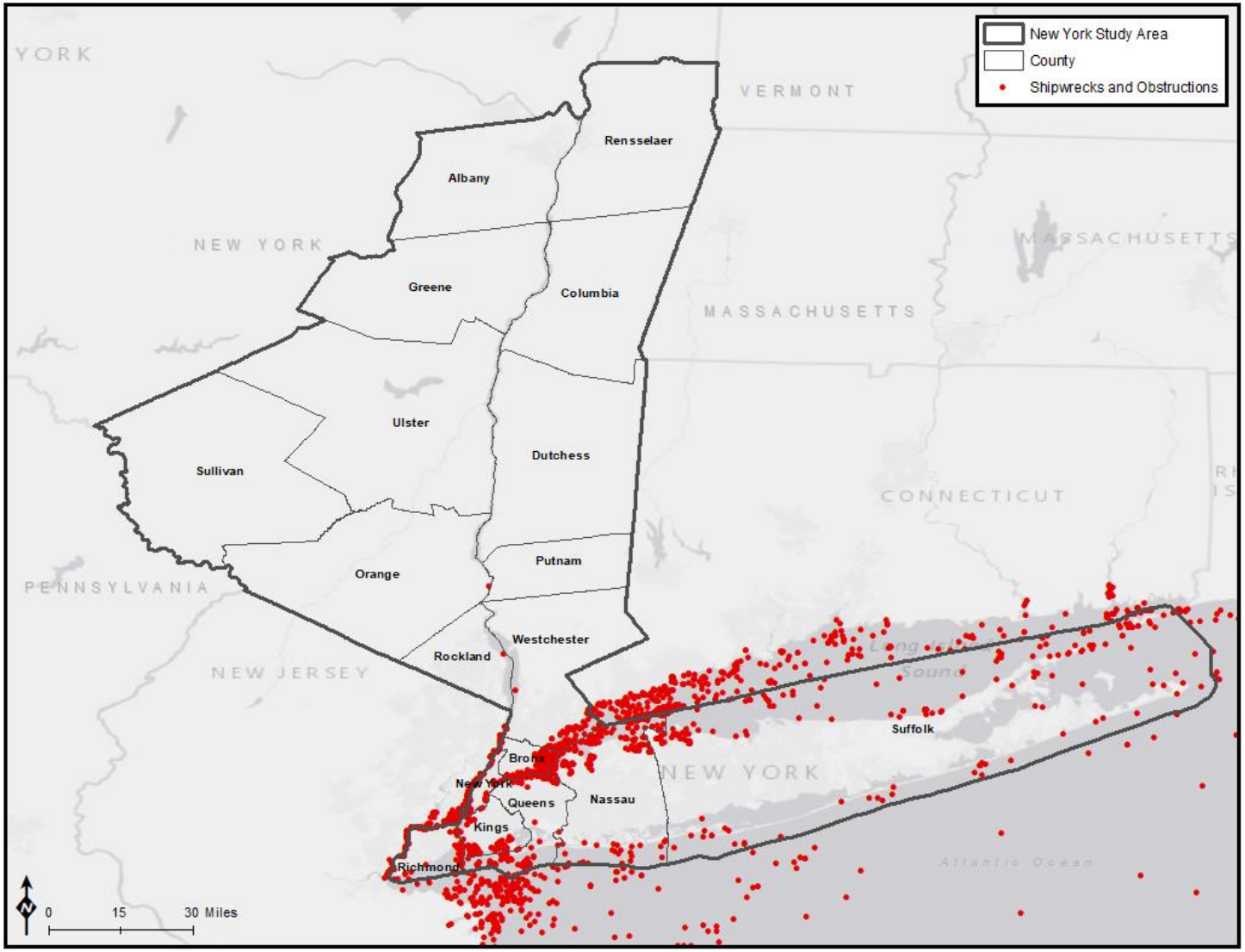
During the Civil War (1861-1865), New York generally supported the Union cause, but the state did not become a major wartime battleground. The decades after the Civil War resulted in an era of extraordinary commercial and economic growth for the state and New York was transformed from an agricultural state to an industrial state. The New York Stock Exchange, which was originally founded in 1792, became the center of world finance and New York City became a leading national center for art, music, and literature and became the home of the United Nations in 1945.

New York State has identified several Heritage Areas that highlight some of states most significant natural, historical, and cultural resources. Heritage Areas within the Study Area include the cities of Albany and Kingston, the village of Ossining in Westchester County, Washington Heights neighborhood in Manhattan, Harbor Parks which includes 23 national park sites in the New York Harbor, and North Shore on Long Island (New York State Parks, Recreation and Historic Preservation 2019a). In addition to the Heritage Areas, New York State has established several historic sites and state historic parks. Figure 5-14 shows cultural and historic sites within the Study Area, several which are concentrated along the Hudson River Valley, New York City, and Long Island (NYS 2019b). Figure 7-17 presents a summary of the maritime sites and shipwrecks located in the Long Island Sound and Atlantic Ocean.



Source: NPS 2014

Figure 7-16. Cultural and Historic Sites within the Rhode Island Study Area



Source: NOAA 2016a

Figure 7-17. Shipwrecks and Obstructions within the New York Study Area

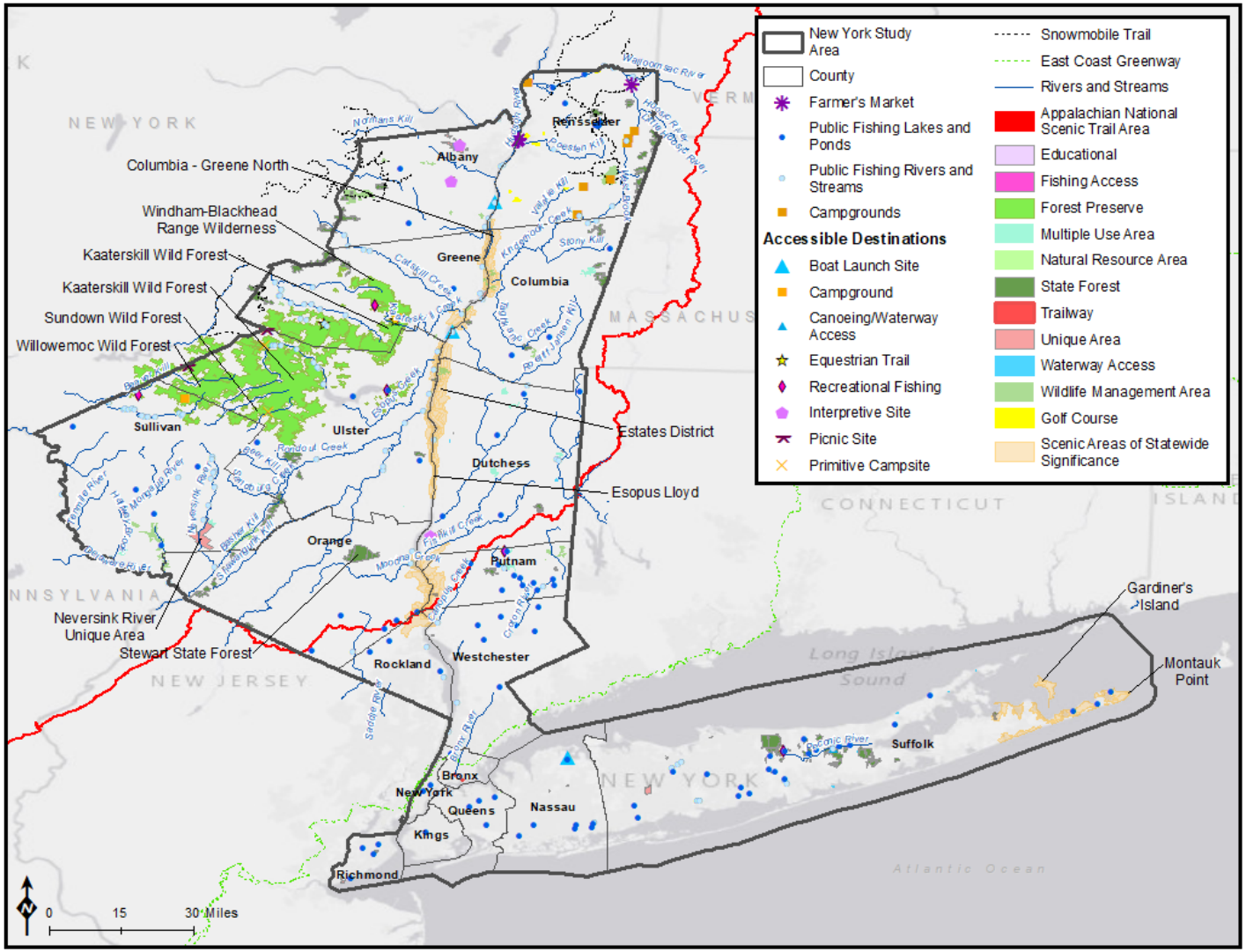
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including New York) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 5-14 and Figure 7-17; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, and marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be impacted by potential future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any potential effects. Because of the importance of New York's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

Many cultural sites in the Study Area have been previously identified as shown in Figure 5-14; however, any site over 50 years old could be considered a potential historic resource. Many sites have yet to be evaluated as historic resources. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of New York's cultural and historical resources, potential future OCS-related project analysis will likely need to include detailed cultural resource surveys of proposed project sites (and their immediate vicinity) to determine potential effects to these resources.

7.3.2.7 Recreation

The New York Study Area has diverse recreational opportunities including National parks and monuments, State parks, State forests, historical and cultural resources, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 7-18. The cultural and historic resources shown in Figure 5-14 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 7-15. The New York Department of Economic Development has defined 11 vacation regions throughout the State (iloveny.com 2020). The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 7.3.2.6), transportation



Sources: NYS 2002a, NYS 2002b, NYS 2004, NYS 2009a, NYS 2009b, NYS 2011, NYS 2014, NYS 2019, NPS 2014, USFS 2019b

Figure 7-18. Select Recreational Resources within the New York Study Area

(Chapter 7.3.2.8), tourism employment (included in Chapter 7.4.4), and rental housing (included in Chapter 7.4.3).

Capital-Saratoga Region

In 2018, tourism spending in the Capital-Saratoga Region (encompassing Albany, Fulton, Rensselaer, Saratoga, Schenectady, and Washington Counties) was $2.1 billion, with approximately $1 billion spent and 15,762 local jobs supported in Albany County alone (Discover Albany 2019). It is important to note that tourism spending and employment represents only a portion of total recreation-related economic impacts in an area. In this region of the Study Area, there are six State parks (NYS Parks 2020) and several attractions, including theaters, music hall, museums, New York State Museum, sightseeing cruises, craft breweries, orchards and farms, scenic cruises, amusement and fun parks, art galleries, performing arts venues, and historic sites (Albany 2020).

Notable annual festivals include the Albany Chefs' Food and Wine Festival (January), Albany Tulip Festival (May), Alive at Five (Summer Concert Series), Dad Fest (June), Riverfront Jazz Festival (September), PearlPalooza (September), Larkfest (September), and several holiday festivals throughout the year (Discover Albany 2020).

Catskills Region

In 2018, tourism spending in the Catskills Region (including Delaware, Greene, Sullivan, and Ulster Counties) was $1.5 billion of which $651 million was spent in Ulster County by 5.3 million people, and $515 million was spent in Sullivan County by over 3.5 million visitors. As described previously tourism spending and employment represents only a portion of total recreation-related economic impacts in an area. Tourism in the Catskills Region supported over 19,500 jobs (Axelrod 2019). In this region of the Study Area, there is the 597-acre Shawangunk Grasslands National Wildlife Refuge (USFWS 2020a) and four State parks – one in Sullivan County and three in Ulster County (NYS Parks 2020). Most notable in this region is the Catskill Mountains, which includes over 700,000 acres of public and private lands spanning four counties (Delaware County is outside the Study Area) (The Catskills 2020a). In the Catskill Mountains visitors can go hiking, biking, camping, fly fishing, whitewater rafting, snow skiing/boarding, visit museums, shops, restaurants, and attend festivals and events (The Catskills 2020b).

Hudson Valley Region

In 2018, the Hudson Valley Region (including Columbia, Dutchess, Orange, Putnam, Rockland, and Westchester Counties) generated almost $4.4 billion in total tourism economic impact. The most visited counties were Westchester County ($2.0 billion) and Orange County ($1.0 billion), followed by Duchess, Rockland, Columbia, and Putnam Counties, respectively (Tourism Economics 2019b). In this region, there are 42 State parks and park preserves, with the majority of parks being in Rockland and Westchester Counties (NYS Parks 2020). There are also several National historic sites (NHS) in Duchess County including the Vanderbilt Mansion NHS, Eleanor Roosevelt NHS, and Home of Franklin D. Roosevelt NHS. Other NHSs include Saint Paul's Church NHS in Westchester County and the Martin Van Buren NHS in Columbia County (NPS 2019q). The Appalachian Trail passes through the Hudson Valley Region. Hikers along the trail cover 90 miles within the Study Area passing near Harriman State Park where there are views of the Manhattan skyline and though a Trailside Museum and Zoo at Bear Mountain (the point of lowest elevation along the entire trail) (Appalachian Trail Conservancy 2020).

In addition to visiting State parks and lakes where visitors can go hiking, biking, camping, snow skiing/boarding, and fishing, notable tourist destinations in this region of the Study Area include art centers, various types of museums, historic mansions and castles, and sculpture gardens at the PepsiCo's

world headquarters (Curbed 2020, Trip Advisor 2020b). There are also festivals and events throughout the year in this region (HV Parent 2020).

New York City Region

The New York City Region (Bronx, Kings, New York, Queens, and Richmond Counties) is the most popular tourist destination in the Study Area. In 2018, 65.1 million people visited the New York City Region and spent over $44.2 billion in total direct spending (Baruch College 2018). Some of the most notable attractions include the Empire State Building, Brooklyn Bridge, One World Trade Center and Observatory, 9/11 Memorial and Museum, Bronx Zoo, Broadway and the Theater District, Battery Park, Staten Island, Grand Central Terminal, High Line, Central Park and the Central Park Zoo, Statue of Liberty on Liberty Island, Ellis Island and the Immigration Museum, Rockefeller Center and Top of the Rock Observation Deck, Metropolitan Museum of Art, Times Square, Fifth Avenue shopping area, New York Public Library, Wall Street, Federal Hall, Radio City Music Hall, St. Patrick's Cathedral, Carnegie Hall, and Bryant Park (Law 2019b).

In the New York City Region, there are nine State parks (NYS Parks 2020) and several National monuments, memorials, and sites. The most popular National sites are the Gateway National Recreation Area (7.8 million visitors per year), Castle Clinton National Memorial (4.36 million visitors per year), Statue of Liberty (4.24 million visitors per year), Stonewall National Memorial (2.1 million visitors per year), and Governors Island National Memorial (590,000 visitors per year) (NPS 2019q).

There are also several professional sports teams in the New York City Region, including the New York Yankees (baseball), New York Mets (baseball), New York Rangers (hockey), New York Knicks (basketball), Brooklyn Nets (basketball), New York Liberty (women's basketball), and New York City Football Club (soccer).

Some of the notable annual events in the New York City Region include holiday festivals and parades, the New York Boat Show (January), Westminster Kennel Club Dog Show (February),), NYC Off-Broadway Week (February), Big East Men's Basketball Tournament (March), New York International Auto Show (April), Tribeca Film Festival (May), U.S. Open Tennis (August-September), New York Fashion Week (Fall and Spring) New York Comic Con (October), New York City Marathon (November), Macy's Thanksgiving Day Parade (November), Rockefeller Center Tree Lighting (December), and Times Square New Year's Eve (NYC GO 2020).

Long Island Region

The Long Island Region includes Nassau and Suffolk Counties. In 2018, tourists visiting this region spent $6.1 billion, with spending being fairly even between Nassau and Suffolk Counties. This spending supported almost 82,000 jobs and generated $2 billion in direct labor income (Calavia-Robertson 2019). Attractions include several wineries, orchards, museums, shops and restaurants, the Long Island Aquarium, and famous homes, mansions, and gardens (Discover Long Island 2020a). In the Long Island Region, there are seven National Wildlife Refuges (USFWS 2020a), 27 State parks and park preserves (NYS Parks 2020), and several beaches, of which many are part of the State parks (Discover Long Island 2020b, Sunkara 2019). Sagamore Hill National Historic Site, home of President Theodore Roosevelt, is located in Suffolk County. The Fire Island National Seashore is also part of Suffolk County. The Fire Island National Seashore protects 26 miles of the 30-mile long Fire Island. The seashore is a barrier island south of Long Island that includes sand flats, wetlands, dunes, maritime forests, and some residential communities. Approximately 6,242 acres of the 19,580 acres are owned by the NPS while the remaining acreage is owned by non-Federal agencies (NPS 2018e). There are several events, festivals, exhibits, and shows throughout the year in Suffolk and Nassau Counties (Long Island.com 2020), but most of the major events and festivals in the area are held in the New York City Region.

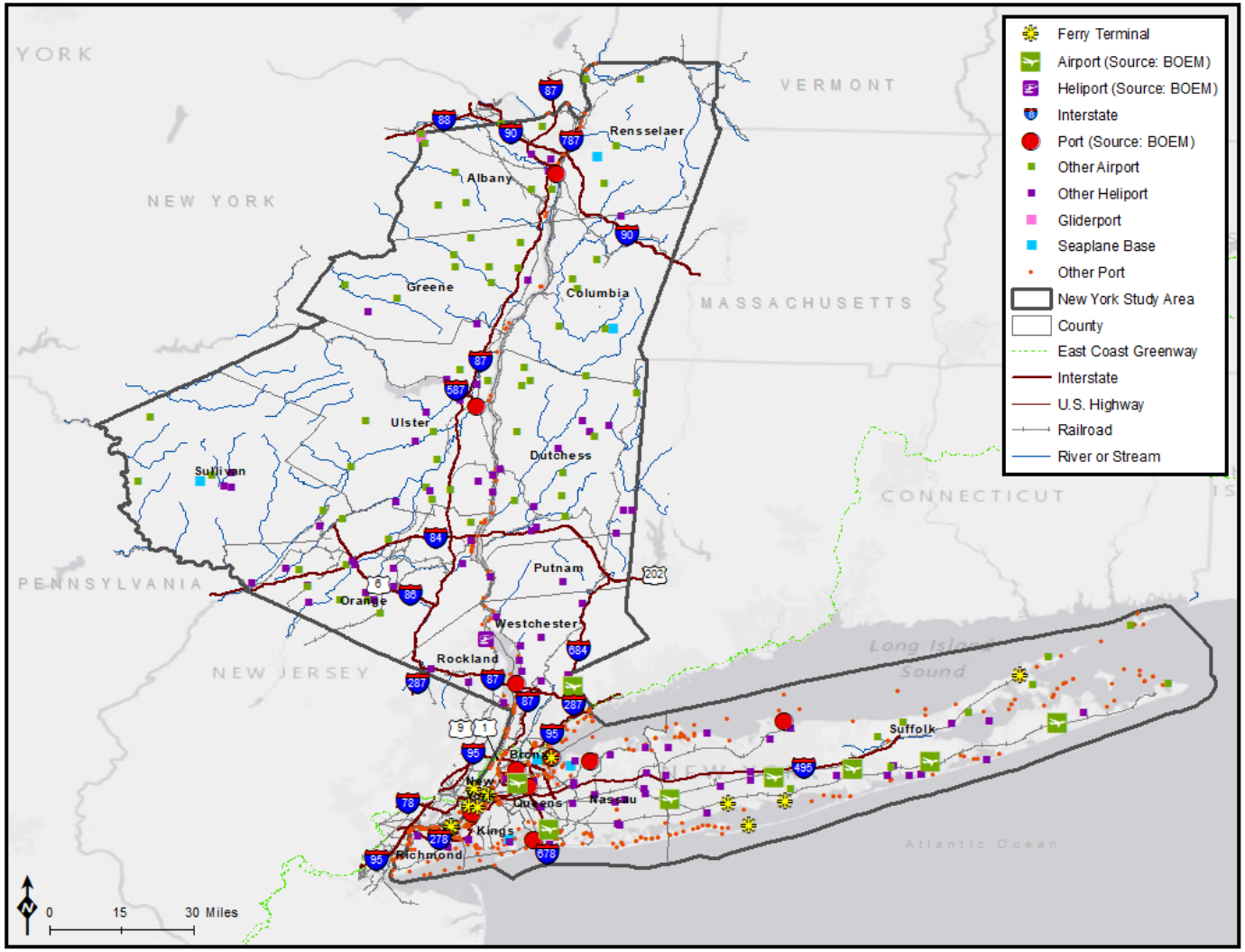
In summary, there are many recreational activities within the Study Area found in areas along the coast, as well as inland, natural settings, urban settings, parks/greenspaces, and built attractions. Rather than having a single peak season, New York State is a four-season destination for tourism. From June to August, when summer weather is ideal for travel, parklands, campgrounds, cities, and beaches are packed, especially on weekends. Most of the Study Area experiences a peak between Memorial Day and Labor Day because outdoor activities (e.g., camping and hiking) are major attractions. These trends continue into fall, from September to November, when tourists visit the Study Area to see the fall foliage in the Catskills Region (Sullivan, Green, and Ulster Counties). Although winter is considered the off-season and is typically slower for tourism, winter activities abound throughout the region. The New York City Region (Bronx, New York, Kings, Queens, and Richmond Counties) is also popular for holiday shopping and holiday festivities, parades, and events. Because there are so many popular annual festivals and events that occur through the Study Area, especially in the New York City Region, potential impacts on these events and attractions should be considered during the analysis of potential future OCS-related projects. Additionally, many of the recreational attractions are also protected lands and historical landmarks, which will likely result in limitations for development near these areas. Local information on additional attractions and events should also be considered by checking relevant city and county tourism websites and event pages.

7.3.2.8 Transportation Resources

New York transportation includes some of the most extensive and one of the oldest transportation infrastructures in the country. The New York State Department of Transportation (NYSDOT) is responsible for the overall transportation policy for the State, along with the development and operation of transportation facilities and services for highways, railroads, mass transit systems, ports, waterways, and aviation facilities. The transportation resources throughout the Study Area are managed by five regional offices within the NYSDOT (Regions 1, 8, 9, 10, and 11). Figure 5-17 shows the transportation resources throughout the Study Area. New York City has its own large department of transportation that oversees the streets, highways, bridges, and waterways of the City's transportation network.

Surface transportation routes have faced engineering difficulties because of the terrain of New York State and the unique issues of New York City (i.e., urban crowding). Within the Study Area, the principal north-south highways are I-87 and I-684 and the principal east-west highways are I-90 and I-84. Additionally, an auxiliary interstate (I-278) serves as a partial beltway for New York City and passes through all five of the city's boroughs. Interstate 495, commonly known as the Long Island Expressway, is an auxiliary interstate that transverses Long Island from the borough of Manhattan to County Route 58 in Riverhead on the east end of the island. New York State Route 25A serves as the main east-west route for most of the north shore of Long Island, and New York State Route 27 acts as the primary east-west highway on southern Long Island.

Two of the five New York sea and inland ports vital to the economy of the eastern United States are located within the Study Area. The Port of Albany, located on the Hudson River 125 miles north of the Battery in New York Harbor, covers 400 acres and has 5,400 feet of wharf length and 350,000 square feet of covered storage space. The port is open year-round with 7 berths and 32 feet of freshwater draft. Two Class 1 rail services access the port, which is directly adjacent to I-90 and I-87, and nearby to I-88 (Port of Albany 2018). The Port of New York and New Jersey is the port district of the New York-Newark metropolitan area within approximately a 25-mile radius of the Statue of Liberty National Monument in the New York Harbor. It is the largest port on the East Coast and third largest in North America. In addition to the Port Authority's port facilities, it includes numerous privately owned dry and liquid bulk terminals, general cargo and barging facilities, cruise terminals, ferry landings, and recreational users, as well as vessel support facilities spread over 3,000 acres (Port Authority of New York and New Jersey).



Sources: RIGIS 2017a, RIGIS 2017b, RIGIS 2017c, RIGIS 2017d, RIGIS 2017e, RIGIS 2019a, RIGIS 2019b, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 7-19. Transportation Resources within the New York Study Area

Four major Class I railroads operate within New York State and within the Study Area. The primary freight rail lines run north-south from Albany to New York City. Freight rail companies using these tracks are CSX Transportation, Inc. and Canadian Pacific (NYSDOT 2019a). Three commuter rail services, operated by the Metropolitan Transportation Authority, are also located within the Study Area. The Long Island Railroad is the largest commuter railroad in the United States and operates along 12 separate routes throughout the length and breadth of Long Island. The Metro-North Railroad is now the second busiest commuter railroad in the United States. New Jersey Transit also operates partially in the New York Study Area (NYSDOT 2019b). In addition to the local commuter rail services, Amtrak also operates passenger rail service both locally within the State and to destinations north, south, and west from New York City on 14 separate routes (Amtrak 2020).

Every county within the Study Area, except for Putnam, Rockland, Bronx, Kings, and Richland, has some classification of commercial or general aviation airport within the New York State public use airport system managed by the NYSDOT Aviation Bureau (NYSDOT 2018). The primary commercial airports in Queens County are La Guardia and John F. Kennedy International. L.I. MacArthur Airport is in Suffolk County. Orange County has Stewart International Airport, and Albany International Airport is in Albany County.

A potential transportation constraint within the Study Area is associated with vulnerabilities (see Chapter 7.2.2), primarily from recurrent flooding and projected congestion in and around New York City, Long Island, and the communities directly adjacent to the Hudson River. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in sea level and an increase in the frequency and intensity of large storm systems). During Hurricane Sandy in 2012, storm surge flooded vehicular tunnels, subway stations, roads, and airports. The transportation outages that followed impaired mobility and access to, from, and within New York City and the region. Flooding in tunnels and near bridges is of special concern since road closures in these areas can be a hindrance to evacuation and emergency services. The NYSDOT is continually assessing the risks posed by climate change and extreme weather. They have also undertaken and identified mitigating strategies to increase resiliency within the entire New York State transportation system posed by these risks (NYSDOT 2019c).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases to the transportation needs of potential future OCS-related projects and will need to be considered during analysis. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. The Port of Albany and the Port of New York and New Jersey are both large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

7.3.3 Summary – Land Cover and Land Use

Predominant land uses in the Study Area are either developed or forested areas. The forested areas could include suburban areas with some development or could be more rural in nature. The urban areas are concentrated around the cities of New York and Albany as well as along the Hudson River, which has traditionally been a major transportation route throughout the history of the area.

New York State is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New York State

has recommended 514 census tracts to the U.S. Department of the Treasury for designation as Opportunity Zones. Maps of Opportunity Zones are available at https://esd.ny.gov/opportunity-zones (NYSESD 2018). There are also 14 Free Trade Zones in the State of New York (USEC 2019).

Analysis for potential future OCS-related projects should include evaluation and consideration of local comprehensive plans (or equivalent) for the county once site-specific information is available. Counties and cities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

New York has a number of organizations, programs, and tax incentives dedicated to encouraging development in the State, including the Start-Up NY Program, Recharge New York Program, investment tax credits, and employment incentive credit. Industrial Development Agencies have also been created to assist development of industrial, manufacturing, civic facilities, and other industries. Some incentives are dependent on whether project is located within an industrial business zone. As of 2011, there were 16 industrial business zones throughout New York City, including the East New York industrial business zones, which is located in the Brooklyn, New York area (Davis 2018, NYCEDC 2019).

A variety of industry is present throughout the Study Area. The density of industry in the New York Study Area is higher than in many of the other States; this can largely be attributed to the presence of New York City. Additionally, New York City is a transportation hub, thus facilitating many business endeavors in the area.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, potential impacts to these resources should be considered during potential future OCS-related project analysis.

A robust transportation network with roads, rail, international and local airports, and the Nation's third largest port is present in the Study Area. A potential transportation constraint within the Study Area is associated with vulnerabilities primarily from recurrent flooding and projected congestion in and around New York City, Long Island, and the communities directly adjacent to the Hudson River. The NYSDOT is continually assessing the risks posed by climate change and extreme weather. They have also undertaken and identified mitigating strategies to increase resiliency within the entire New York State transportation system posed by these risks (NYSDOT 2019c).

7.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

7.4.1 Population

After decades of rapid growth, New York's population is still increasing but at a slower rate. According to the USCB, New York's estimated population was 19.8 million in 2017. As shown in Table 7-7, the population of New York grew 2.2% since the 2010 Census, having added approximately 420,126 people. During the same period, the population of the United States grew 4.0% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. The population of the U.S. grew at its slowest pace since 1937, according to 2018 USCB estimates. The data show that the annual rate of the Nation's population growth was 0.62% for the year ending July 2018, hitting an 80-year low, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). New York is affected by the nationwide trend of aging population, as indicated by its declining rate of natural increase. According to USCB 2018 estimates, New York's natural increase declined 27.2% from 2016 (84,258 people) to 2018 (61,371 people). Despite its decline, natural increase was still positive; however, New York has experienced a recent trend of overall population decline in the last few years, as a result of domestic out-migration. In 2018, approximately 180,300 people moved out of the State; however, this loss was partially offset by a gain of approximately 70,375 residents from international migration. The net result was an overall population loss of approximately 48,510. These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Prior to the release of the USCB 2018 population estimates, it was reported that population loss in the State was focused in Upstate New York, as 42 of the 50 upstate counties reported a population loss since 2010 (Platsky 2018). Probable reasons for the large out-migration, as suggested by gubernatorial candidates in a recent election, were climate-based due to New York's long cold winters in the upstate area, as well as high property taxes. After the release of the 2018 estimates, it was noted that population decline spread downstate to the New York City, Hudson Valley, and Long Island Regions. However, downstate regions also attract international immigrants, and thus are able to offset domestic out-migration loss with international gains. Specifically, population loss was noted in Manhattan, Queens, Brooklyn, Nassau, and Westchester Counties. With continued population loss, two congressional seats could be lost (Axelson 2019).

Northeastern States have higher populations of adults over the age of 65 as compared to southern and western States. New York, as well as the neighboring States of New Jersey and Connecticut, is experiencing high migration losses of the elderly as a result of National migration pattern toward the southern and western parts of the United States. According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway, driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather. This trend was stalled by the Great Recession of 2007 due to the housing crisis and unemployment. Migration resumed slowly after the recession as the economy recovered (Frey 2019). During 2018, the largest domestic out-migration flows were to New Jersey, California, Florida, Pennsylvania, and Texas (USCB 2019c).

Table 7-7. 2010 and 2017 Total Population and Population Projections Through 2040 in the New York Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Capital District	Albany	304,204	308,580	312,945	322,394	328,968	1.4	6.6
	Columbia	63,096	61,481	59,939	57,200	54,459	-2.6	-11.4
	Greene	49,221	47,791	46,779	45,392	43,697	-2.9	-8.6
	Rensselaer	159,429	159,800	161,140	161,946	160,846	0.2	0.7
	Total Capital District Region	***575,950***	***577,652***	***580,803***	***586,932***	***587,970***	***0.3***	***1.8***
Hudson Valley	Dutchess	297,488	295,685	292,936	290,338	285,869	-0.6	-3.3
	Orange	372,813	378,174	384,125	397,598	406,292	1.4	7.4
	Putnam	99,710	99,464	99,274	100,199	100,435	-0.2	1.0
	Rockland	311,687	325,027	336,544	356,758	372,432	4.3	14.6
	Sullivan	77,547	75,783	74,968	74,720	74,364	-2.3	-1.9
	Ulster	182,493	180,129	179,009	176,893	173,499	-1.3	-3.7
	Westchester	949,113	975,321	996,039	1,037,234	1,064,958	2.8	9.2
	Total Hudson Valley Region	***2,290,851***	***2,329,583***	***2,362,895***	***2,433,740***	***2,477,849***	***1.7***	***6.4***
Long Island	Nassau	1,339,532	1,363,069	1,386,500	1,432,859	1,452,510	1.8	6.6
	Suffolk	1,493,350	1,497,595	1,497,391	1,488,885	1,453,196	0.3	-3.0
	Total Long Island Region	***2,832,882***	***2,860,664***	***2,883,891***	***2,921,744***	***2,905,706***	***1.0***	***1.6***
New York City	Bronx	1,385,108	1,455,846	1,519,809	1,604,168	1,656,930	5.1	13.8
	Kings	2,504,700	2,635,121	2,738,283	2,863,996	2,940,373	5.2	11.6
	New York	1,585,873	1,653,877	1,688,894	1,727,631	1,756,587	4.3	6.2
	Queens	2,230,722	2,339,280	2,436,549	2,565,268	2,649,443	4.9	13.3
	Richmond	468,730	475,948	481,351	488,119	485,084	1.5	1.9
	Total New York City Region	***8,175,133***	***8,560,072***	***8,864,886***	***9,249,182***	***9,488,417***	***4.7***	***10.8***
	Study Area Total	**13,874,816**	**14,327,971**	**14,692,475**	**15,191,598**	**15,459,942**	**3.3**	**7.9**
	New York	**19,378,102**	**19,798,228**	**20,146,131**	**20,604,030**	**20,794,907**	**2.2**	**5.0**
	United States	**308,745,538**	**321,004,407**	**332,527,548[4]**	**357,975,719[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - Cornell 2018; 4 - USCB 2018b

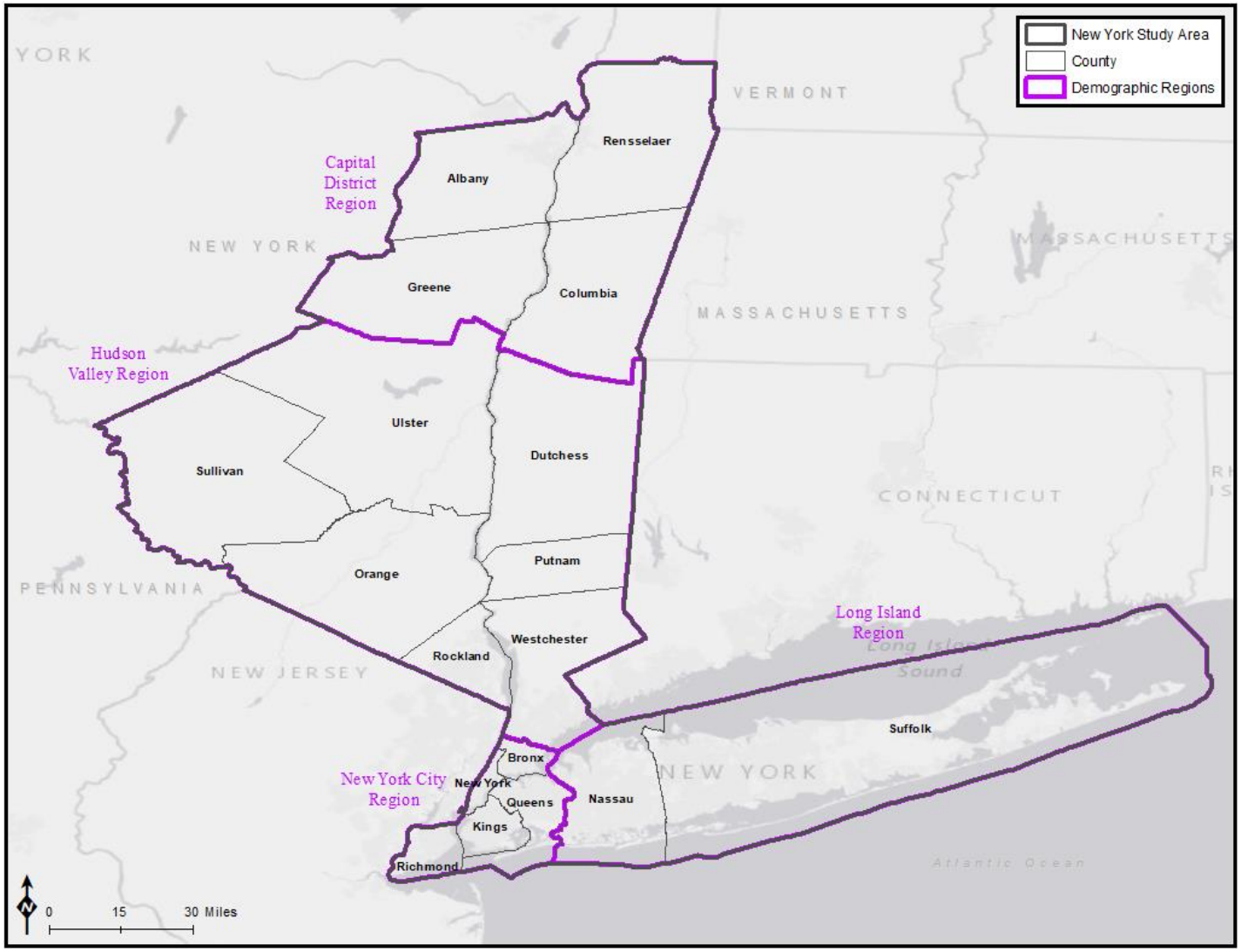
7.4.1.1 Study Area Trends

Figure 7-20 shows the four demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 7.2 because they are derived from official demographic regions used by Empire State Development. The counties within the Study Area are located within four demographic regions defined as Capital District, Hudson Valley, Long Island, and New York City (NYSESD 2016a). The New York City Region is comprised of five counties that are also known as boroughs in New York City (for this discussion the county name is listed first followed by the borough name in parentheses): Bronx (The Bronx), Kings (Brooklyn), New York (Manhattan and small islands), Queens (Queens), and Richmond (Staten Island) (ny.gov 2020). According to 2017 population estimates, the Study Area represented 72.4% (14.3 million residents) of the overall State population of 19.8 million. Table 7-7 shows population growth and decline in the Study Area counties, as well as their location with the demographic regions. Between 2010 and 2017, 13 out of 18 counties gained population, while 5 counties lost population. Overall, the population of the Study Area grew 3.3%, faster than the State (2.2%) but slower than the Nation (4.0%) (USCB 2017a, USCB 2017d).

Between 2010 and 2017, the New York City Region grew 4.7%, the Hudson Valley Region grew 1.7%, the Long Island Region grew 1.0%, and the Capitol District Region grew 0.3%. New York City is a magnet for people seeking opportunities, creating a vibrant dynamic environment that defines the city and sets it apart from almost any other place in the world (NYCDCP 2019). Four of the five New York City county-boroughs experienced the largest overall population increases in the Study Area since 2010. Percentage gains were Kings (Brooklyn) with 5.2%, Bronx with 5.1%, Queens with 4.9%, and New York (Manhattan) with 4.3%. Growth rates have been variable; the city had higher growth rates in the early part of the decade, a subsequent slowdown, and some periods of small declines since 2016. Staten Island grew 1.5% (USCB 2017a, USCB 2017d) (NYCDCP 2019).

Rockland, Westchester, and Orange Counties led growth in the Hudson Valley Region, growing 4.3%, 2.8%, and 1.4%, respectively, between 2010 and 2017. Other Hudson Valley counties experienced population decline. Nassau County lead the Long Island Region's growth at 1.8%. In the Capital District, Albany, home to the State's capital, grew 1.4%. Rensselaer County grew just 0.2%, while the rural counties of Columbia and Greene lost population, posting decreases of 11.4% and 8.6%, respectively, during the same time period (USCB 2017a, USCB 2017d).

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is also evident in New York. All counties (with the exception of Sullivan County) included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 7-7, the Study Area is 8,489 square miles, representing 17.4% of the State's total land area of 48,710 square miles. Therefore, more than half (72.4%) of New York's population resided in 17.4% of its land located near the coasts in 2017 (USCB 2017d, USCB 2017c).



Source: NYSESD 2016a

Figure 7-20. Demographic Regions of the New York Study Area

Figure 7-21 shows the population counts in census block groups within the 18 counties located in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 7-22 the MSAs present in the Study Area are:

- Kingston, NY; and
- New York-Newark-Jersey City, NY-NJ-PA.

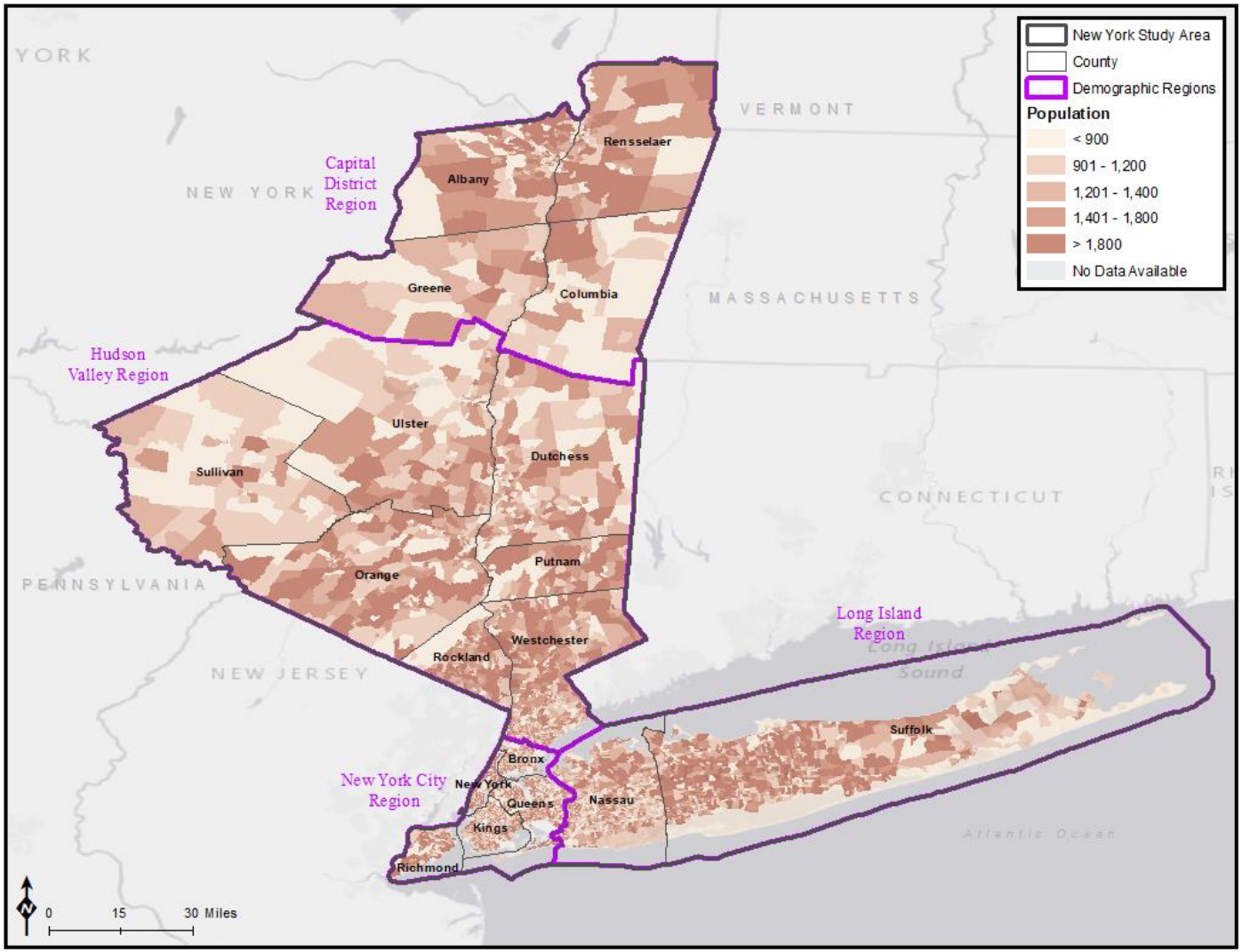
The MSAs are located within the Hudson Valley and New York City Regions of the Study Area (Data.gov 2017).

Within the limited space of the Nation's coasts, population density far exceeds the Nation as a whole. According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the National population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 7-23. The figure illustrates geographic high-density concentrations in major urban areas, particularly the New York City Region with density in the greater than "1,700 persons per square mile" range.

Locations farthest away from the urban area, such as the northwestern and northeastern boundaries of the Hudson Valley Region and the large contiguous areas of the Capital District Region located away from the capital have low-density areas comprising the less than "100 persons per square mile" and "101-200 persons per square mile" categories. As shown in Table 7-8, the population density of the New York Study Area was 1,687 persons per square mile in 2017, greater than the State (406 persons per square mile) and the Nation (90 persons per square mile), signifying that the coastal counties are more densely populated than the State and the Nation. Population densities in the Study Area ranged from 73 persons per square mile in rural Greene County (Capital District) to 72,997 persons per square mile in New York County (Manhattan) in the New York City District (USCB 2017d, USCB 2017c, USDA 2013).

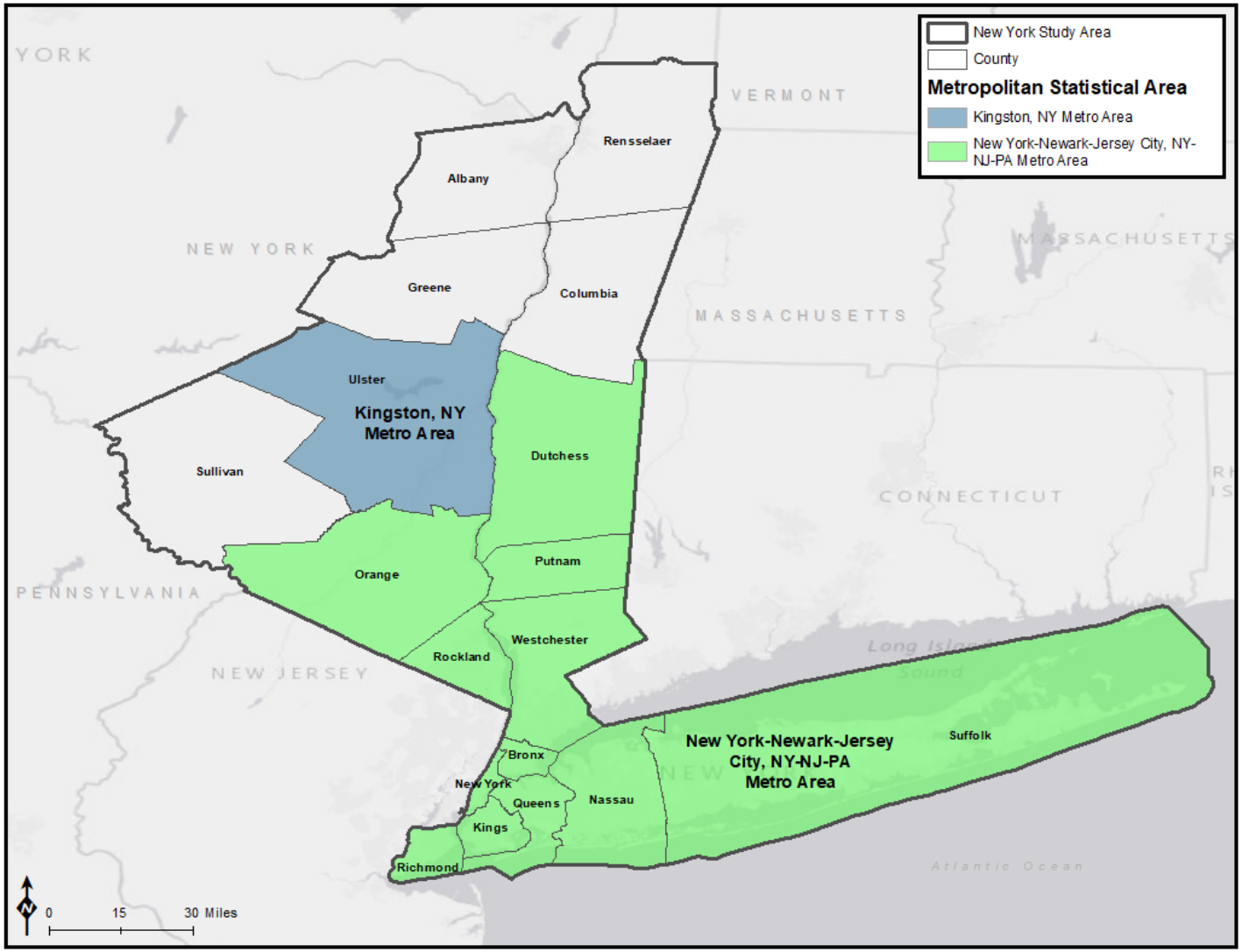
7.4.1.2 Population Projections

According to Cornell University, New York's population is projected to grow 5.0% (20.8 million residents) by 2040. Population in the Study Area is projected to follow a similar pattern to that of the State, growing 7.9% (15.5 million residents) by 2040. During the same period, the Nation's population is projected to grow 16.4% (373.5 million), more than the State and the Study Area. Table 7-7 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040, delineated by region (USCB 2017d, USCB 2017c, USCB 2018b, Cornell 2018). Figure 7-24 shows the overall projected percent change in population in each county during the same period.



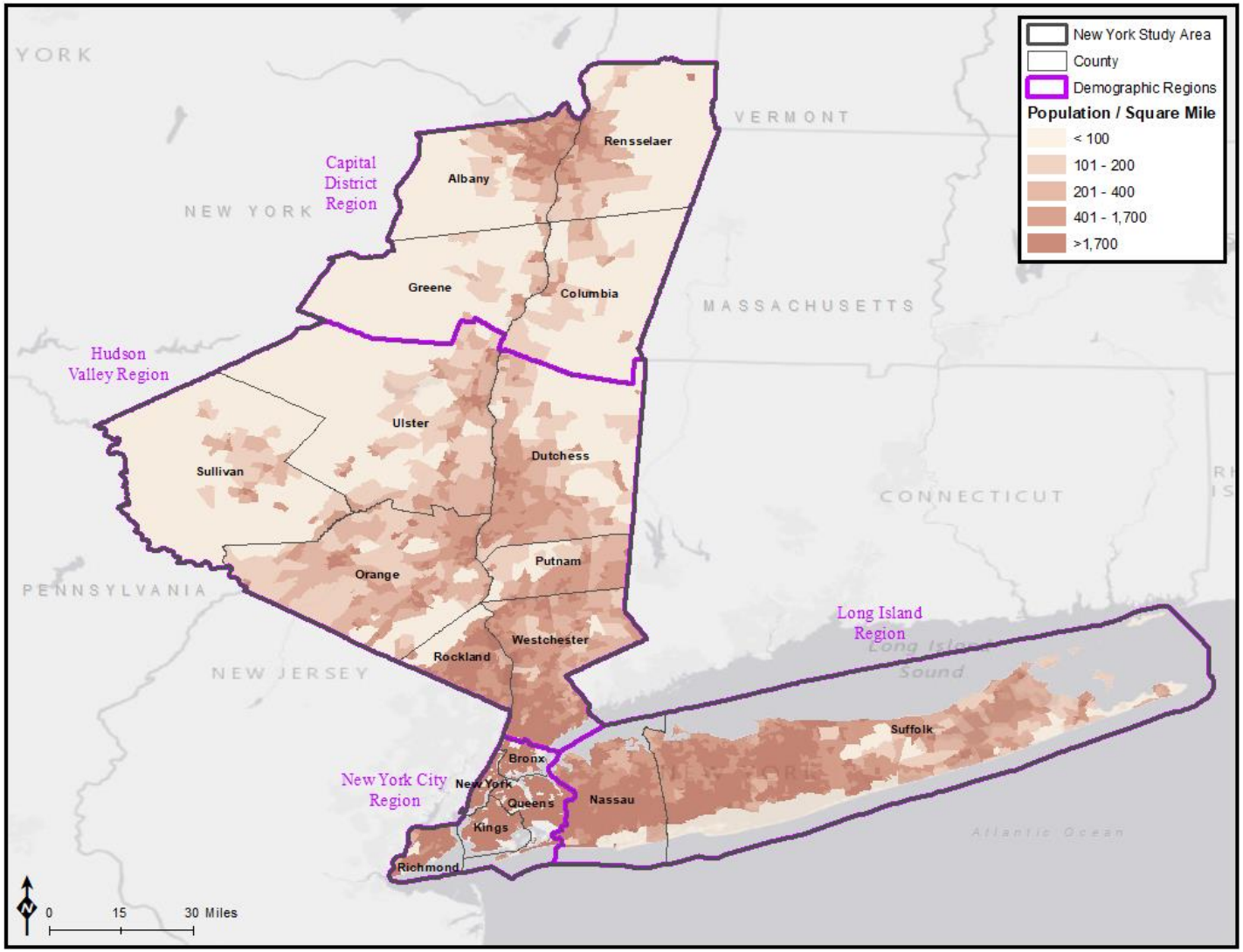
Source: USCB 2017r

Figure 7-21. Population in the New York Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 7-22. Metropolitan Statistical Areas Located within the New York Study Area



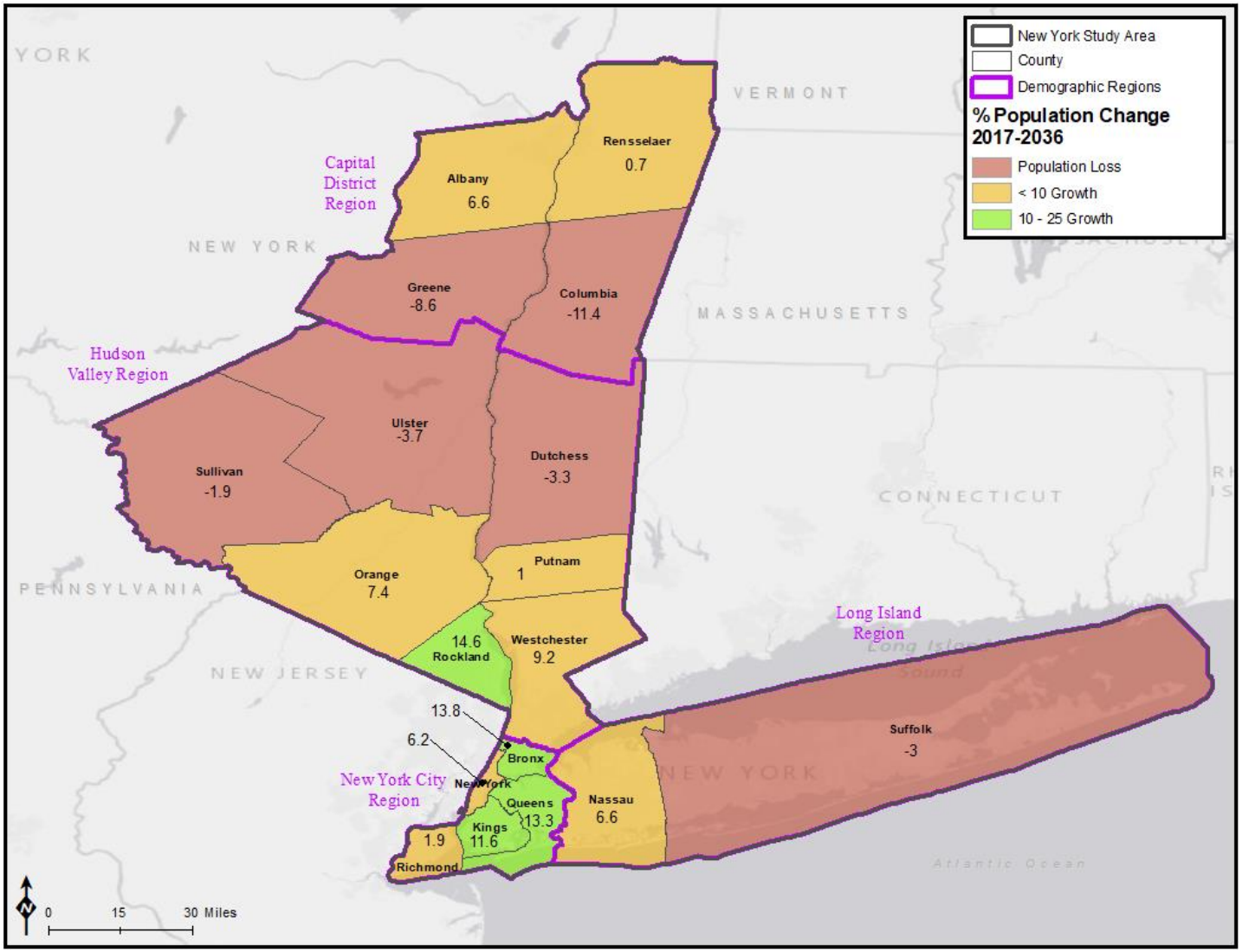
Source: USCB 2017r

Figure 7-23. Population Density in the New York Study Area by Census Block Group

Table 7-8. 2017 and 2040 Population Density in the New York Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2038 Population Density (people per square mile of land area)
Capital District	**Albany**	308,580	328,968	523	590.2	629.2
	Columbia	61,481	54,459	635	96.9	85.8
	Greene	47,791	43,697	647	73.8	67.5
	Rensselaer	159,800	160,846	652	244.9	246.5
	Total Capital District Region	***577,652***	***587,970***	***2,457***	***235.1***	***239.3***
Hudson Valley	**Dutchess**	295,685	285,869	796	371.6	359.3
	Orange	378,174	406,292	812	465.5	500.2
	Putnam	99,464	100,435	230	431.9	436.1
	Rockland	325,027	372,432	173	1,874.0	2,147.4
	Sullivan	75,783	74,364	968	78.3	76.8
	Ulster	180,129	173,499	1,124	160.2	154.3
	Westchester	975,321	1,064,958	431	2,265.2	2,473.4
	Total Hudson Valley Region	***2,329,583***	***2,477,849***	***4,535***	***513.7***	***546.4***
Long Island	**Nassau**	1,363,069	1,452,510	285	4,789.6	5,103.9
	Suffolk	1,497,595	1,453,196	912	1,642.5	1,593.8
	Total Long Island Region	***2,860,664***	***2,905,706***	***1,196***	***2,391.1***	***2,428.8***
New York City	**Bronx**	1,455,846	1,656,930	42	34,621.8	39,403.8
	Kings	2,635,121	2,940,373	69	37,985.7	42,385.9
	New York	1,653,877	1,756,587	23	72,997.4	77,530.7
	Queens	2,339,280	2,649,443	109	21,505.0	24,356.4
	Richmond	475,948	485,084	58	8,274.7	8,433.5
	Total New York City Region	***8,560,072***	***9,488,417***	***300***	***28,498.0***	***31,588.6***
	Study Area Total	**14,327,971**	**15,459,942**	**8,489**	**1,687.9**	**1,821.3**
	New York	**19,798,228**	**20,794,907**	**48,718**	**406.4**	**426.8**
	United States	**321,004,407**	**379,392,779**	**3,531,905**	**90.9**	**107.4**

Sources: USCB 2017c, USCB 2017d, USCB 2018b, Cornell 2018



Source: Cornell 2018

Figure 7-24. Overall Projected Population Change from 2017-2040 in the New York Study Area by County

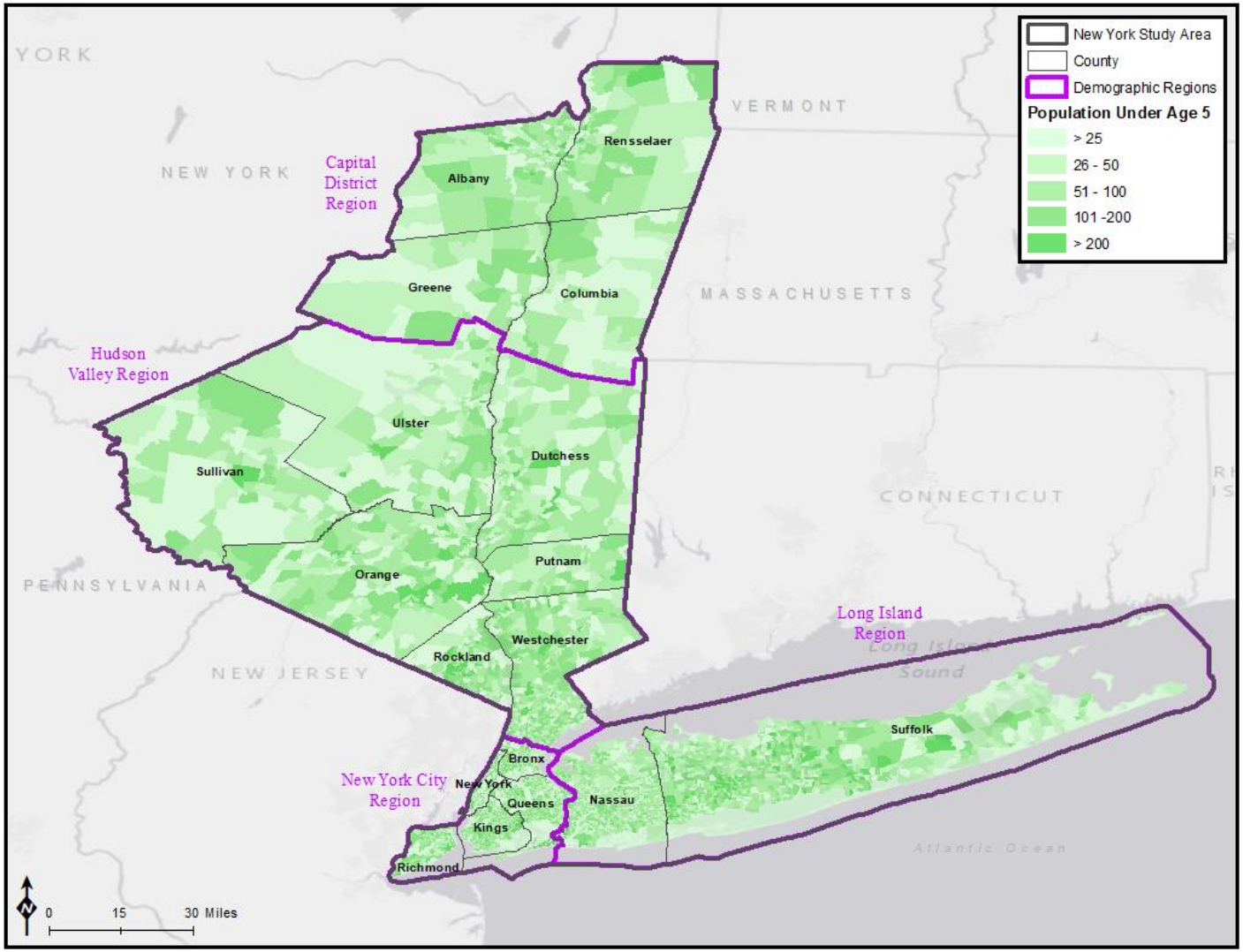
As shown in Table 7-8, projections indicate that 74.3% (15.5 million people) of the State's population will reside in the Study Area by 2040 as compared to 72.4% (14.7 million people) in 2017. Growth will not be uniform across the Study Area. Strong growth trends are expected to continue in the New York City Region, projected to be 10.8% between 2017 and 2040. Continued rapid growth is projected in the Hudson Valley Region county of Rockland, as younger families move to suburbs in search of relatively cheaper housing and less crowded schools. Gains in these counties help offset the projected stagnation and population decline predicted in the rural counties in the Study Area. Relatively modest growth of 1.6% and 1.8% is predicted for the Long Island and Capital District Regions, respectively, likely due to a combination of out-migration and low birth rates. Population loss of 11.4% and 8.6% by 2040 are projected in the rural counties of Columbia and Greene, both located in the Capital District Region. Of the 18 counties in the Study Area, 12 geographies are projected to increase population while 6 are projected to decrease population (Cornell 2018, USDA 2013, USCB 2017d).

Population density in the Study Area is projected to increase from 1,688 persons per square mile to 1,821 persons per square mile in the Study Area between 2017 and 2040 (USCB 2017d, USCB 2017c, Cornell 2018). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

7.4.2 Demographics

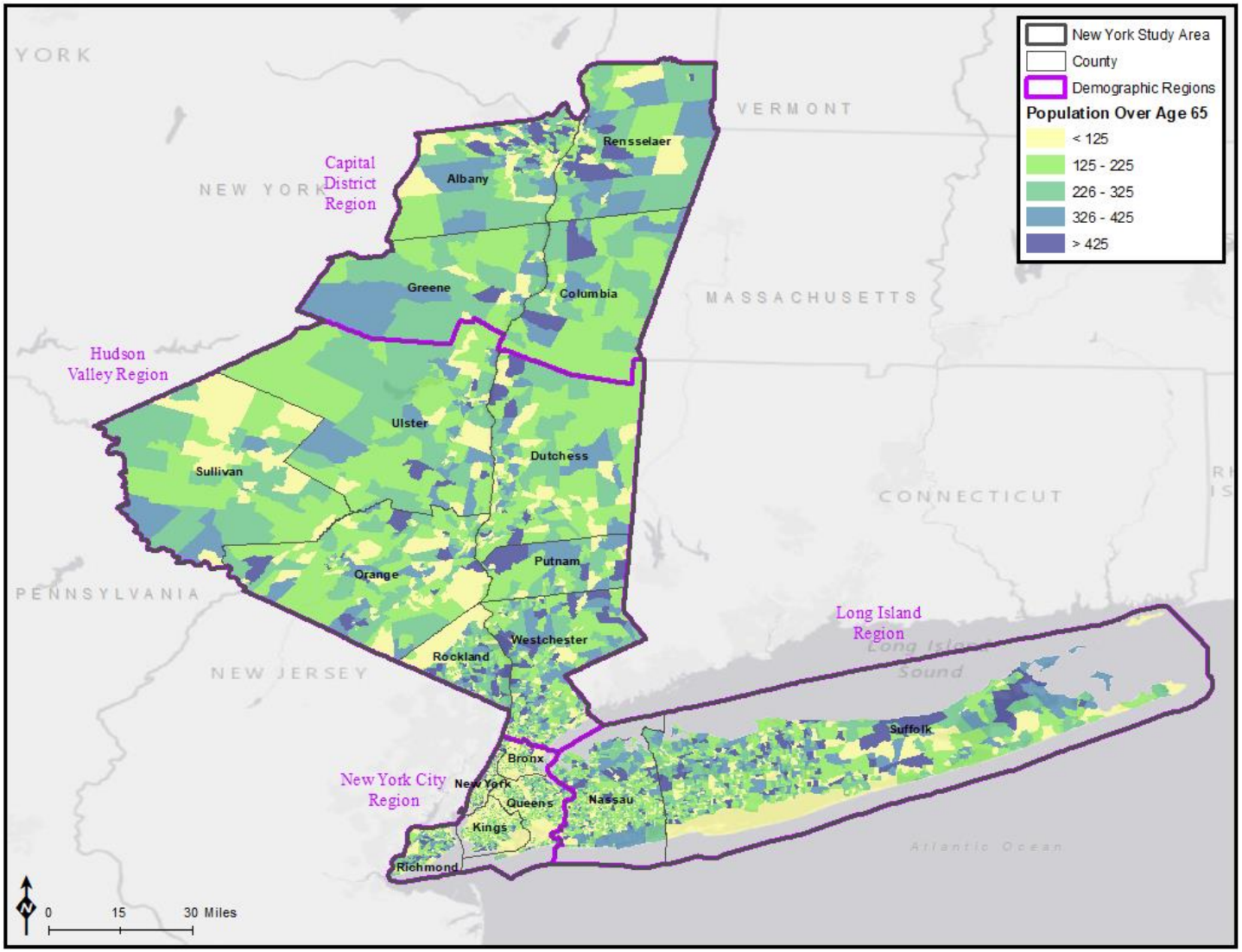
As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact New York and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 7-25 and Figure 7-26 show the 2017 estimated population Under Age 5 and Over Age 65, respectively. Figure 7-27 and Figure 7-28 show the projected change in these groups by 2040. Table 7-9 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., New York, and the Study Area (Brookings Institute 2018, USCB 2017b, Cornell 2018).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) are present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in New York and 6.1% in the Study Area. Table 7-9 shows the breakdown by demographic region. Projections by the year 2040 indicate this group's proportional decline in the Nation (5.7%), the State (5.4%), and the Study Area (5.6%). The Capital District Region had the smallest percentage (5.0%) of young children in 2017; a further decrease to 4.7% is projected by 2040. For the study area, this is an overall decrease of 0.5% in the proportion of the population under age 5 from 2017-2040 (USCB 2017b, USCB 2018b, Cornell 2018).



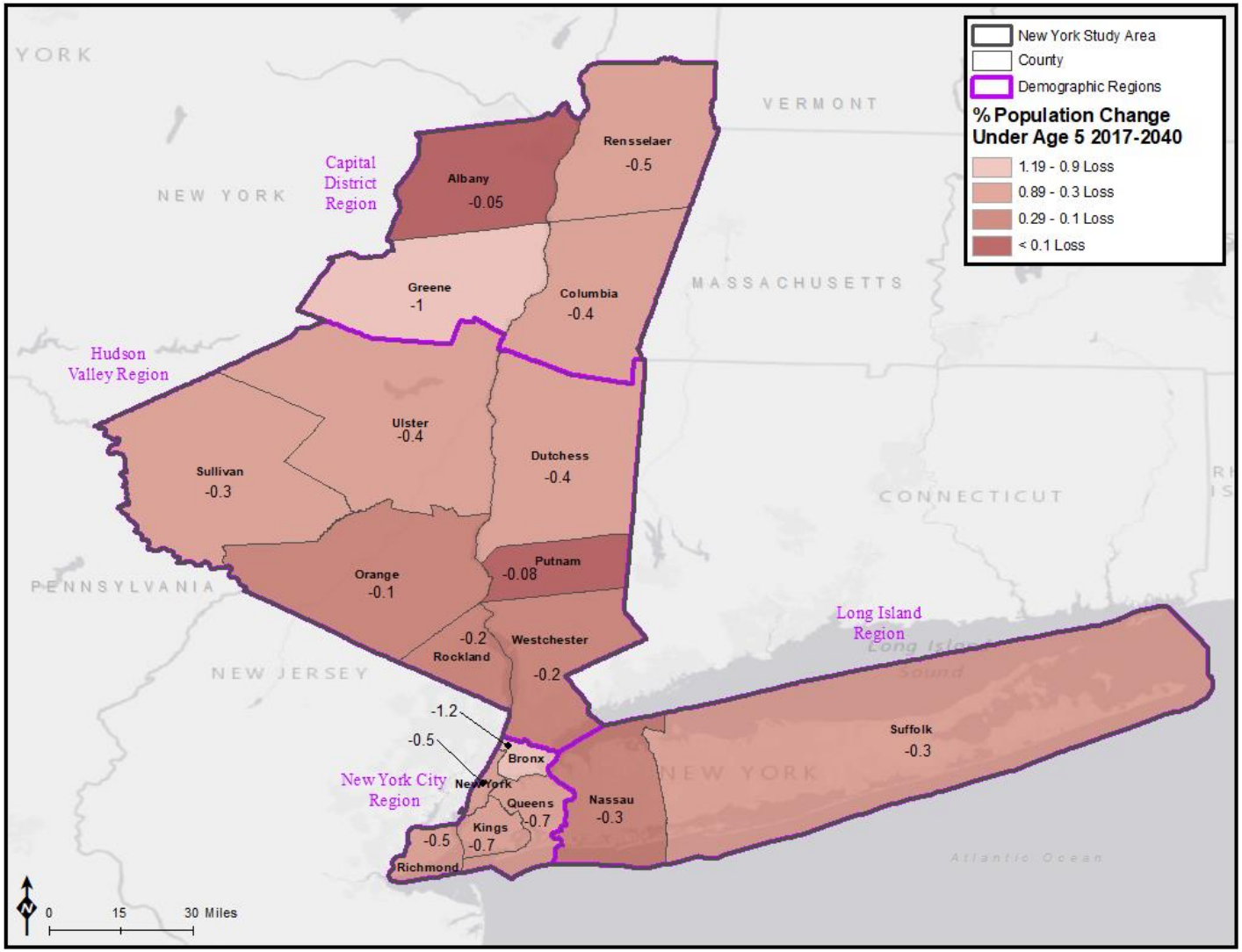
Source: USCB 2017r

Figure 7-25. Population Under Age 5 in the New York Study Area by Census Block Group



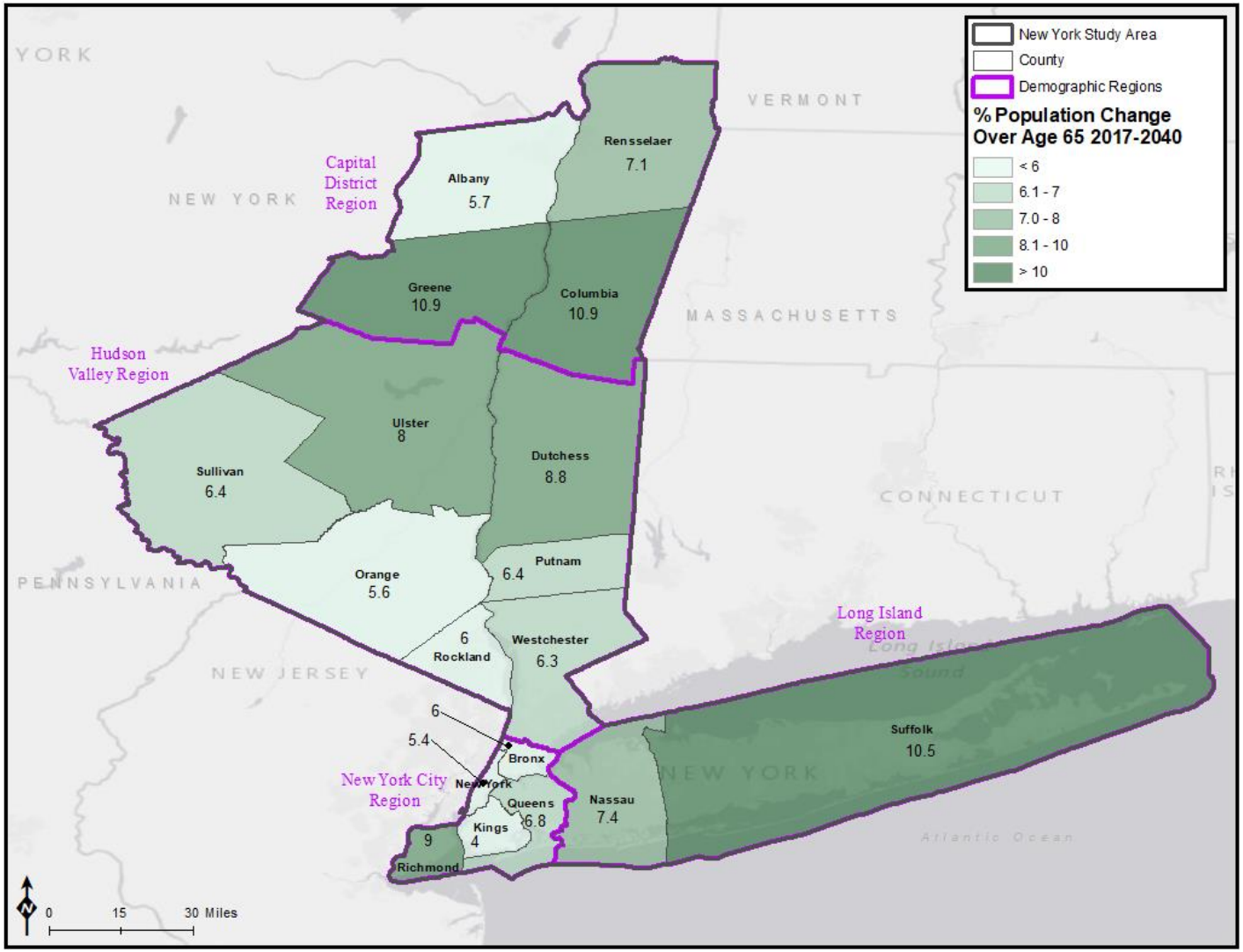
Source: USCB 2017r

Figure 7-26. Population Over Age 65 in the New York Study Area by Census Block Group



Source: Cornell 2018

Figure 7-27. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the New York Study Area by 2040



Source: Cornell 2018

Figure 7-28. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the New York Study Area by 2040

Table 7-9. Population Under Age 5 and Over Age 65 in the New York Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Capital District	**Albany**	308,580	15,646	5.1	48,135	15.6	328,968	16,506	5.0	70,067	21.3
	Columbia	61,481	2,634	4.3	13,273	21.6	54,459	2,139	3.9	17,687	32.5
	Greene	47,791	2,130	4.5	9,702	20.3	43,697	1,519	3.5	13,623	31.2
	Rensselaer	159,800	8,526	5.3	24,956	15.6	160,846	7,731	4.8	36,537	22.7
	Total Capital District Region	***577,652***	***28,936***	***5.0***	***96,066***	***16.6***	***587,970***	***27,895***	***4.7***	***137,914***	***23.5***
Hudson Valley	**Dutchess**	295,685	13,858	4.7	47,422	16.0	285,869	12,341	4.3	71,138	24.9
	Orange	378,174	24,827	6.6	49,012	13.0	406,292	26,088	6.4	75,226	18.5
	Putnam	99,464	4,440	4.5	15,514	15.6	100,435	4,404	4.4	22,063	22.0
	Rockland	325,027	24,718	7.6	49,088	15.1	372,432	27,590	7.4	78,508	21.1
	Sullivan	75,783	4,252	5.6	13,236	17.5	74,364	3,948	5.3	17,738	23.9
	Ulster	180,129	8,066	4.5	32,421	18.0	173,499	7,064	4.1	45,153	26.0
	Westchester	975,321	55,593	5.7	156,260	16.0	1,064,958	59,102	5.5	237,752	22.3
	Total Hudson Valley Region	***2,329,583***	***135,754***	***5.8***	***362,953***	***15.6***	***2,477,849***	***140,537***	***5.7***	***547,578***	***22.1***
Long Island	**Nassau**	1,363,069	74,315	5.5	228,558	16.8	1,452,510	75,039	5.2	350,834	24.2
	Suffolk	1,497,595	80,955	5.4	233,897	15.6	1,453,196	73,507	5.1	379,063	26.1
	Total Long Island Region	***2,860,664***	***155,270***	***5.4***	***462,455***	***16.2***	***2,905,706***	***148,546***	***5.1***	***729,897***	***25.1***
New York City	**Bronx**	1,455,846	108,200	7.4	171,277	11.8	1,656,930	103,503	6.2	293,728	17.7
	Kings	2,635,121	196,132	7.4	337,741	12.8	2,940,373	198,877	6.8	495,861	16.9
	New York	1,653,877	82,097	5.0	252,718	15.3	1,756,587	78,041	4.4	363,375	20.7
	Queens	2,339,280	146,432	6.3	334,838	14.3	2,649,443	146,516	5.5	559,023	21.1
	Richmond	475,948	27,497	5.8	71,694	15.1	485,084	25,538	5.3	116,862	24.1
	Total New York City Region	***8,560,072***	***560,358***	***6.5***	***1,168,268***	***13.6***	***9,488,417***	***552,475***	***5.8***	***1,828,849***	***19.3***
	Study Area Total	**14,327,971**	**880,318**	**6.1**	**2,089,742**	**14.6**	**15,459,942**	**869,453**	**5.6**	**3,244,238**	**21.0**
	New York	**19,798,228**	**1,176,877**	**5.9**	**3,008,351**	**15.2**	**20,794,907**	**1,131,545**	**5.4**	**4,509,462**	**21.7**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: Cornell 2018, USCB 2017b, USCB 2018b

According to 2017 estimates shown in Table 7-9, the elderly represented 14.9% of the U.S. population; 15.2% in New York and 14.6% in the Study Area. The number and proportion of elderly are projected to rise, fueled by aging baby boomers. The consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 21.7% in the State, and 21.0% in the Study Area. Each region in the Study Area projects an increase in the elderly population. The Capital District Region had the highest percentage of elderly (16.6%) in 2017; a further increase to 23.5% is projected by 2040. Figure 7-26 shows large concentrations of elderly in rural counties of Columbia and Greene in the Capital District Region, which are projected to have 32.5% and 31.2%, respectively. The Long Island Region had the largest percentage (16.6%) of elderly in 2017; a further increase to 23.5% is projected by 2040. For the study area, this is an overall increase of 6.4% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, Cornell 2018).

7.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area, are presented in Table 7-10.

As shown in Table 7-10, in 2017 homeownership in New York was 54.0%, lower than the Nation (63.8%) and higher than the Study Area (48.0%). Renters comprised approximately 46.0% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was higher (52.0%) (USCB 2017m).

Median home values were higher in the Study Area ($347,625) than the State ($293,000) and Nation ($193,500) (USCB 2017l). Figure 7-29 illustrates median home values in the Study Area.

Home values in the State increased 2.6% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Zillow.com 2019p). The market temperature of the State is characterized as hot, which indicates market conditions favorable to sellers (Zillow.com 2019p). In the 12-month period ending November 2019, metropolitan area market temperatures ranged from hot to very hot, and home values increased at the following rates:

- New York-Newark-Jersey City, NY-NJ-PA – 0.9%; hot (Zillow.com 2019r)
- Kingston, NY – 5.8%; very hot (Zillow.com 2019q)

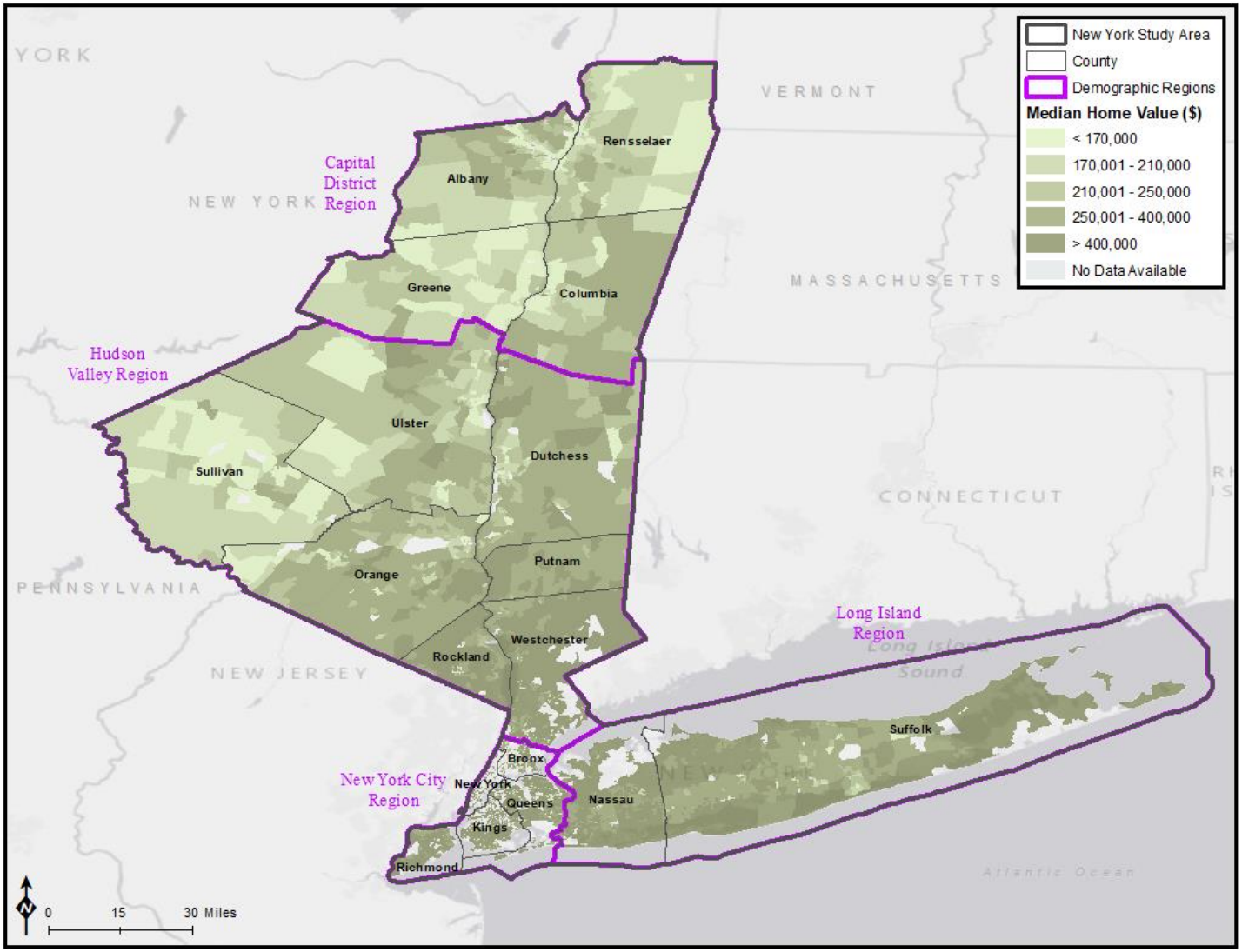
Chapter 1.6.3 discusses additional home value trends across the overall Study Area, including New York.

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Table 7-10. Housing Utilization and Vacancy Rates in the New York Study Area

Region	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Gross Rent
Capital District	Albany	140,088	125,376	14,712	10.5	71,274	56.8	54,102	43.2	$214,400	$969
	Columbia	33,252	25,470	7,782	23.4	18,429	72.4	7,041	27.6	$224,600	$886
	Greene	29,625	17,106	12,519	42.3	12,960	75.8	4,146	24.2	$176,100	$876
	Rensselaer	72,663	64,456	8,207	11.3	40,878	63.4	23,578	36.6	$183,400	$908
	Total Capital District Region	***275,628***	***232,408***	***43,220***	***15.7***	***143,541***	***61.8***	***88,867***	***38.2***	***NA***	***NA***
Hudson Valley	Dutchess	120,136	107,384	12,752	10.6	74,264	69.2	33,120	30.8	$275,200	$1,174
	Orange	141,493	126,460	15,033	10.6	86,449	68.4	40,011	31.6	$260,300	$1,187
	Putnam	38,578	34,316	4,262	11.0	28,101	81.9	6,215	18.1	$357,700	$1,334
	Rockland	105,530	99,935	5,595	5.3	68,822	68.9	31,113	31.1	$425,100	$1,420
	Sullivan	50,232	27,679	22,553	44.9	18,521	66.9	9,158	33.1	$167,900	$860
	Ulster	84,647	69,662	14,985	17.7	48,343	69.4	21,319	30.6	$221,600	$1,053
	Westchester	373,236	345,885	27,351	7.3	212,731	61.5	133,154	38.5	$513,300	$1,444
	Total Hudson Valley Region	***913,852***	***811,321***	***102,531***	***11.2***	***537,231***	***66.2***	***274,090***	***33.8***	***NA***	***NA***
Long Island	Nassau	471,031	444,136	26,895	5.7	357,982	80.6	86,154	19.4	$460,700	$1,663
	Suffolk	574,342	489,328	85,014	14.8	393,065	80.3	96,263	19.7	$379,400	$1,646
	Total Long Island Region	***1,045,373***	***933,464***	***111,909***	***10.7***	***751,047***	***80.5***	***182,417***	***19.5***	***NA***	***NA***
New York City	Bronx	524,488	495,356	29,132	5.6	97,658	19.7	397,698	80.3	$371,800	$1,133
	Kings	1,028,383	944,650	83,733	8.1	283,752	30.0	660,898	70.0	$623,900	$1,314
	New York	872,645	758,345	114,300	13.1	182,453	24.1	575,892	75.9	$915,300	$1,615
	Queens	850,422	777,904	72,518	8.5	346,041	44.5	431,863	55.5	$481,300	$1,456
	Richmond	179,179	166,150	13,029	7.3	115,428	69.5	50,722	30.5	$460,200	$1,229
	Total New York City Region	***3,455,117***	***3,142,405***	***312,712***	***9.1***	***1,025,332***	***32.6***	***2,117,073***	***67.4***	***NA***	***NA***
	Study Area Total	**5,689,970**	**5,119,598**	**570,372**	**10.0**	**2,457,151**	**48.0**	**2,662,447**	**52.0**	**$347,625**	**$1,251**
	New York	**8,255,911**	**7,302,710**	**953,201**	**11.5**	**3,942,483**	**54.0**	**3,360,227**	**46.0**	**$293,000**	**$1,194**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**36.5**	**42,992,786**	**63.8**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 7-29. Median Home Value in the New York Study Area by Census Block Group

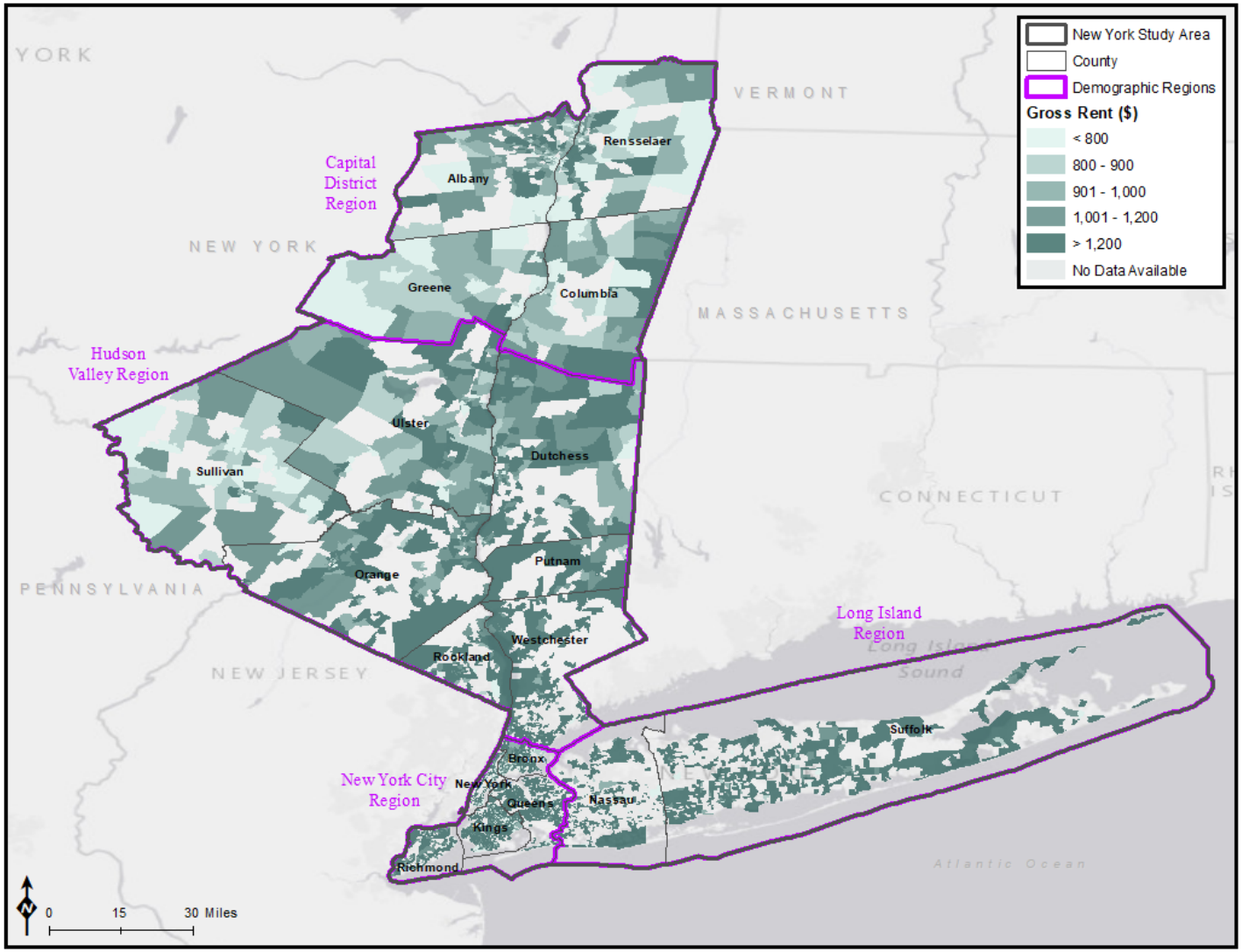
Figure 7-30 illustrates median gross rent in the Study Area. According to the National Low Income Housing Coalition, as of 2019, fair market rent for a two-bedroom rental unit in the State is $1,599. In these conditions, a minimum wage worker would have to work approximately 111 hours a week in order to afford a two-bedroom fair market rate home. New York has a shortage of approximately 605,313 rental homes affordable and available to extremely low-income households. Approximately 954,802 (28%) of renter households in New York are considered extremely low income; approximately 668,361 (70%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (34%), single caregivers (34%), and disabled (20%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

As shown in Table 7-10, home vacancy rates in New York (11.5%) in 2017 were lower than the Nation (12.2%) and higher than the Study Area (10.0%). Figure 7-31 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates in the Long Island Region, in Suffolk County near the beach destinations and rental homes in popular towns including East Hampton, West Hampton, South Hampton, and Montauk (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Airbnb has said that 46,000 Airbnb hosts in New York City have generated more than $2 billion in economic activity. The use of Airbnb and other online short-term rental portals in the New York metropolitan area have various restrictions placed on them by local municipalities (hamptons.com 2020). Figure 7-31 illustrates high vacancy rates in counties with negative population growth (Greene, Columbia, Sullivan and Ulster Counties) (USCB 2017r).

7.4.4 Employment

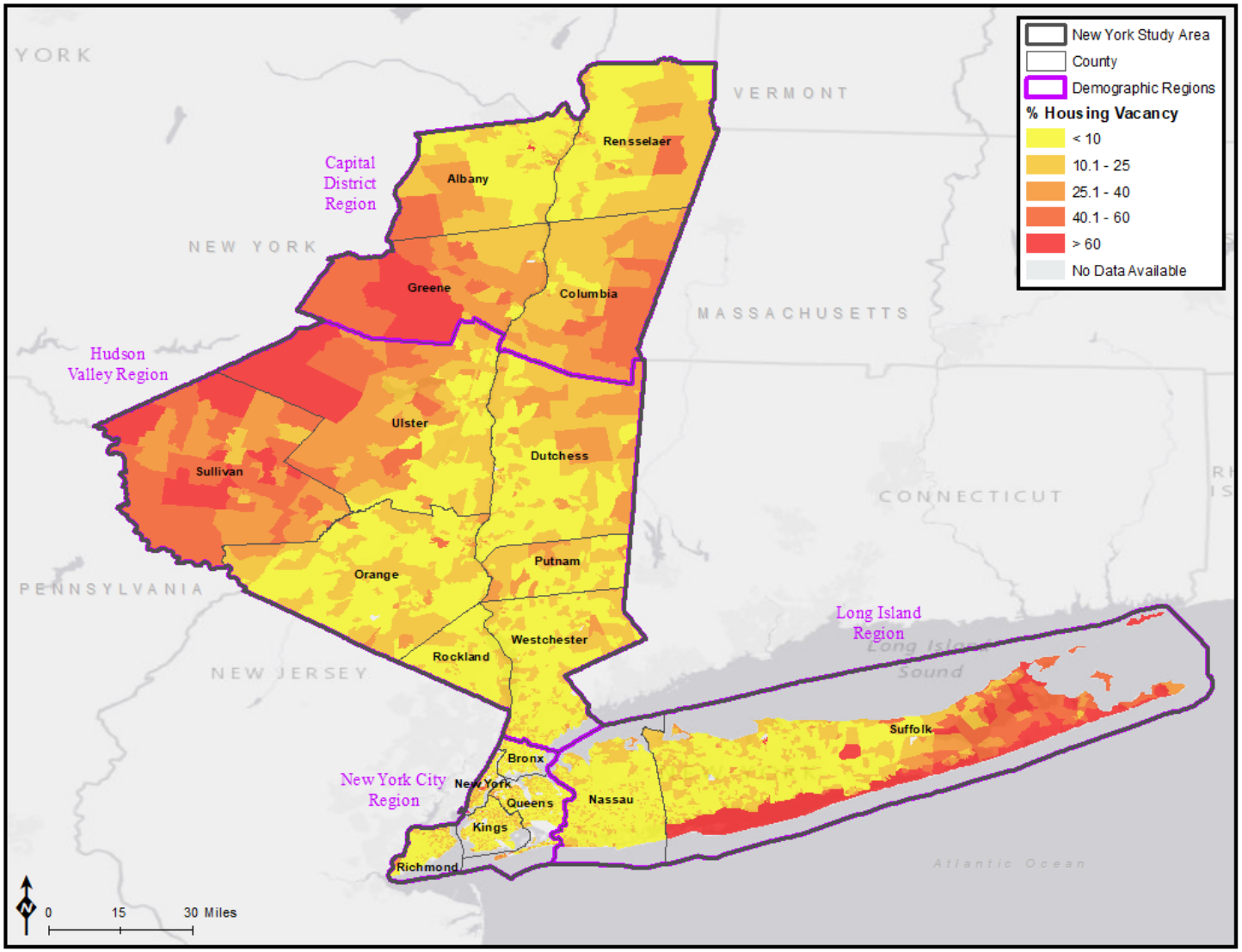
7.4.4.1 Types of Employment

Employment data by industry sector in 2017 are presented in Table 7-11. In 2017, the Study Area had a total employment of 6.9 million jobs, representing approximately 73.0% of the total jobs in New York and 4.6% of the total jobs in the U.S. (USCB 2017p). New York's 2018 annual gross domestic product was 1.6 trillion, which represented 8.1% of the Nation's gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 7-30. Median Gross Rent in the New York Study Area by Census Block Group



Source: USCB 2017r

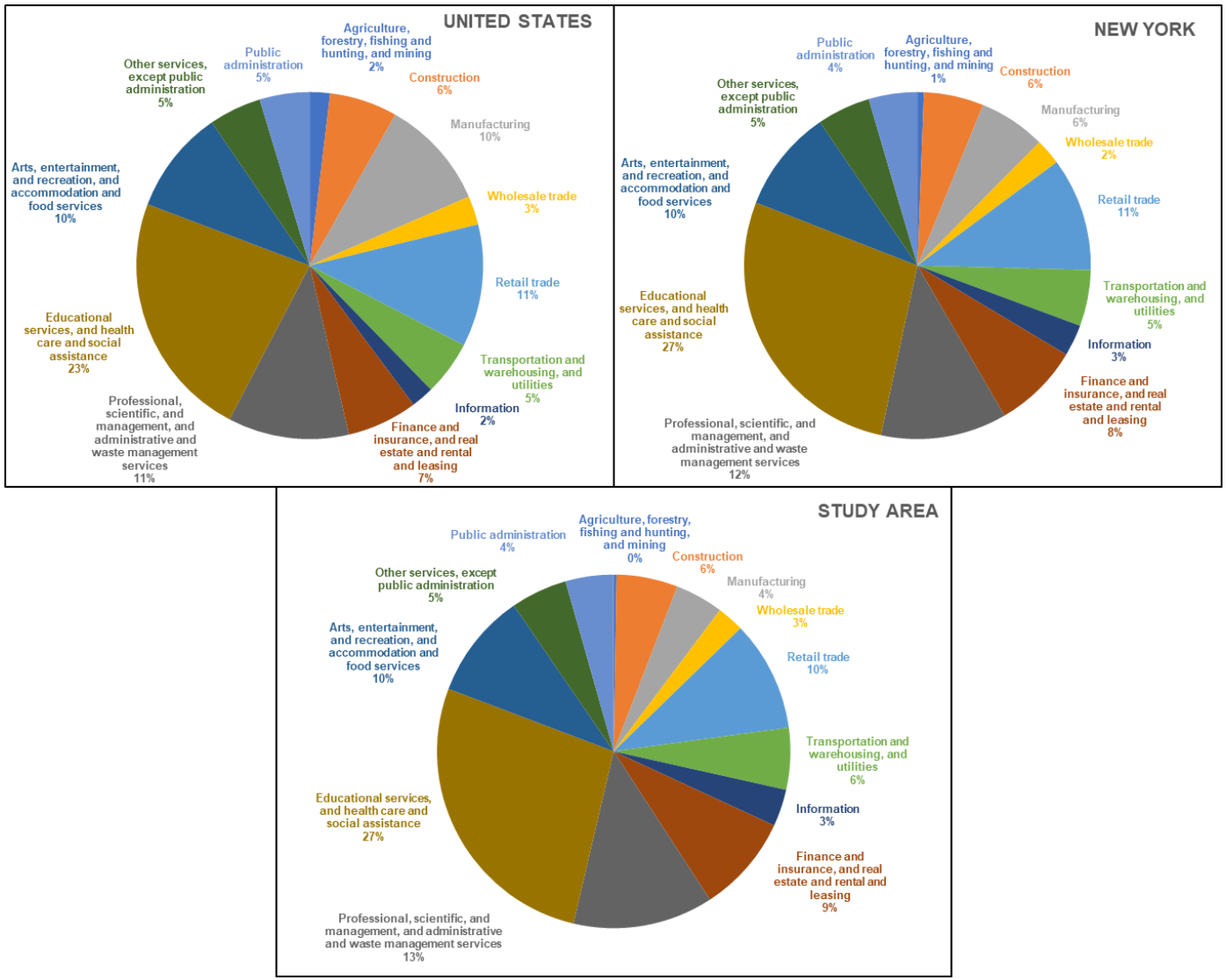
Figure 7-31. Housing Vacancy Rates in the New York Study Area by Census Block Group

Table 7-11. Census Bureau Labor and Industry Statistics for the U.S., New York, and the New York Study Area (number of jobs)

Industry	United States	Percent (%)	New York	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**9,467,631**		**6,909,369**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	56,127	0.6	17,391	0.3
Construction	9,564,541	6.4	528,962	5.6	387,698	5.6
Manufacturing	15,477,389	10.3	590,021	6.2	304,248	4.4
Wholesale trade	4,042,867	2.7	229,675	2.4	171,050	2.5
Retail trade	17,167,000	11.4	1,000,344	10.6	698,251	10.1
Transportation and warehousing, and utilities	7,681,579	5.1	495,766	5.2	390,353	5.6
Information	3,173,300	2.1	277,518	2.9	233,587	3.4
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	762,192	8.1	618,455	9.0
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	1,114,372	11.8	887,479	12.8
Educational services, and health care and social assistance	34,781,348	23.1	2,605,856	27.5	1,871,360	27.1
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	905,824	9.6	668,938	9.7
Other services, except public administration	7,371,226	4.9	470,708	5.0	356,421	5.2
Public administration	7,025,870	4.7	430,266	4.5	304,138	4.4

Source: USCB 2017p

Table 7-11 and Figure 7-32 show the number of jobs in each major industry sector for the U.S., the State, and the Study Area. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (27.1%); professional, scientific, and management, and administrative and waste management (12.8%); retail trade (10.1%); and finance and insurance, and real estate and rental and leasing (9.0%). Generally, the dominant employment categories in the Study Area are similar to those of the State. In the Study Area, 9.0% of people work in finance and insurance, and real estate and rental and leasing, more than the State (8.1%) and the U.S. (6.6%) (USCB 2017p). This reflects New York City's position as a global center for banking and financial services, publishing, media, advertising, arts, culture, and industry as well as the innovation economy (NYSESD 2016b). Manufacturing in the Study Area is 4.4%, less that the State (6.2%) and Nation (10.3%) (USCB 2017p).



Source: USCB 2017p

Figure 7-32. Number of Jobs by Industry Sector for the U.S., New York, and the New York Study Area

According to the New York City Regional Economic Development Council, the New York City Region dominates the economy of the State and accounts for approximately 56% of its economic output. Financial services and technology are its strongest industry sectors; financial services provide the anchor industry, while technology is the fastest growing industry (NYCREDC 2018). The region gained over 50,000 jobs in technology between 2011 and 2018 for a total of over 172,000 jobs. The New York City Region is home to the headquarters of many Fortune 500 companies. Global venture capital investment in the region increased from 4.6% in 2008 to 6.0% in 2017 (NYSESD 2016b).

Figure 7-33 shows the location of jobs within the Study Area. The greater portion of jobs are located in the New York City Region in the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017r). Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the rural Capital District and Hudson Valley Regions. Rural areas tend to have fewer locally available options and less economic development.

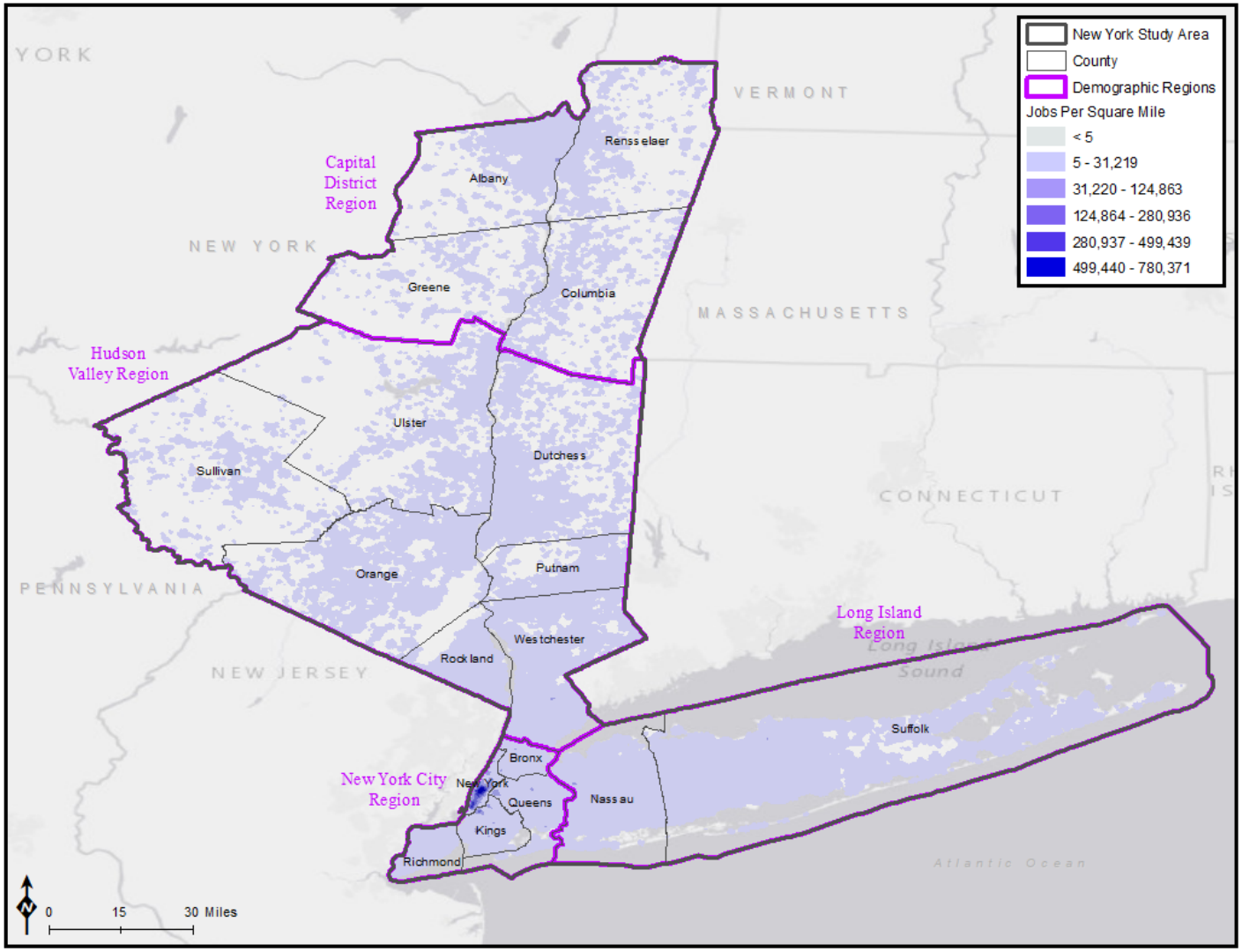
7.4.4.1.1 New York Ocean Economy

New York's ocean economy ranked third in employment among the 30 States included in the U.S. Ocean and Great Lakes economy. As shown in Table 7-12, New York's ocean economy accounted for 384,681 maritime jobs in 2016, accounting for 4.2% of New York's employment (USCB 2017i, NOAA 2016b). Within the State, tourism and recreation was the dominant sector, accounting for 91.6% (347,001) of maritime jobs. The tourism and recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 343,593 maritime jobs, representing 89.3% of total maritime jobs in the State. New York County had the greatest number of maritime jobs (216,413), representing 77.3% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). Figure 7-34 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. The counties in the Long Island and New York City Regions have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities. The Port of New York's port (known as the Port of New York and New Jersey, operated by the Port Authority of New York and New Jersey) is the third largest port in the Nation (NYSESD 2016b). The highest percentage of maritime jobs to overall county jobs were in New York (8.7%), Richmond (8.3%), and Suffolk (5.7%) Counties, indicative of higher economic diversity in metropolitan areas (NOAA 2016b).

7.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 7-12, in 2017 New York had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had median income of $57,652 and per capita income of $31,177 in 2017. During the same period, New York had median income of $62,756 (8.9% higher than the Nation's median income) and per capita income of $35,752 (14.7% higher than the Nation's per capita income). Median and per capita income in the Study Area were higher than the State at $69,156 and $36,807, respectively (USCB 2017k, USCB 2017n).



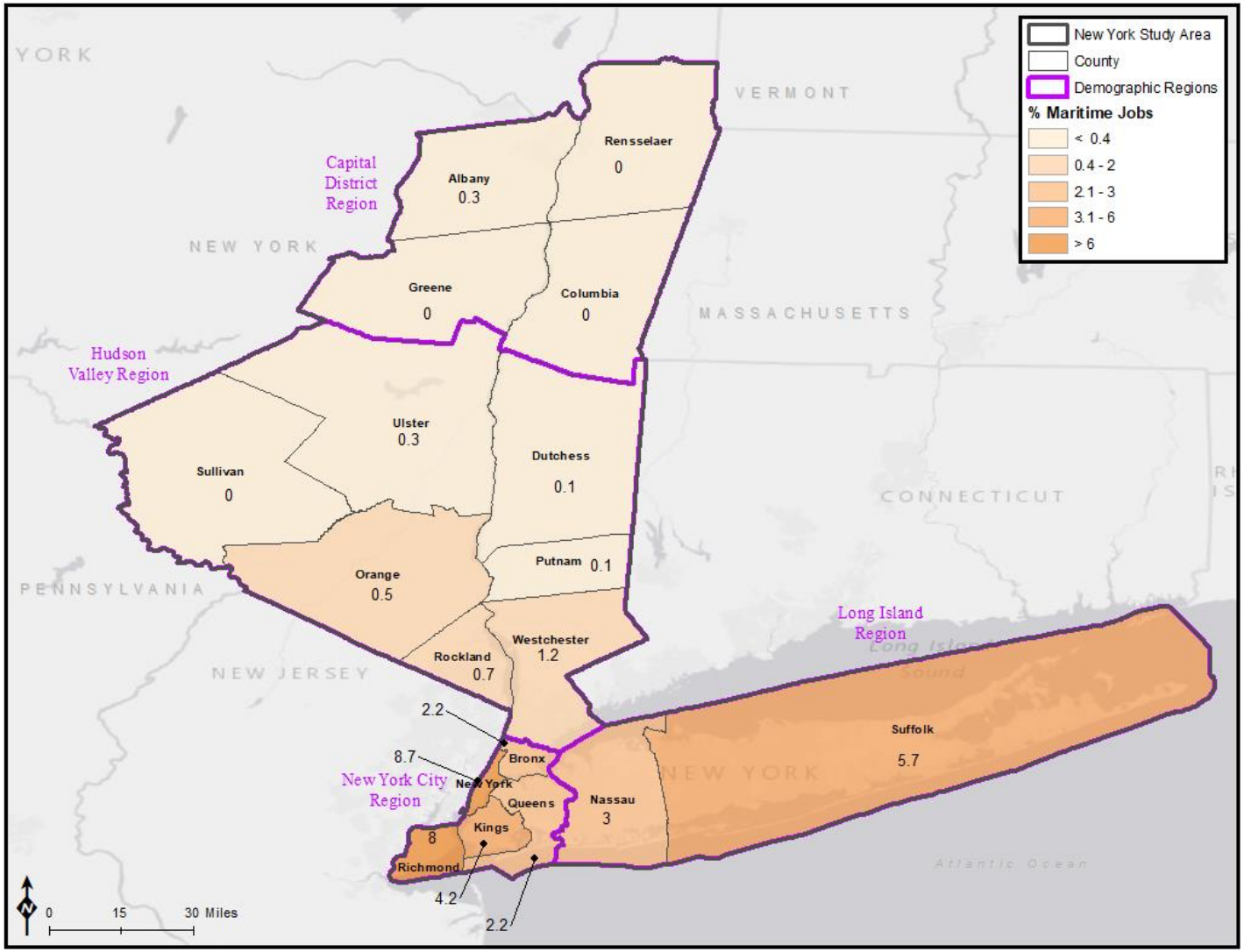
Source: USCB 2017r

Figure 7-33. Jobs per Square Mile in the New York Study Area by Census Block Group

Table 7-12. Employment Data in the New York Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Capital District	**Albany**	168,085	167,828	158,961	8,867	5.3	237,480	774	0.3	$62,293	$35,278
	Columbia	31,747	31,744	30,164	1,580	5.0	21,334	0	0.0	$61,093	$34,737
	Greene	21,372	21,342	20,009	1,333	6.2	13,795	0	0.0	$53,214	$27,402
	Rensselaer	85,563	85,428	80,468	4,960	5.8	50,510	0	0.0	$63,166	$33,067
	Total Capital District Region	***306,767***	***306,342***	***289,602***	***16,740***	***5.5***	***323,119***	***774***	***0.2***	***NA***	***NA***
Hudson Valley	**Dutchess**	155,405	155,261	144,934	10,327	6.7	111,084	26	0.0	$75,585	$36,704
	Orange	189,468	185,146	174,770	10,376	5.6	137,628	733	0.5	$75,146	$32,616
	Putnam	54,712	54,701	51,775	2,926	5.3	26,194	12	0.0	$99,608	$44,063
	Rockland	159,985	159,907	149,868	10,039	6.3	122,054	836	0.7	$88,571	$36,898
	Sullivan	36,015	35,966	32,610	3,356	9.3	25,647	0	0.0	$53,877	$28,224
	Ulster	93,329	93,194	86,552	6,642	7.1	58,003	148	0.3	$61,652	$32,453
	Westchester	512,919	512,798	479,696	33,102	6.5	417,902	5,221	1.2	$89,968	$52,049
	Total Hudson Valley Region	***1,201,833***	***1,196,973***	***1,120,205***	***76,768***	***6.4***	***898,512***	***6,976***	***0.8***	***NA***	***NA***
Long Island	**Nassau**	717,978	717,480	682,063	35,417	4.9	644,216	18,992	2.9	$105,744	$46,839
	Suffolk	788,081	787,524	744,660	42,864	5.4	654,733	37,031	5.7	$92,838	$40,277
	Total Long Island Region	***1,506,059***	***1,505,004***	***1,426,723***	***78,281***	***5.2***	***1,298,949***	***56,023***	***4.3***	***NA***	***NA***
New York City	**Bronx**	672,109	671,765	593,858	77,907	11.6	313,430	6,927	2.2	$36,593	$19,721
	Kings	1,325,652	1,324,952	1,217,976	106,976	8.1	780,252	32,731	4.2	$52,782	$29,928
	New York	966,564	966,160	906,389	59,771	6.2	2,500,850	216,413	8.7	$79,781	$69,529
	Queens	1,228,111	1,227,523	1,142,363	85,160	6.9	666,296	14,832	2.2	$62,008	$28,814
	Richmond	224,926	224,697	212,253	12,444	5.5	106,953	8,917	8.3	$76,244	$33,922
	Total New York City Region	***4,417,362***	***4,415,097***	***4,072,839***	***342,258***	***7.8***	***4,367,781***	***279,820***	***6.4***	***NA***	***NA***
	Study Area Total	**7,432,021**	**7,423,416**	**6,909,369**	**514,047**	**6.9**	**6,888,361**	**343,593**	**5.0**	**$69,156**	**$36,807**
	New York	**10,176,202**	**10,152,999**	**9,467,631**	**685,368**	**6.8**	**9,215,263**	**384,681**	**4.2**	**$62,765**	**$35,752**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 7-34. Maritime Jobs in New York Study Area by County

After the Great Recession, downstate areas comprising the New York City metropolitan area gained jobs and personal income faster than the National average, while upstate counties gained private-sector jobs at one-third the National rate and less than one-quarter the downstate rate. Upstate New York has yet to recover from the Great Recession (empirecenter.org 2020). Figure 7-35 and Figure 7-36 show median household and per capita income in the Study Area (USCB 2017k, USCB 2017n).

7.4.4.3 Unemployment Rates

Figure 7-37 shows the 2017 unemployment rates in the counties in the Study Area by census block group. Table 7-12 presents unemployment rates for each county in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 6.9%, similar to the State (6.8%) and the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area counties, unemployment rates ranged from 4.9% in Nassau County (Long Island Region) to 11.6% in Bronx County (New York City Region) in 2017. Regionally, the unemployment rate was highest in the New York City Region at 7.8% and lowest in the Long Island Region at 5.3%. (USCB 2017h).

7.4.4.4 Educational Attainment

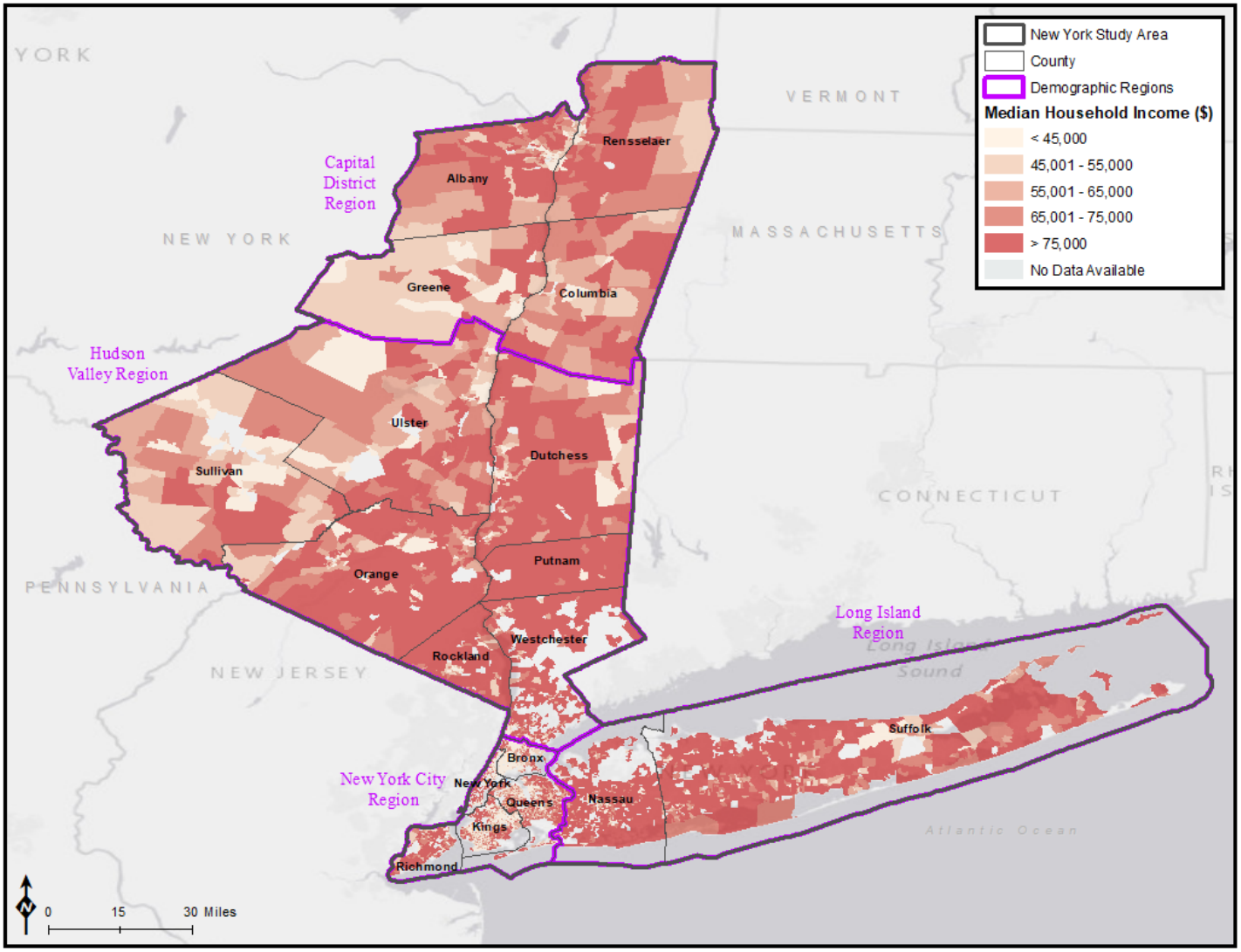
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region, and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 7-13 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State, and the Nation (USCB 2017t).

Figure 7-38 shows the percentage of the working-age population who earned only a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

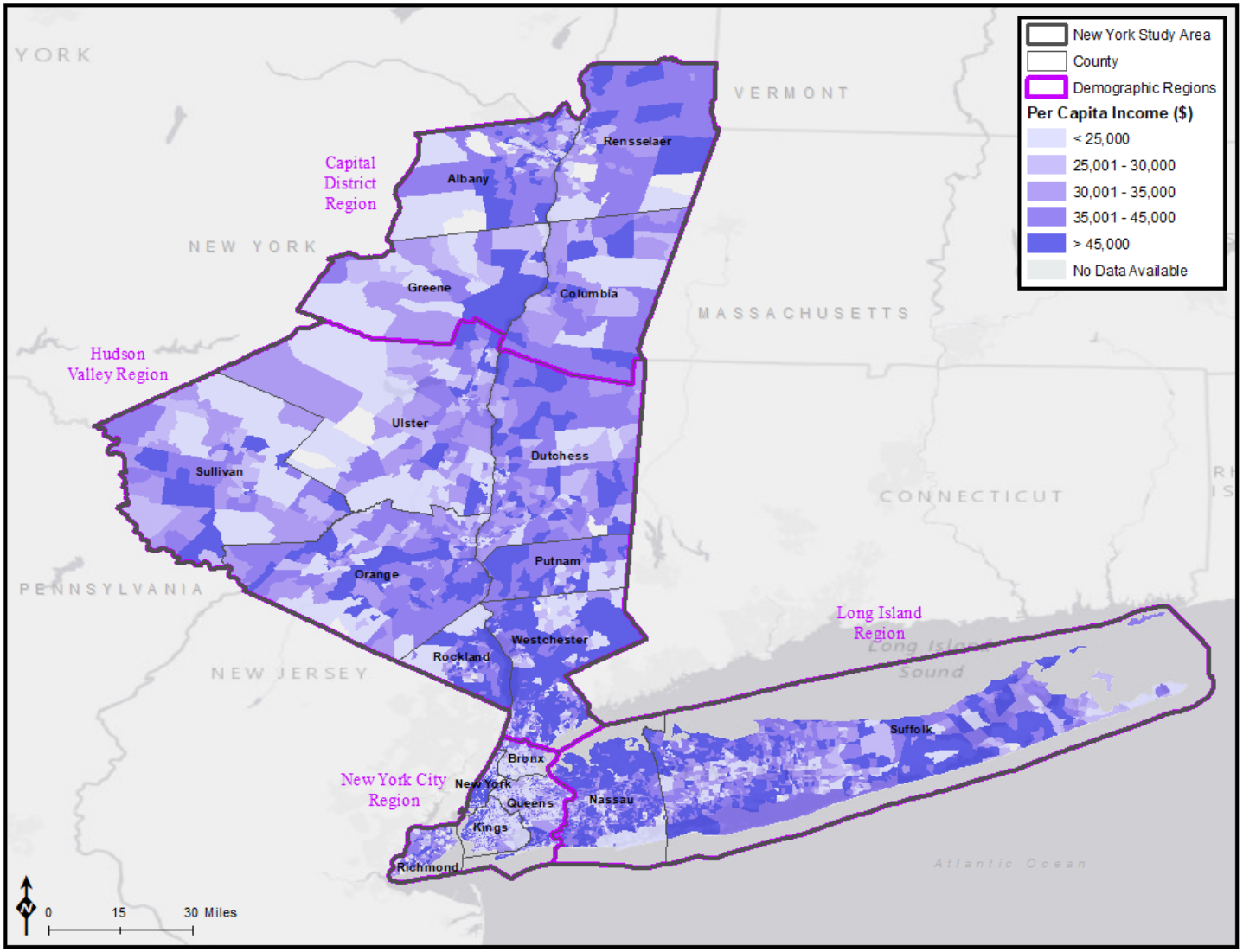
- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In New York, 26.3% of the working-age population earned only a high school diploma; 41.5% earned a college or advanced degree.
- In the New York Study Area, 24.7% of the working-age population earned only a high school diploma; 41.7% earned a college or advanced degree (USCB 2017q).

Figure 7-39 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q). Overall, the New York City Region tends to have a higher percentage of workers with less than a high school diploma than the other regions. This may be associated with the higher population density and greater numbers of potentially vulnerable communities (such as minority, low-income, limited-English speaking communities) within the highly urban New York City metropolitan area. The New York City Region also has the lowest percentage of workers with some college, with associate's degrees, and with graduate or professional degrees than the other regions. However, the New York City Region also has the second highest percentage of workers with a bachelor's degree of all the regions (the Long Island Region has the highest). The Capital District Region has the highest percentage of workers with an associate's degree. The Hudson Valley Region has the highest percentage of workers with a graduate or professional degree.



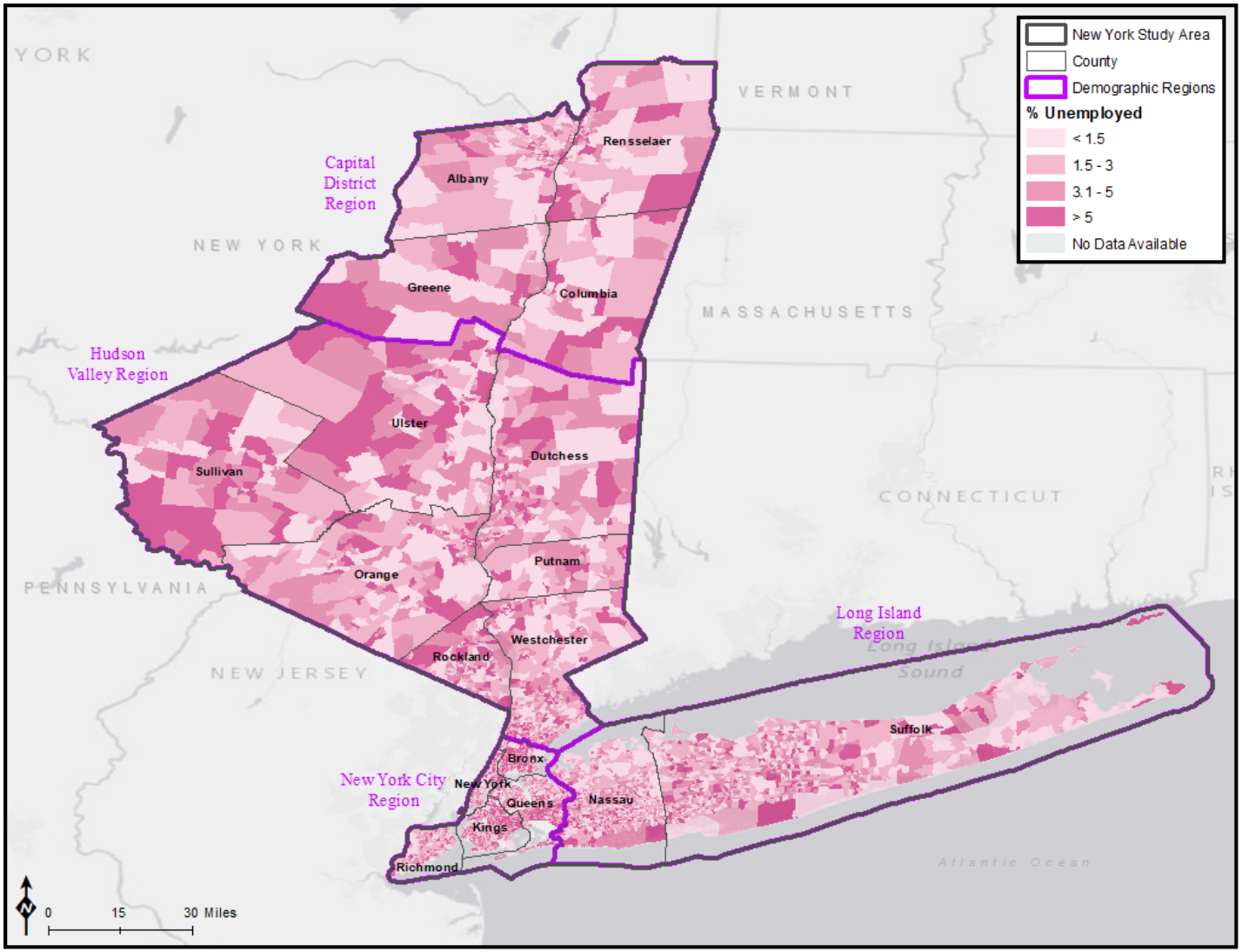
Source: USCB 2017r

Figure 7-35. Median Household Income in the New York Study Area by Census Block Group



Source: USCB 2017r

Figure 7-36. Per Capita Income in the New York Study Area by Census Block Group



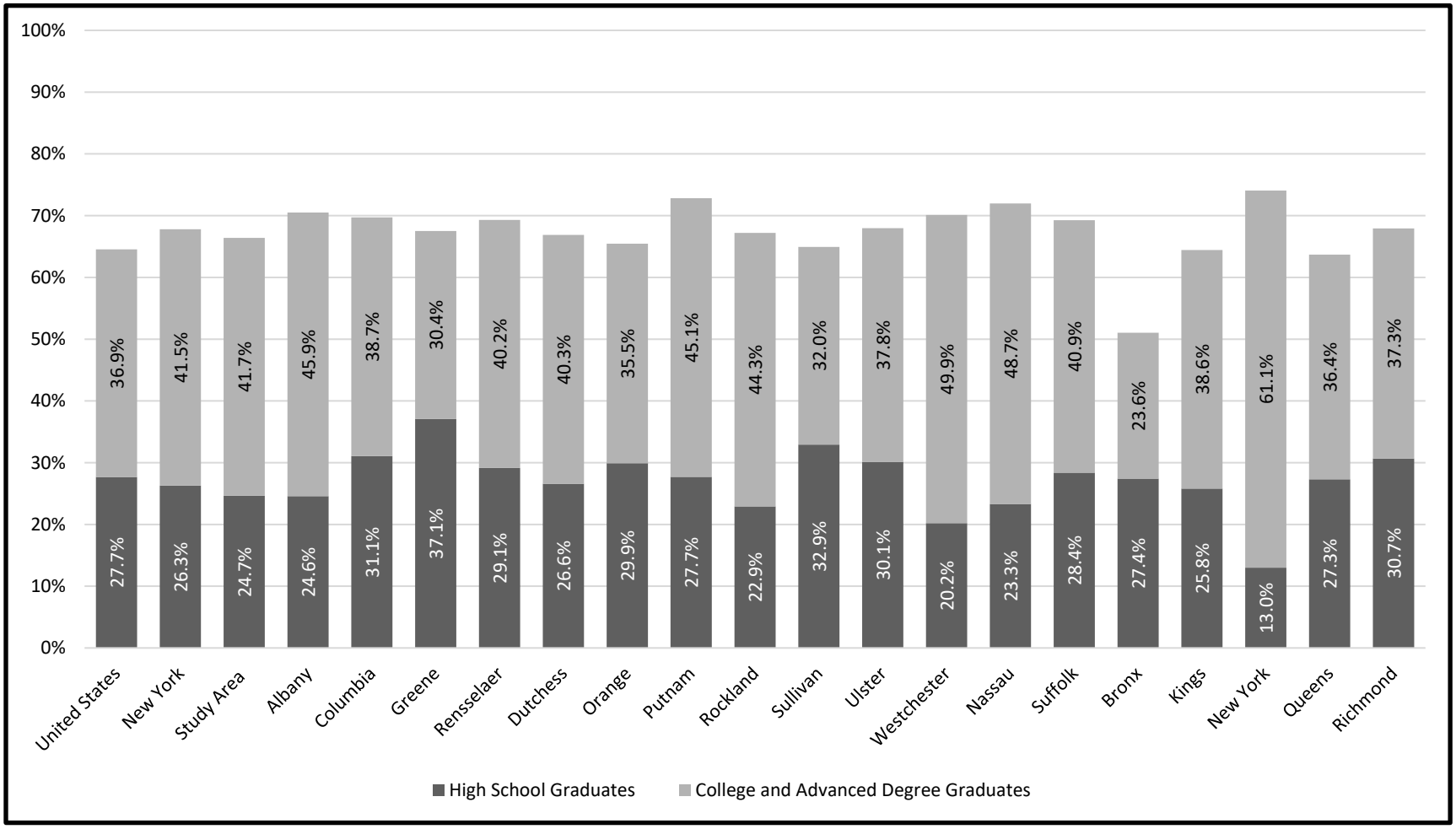
Source: USCB 2017r

Figure 7-37. Unemployment Rates in the New York Study Area by Census Block Group

Table 7-13. Educational Attainment in the New York Study Area

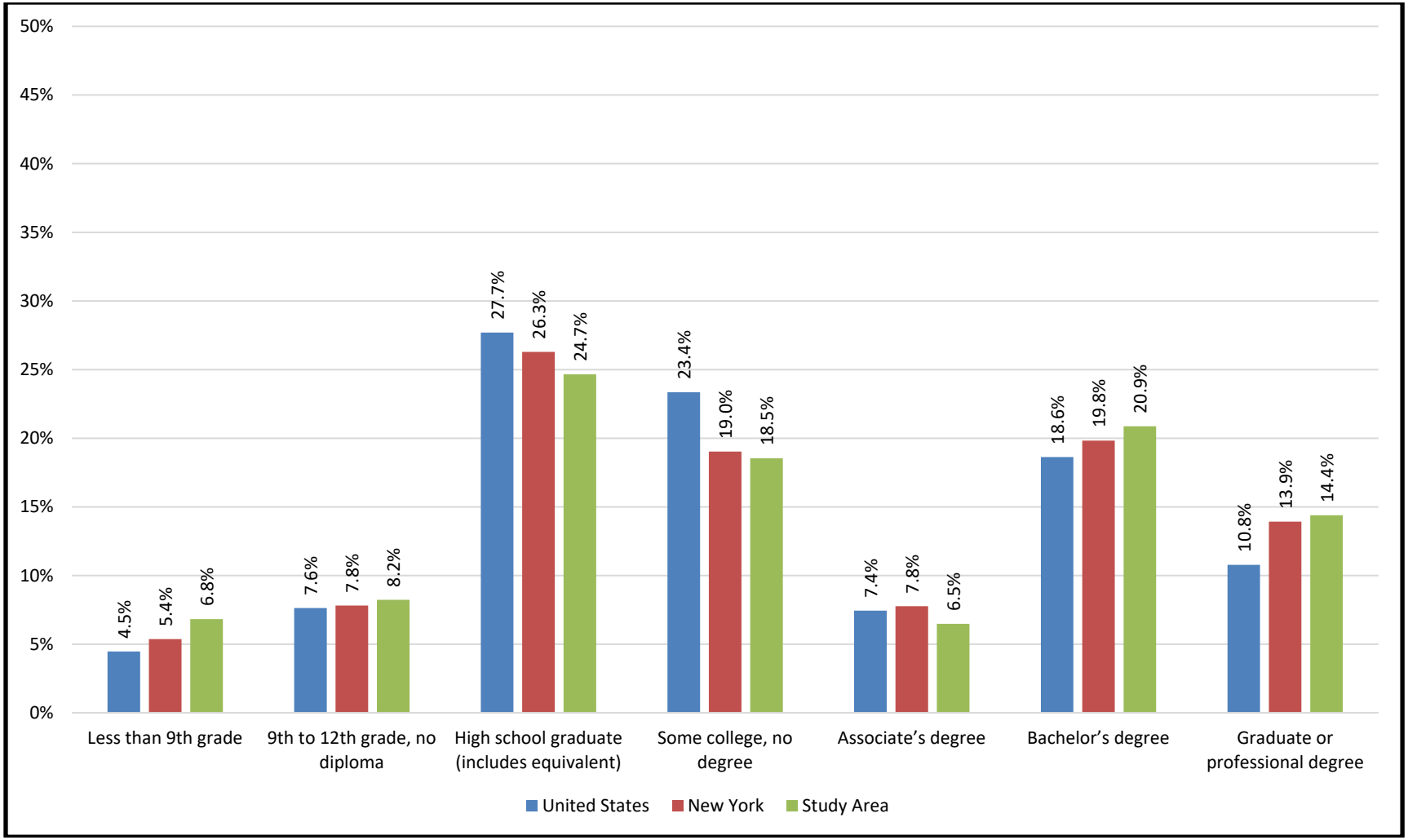
Region	Geographic Unit	Number								Percent						
		Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree	Total	Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Capital District	**Albany**	5,104	13,083	61,585	55,679	23,228	51,848	39,895	250,422	2.0	5.2	24.6	22.2	9.3	20.7	15.9
	Columbia	1,692	3,932	15,602	9,584	5,057	7,696	6,663	50,226	3.4	7.8	31.1	19.1	10.1	15.3	13.3
	Greene	1,188	4,875	14,697	6,812	4,099	4,585	3,363	39,619	3.0	12.3	37.1	17.2	10.3	11.6	8.5
	Rensselaer	2,720	7,726	37,224	28,770	15,870	21,242	14,169	127,721	2.1	6.0	29.1	22.5	12.4	16.6	11.1
	Total Capital District Region	***10,704***	***29,616***	***129,108***	***100,845***	***48,254***	***85,371***	***64,090***	***467,988***	***2.3***	***6.3***	***27.6***	***21.5***	***10.3***	***18.2***	***13.7***
Hudson Valley	**Dutchess**	6,498	16,456	63,065	55,631	21,330	42,474	31,746	237,200	2.7	6.9	26.6	23.5	9.0	17.9	13.4
	Orange	8,570	20,535	83,920	67,847	24,590	45,397	29,772	280,631	3.1	7.3	29.9	24.2	8.8	16.2	10.6
	Putnam	2,590	3,407	21,811	15,398	6,600	17,396	11,507	78,709	3.3	4.3	27.7	19.6	8.4	22.1	14.6
	Rockland	12,176	18,365	53,898	46,556	16,562	49,710	37,762	235,029	5.2	7.8	22.9	19.8	7.0	21.2	16.1
	Sullivan	2,235	6,114	19,616	12,534	6,091	7,677	5,297	59,564	3.8	10.3	32.9	21.0	10.2	12.9	8.9
	Ulster	3,828	10,043	44,344	33,269	13,181	24,090	18,400	147,155	2.6	6.8	30.1	22.6	9.0	16.4	12.5
	Westchester	44,461	48,701	152,466	132,346	41,298	175,958	159,217	754,447	5.9	6.5	20.2	17.5	5.5	23.3	21.1
	Total Hudson Valley Region	***80,358***	***123,621***	***439,120***	***363,581***	***129,652***	***362,702***	***293,701***	***1,792,735***	***4.5***	***6.9***	***24.5***	***20.3***	***7.2***	***20.2***	***16.4***
Long Island	**Nassau**	44,564	50,519	248,205	203,237	74,251	255,078	188,711	1,064,565	4.2	4.7	23.3	19.1	7.0	24.0	17.7
	Suffolk	46,974	68,802	331,511	243,394	94,513	219,737	163,250	1,168,181	4.0	5.9	28.4	20.8	8.1	18.8	14.0
	Total Long Island Region	***91,538***	***119,321***	***579,716***	***446,631***	***168,764***	***474,815***	***351,961***	***2,232,746***	***4.1***	***5.3***	***26.0***	***20.0***	***7.6***	***21.3***	***15.8***
New York City	**Bronx**	134,691	165,969	298,437	232,410	65,180	128,119	63,879	1,088,685	12.4	15.2	27.4	21.3	6.0	11.8	5.9
	Kings	172,862	206,230	522,718	341,436	111,304	422,601	249,155	2,026,306	8.5	10.2	25.8	16.9	5.5	20.9	12.3
	New York	88,010	92,403	183,875	186,263	48,338	449,175	366,162	1,414,226	6.2	6.5	13.0	13.2	3.4	31.8	25.9
	Queens	174,550	163,513	509,703	339,474	133,147	357,266	187,932	1,865,585	9.4	8.8	27.3	18.2	7.1	19.2	10.1
	Richmond	15,504	26,258	113,700	77,073	25,724	69,502	42,865	370,626	4.2	7.1	30.7	20.8	6.9	18.8	11.6
	Total New York City Region	***585,617***	***654,373***	***1,628,433***	***1,176,656***	***383,693***	***1,426,663***	***909,993***	***6,765,428***	***8.7***	***9.7***	***24.1***	***17.4***	***5.7***	***21.1***	***13.5***
	Study Area Total	**768,217**	**926,931**	**2,776,377**	**2,087,713**	**730,363**	**2,349,551**	**1,619,745**	**11,258,897**	**6.8**	**8.2**	**24.7**	**18.5**	**6.5**	**20.9**	**14.4**
	New York	**842,286**	**1,225,626**	**4,126,195**	**2,986,082**	**1,218,132**	**3,112,339**	**2,185,242**	**15,695,902**	**5.4**	**7.8**	**26.3**	**19.0**	**7.8**	**19.8**	**13.9**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 7-38. High School, College, and Advanced Degree Graduate Rates in the New York Study Area



Source: USCB 2017q

Figure 7-39. Educational Attainment in the New York Study Area

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

7.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

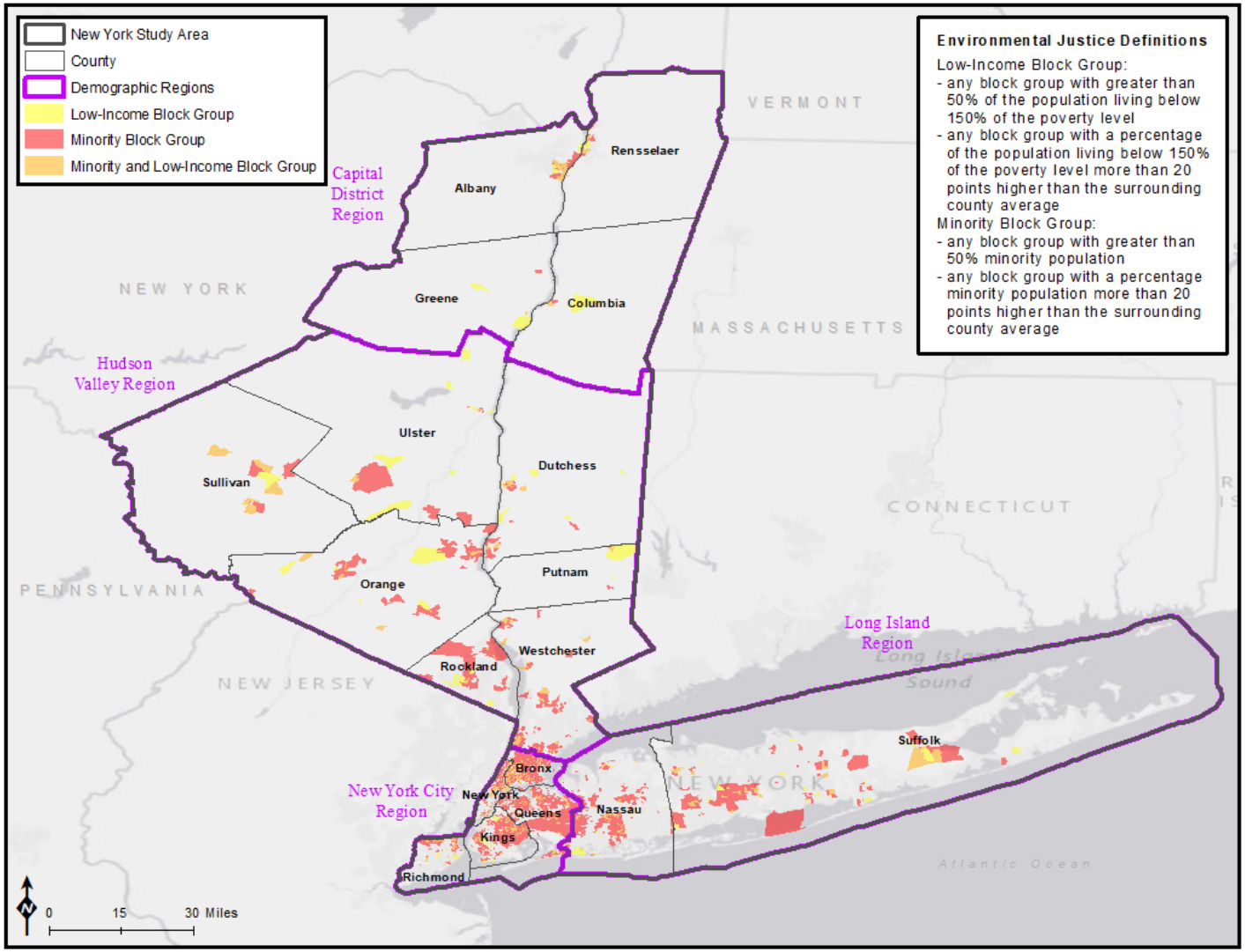
7.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 7-40 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

7.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 7-14 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 14,327,971 people living in the Study Area, approximately 7,790,279 (54.4%) are minority. This is significantly higher than the State (44.1%) and the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 10,776 block groups in the Study Area, approximately 47.7% (5,138 block groups) are considered minority populations (USCB 2017f).



Source: USCB 2017r

Figure 7-40. Minority and Low-Income Population in the New York Study Area by Census Block Group

Table 7-14. Low-Income and Minority Populations in the New York Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150 Percent of the Poverty Level	Percent Population with Incomes Less than 150 Percent of the Poverty Level (%)
Capital District	**Albany**	308,580	225,210	83,370	27.0	235	38	16.2	41	17.4	292,776	56,772	19.4
	Columbia	61,481	53,427	8,054	13.1	61	6	9.8	6	9.8	59,655	11,724	19.7
	Greene	47,791	40,928	6,863	14.4	43	3	7.0	2	4.7	44,661	9,053	20.3
	Rensselaer	159,800	134,012	25,788	16.1	125	28	22.4	21	16.8	153,931	30,389	19.7
	Total Capital District Region	***577,652***	***453,577***	***124,075***	***21.5***	***464***	***75***	***16.2***	***70***	***15.1***	***551,023***	***107,938***	***19.6***
Hudson Valley	**Dutchess**	295,685	213,506	82,179	27.8	248	24	9.7	39	15.7	278,988	43,848	15.7
	Orange	378,174	247,267	130,907	34.6	275	34	12.4	78	28.4	368,389	71,190	19.3
	Putnam	99,464	79,747	19,717	19.8	69	3	4.3	2	2.9	98,063	9,123	9.3
	Rockland	325,027	205,500	119,527	36.8	203	25	12.3	57	28.1	320,427	69,960	21.8
	Sullivan	75,783	54,910	20,873	27.5	78	9	11.5	11	14.1	72,944	17,522	24.0
	Ulster	180,129	143,781	36,348	20.2	152	11	7.2	11	7.2	172,357	36,090	20.9
	Westchester	975,321	530,156	445,165	45.6	704	81	11.5	261	37.1	951,990	149,236	15.7
	Total Hudson Valley Region	***2,329,583***	***1,474,867***	***854,716***	***36.7***	***1,729***	***187***	***10.8***	***459***	***26.5***	***2,263,158***	***396,969***	***17.5***
Long Island	**Nassau**	1,363,069	836,384	526,685	38.6	1,138	60	5.3	316	27.8	1,343,543	136,011	10.1
	Suffolk	1,497,595	1,025,705	471,890	31.5	999	52	5.2	166	16.6	1,468,577	180,282	12.3
	Total Long Island Region	***2,860,664***	***1,862,089***	***998,575***	***34.9***	***2,137***	***112***	***5.2***	***482***	***22.6***	***2,812,120***	***316,293***	***11.2***
New York City	**Bronx**	1,455,846	137,674	1,318,172	90.5	1,154	421	36.5	1,030	89.3	1,419,902	610,318	43.0
	Kings	2,635,121	947,519	1,687,602	64.0	2,062	350	17.0	1,263	61.3	2,611,506	861,649	33.0
	New York	1,653,877	773,377	880,500	53.2	1,167	175	15.0	457	39.2	1,607,109	402,256	25.0
	Queens	2,339,280	593,073	1,746,207	74.6	1,739	124	7.1	1,281	73.7	2,313,290	551,317	23.8
	Richmond	475,948	295,516	180,432	37.9	324	38	11.7	96	29.6	470,199	89,612	19.1
	Total New York City Region	***8,560,072***	***2,747,159***	***5,812,913***	***67.9***	***6,446***	***1,108***	***17.2***	***4,127***	***64.0***	***8,422,006***	***2,515,152***	***29.9***
	Study Area Total	**14,327,971**	**6,537,692**	**7,790,279**	**54.4**	**10,776**	**1,482**	**13.8**	**5,138**	**47.7**	**14,048,307**	**3,336,352**	**23.7**
	New York	**19,798,228**	**11,071,563**	**8,726,665**	**44.1**						**19,285,448**	**4,539,010**	**23.5**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percentage	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

Each of the demographic regions contain census block groups with minority populations. The New York City Region has the highest percentage of census block groups with minority population at 64.0%. The Hudson Valley and Long Island Regions have 26.5% and 22.6%, respectively, of census block groups with minority populations. The Capital District Region has the lowest percentage at 15.1%. Counties with high percentages of minority populations are Bronx (89.3%), Queens (73.7%), and Kings (61.3%) Counties, all located in the New York City Region. The total percent minority population of the Hudson Valley and Long Island Regions fall within a few percent of the National percentage of 38.5%. The Capital District Region is 21.5%, thus significantly lower than the National percentage. The New York City Region is 67.9%, significantly higher than the National percentage (USCB 2017f).

Within the Study Area the largest minority group is Black or African-American (17.1%) followed by Asian (10.5%) (USCB 2017f).

7.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 7-14 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 14,048,307 people for whom poverty status is determined living in the Study Area, approximately 3,336,352 (23.7%) individuals have incomes less than 150% of the poverty level. This is equivalent to the State (23.5%) and the same as the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 10,776 census block groups in the Study Area, approximately 13.8% (1,482 block groups) are considered low-income populations (USCB 2017o).

Each of the demographic regions contain census block groups with low-income populations. The New York City Region and Capitol District Region have the highest percentage of census block groups with low-income populations of 17.2% and 16.2%, respectively. The Long Island Region has the lowest percentage at 5.2%.

As shown in Table 7-14, the New York City Region's total percent of the population with incomes less than 150% of the poverty level is 29.9%, slightly higher than the National total of 23.7%. The other Study Area Regions are all significantly lower than the National total for low-income populations: Capital District Region 19.6%, Hudson Valley Region 17.5%, and Long Island Region 11.2 which is consistent with housing prices and other economic conditions in these areas.

Counties with the highest percentages of low-income block group populations are Bronx (36.5%), Rensselaer (22.4%), and Kings (17.0%) Counties. Figure 7-40 illustrates the location of containing census block groups with high percentages of low-income populations (USCB 2017o).

7.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this report, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this report to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in "Fishing Communities" (Chapter 7.4.5.3.1).

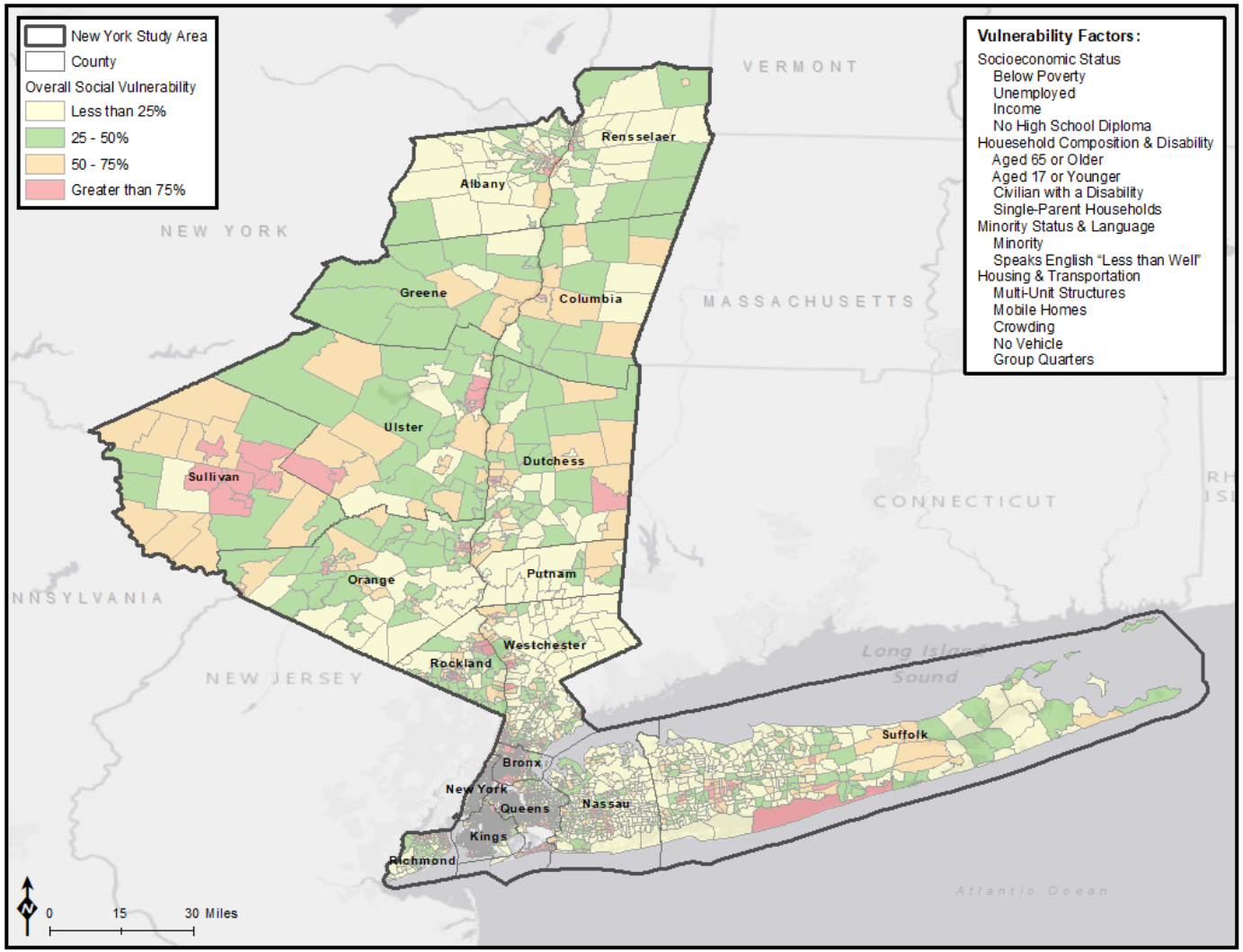
The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 7-41 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 7-41, all counties of the New York City Region, along the shore of Suffolk County and inland areas, as well as parts of Dutchess, Rockland, Orange, Ulster, Sullivan, Albany and Rensselaer Counties have some populations deemed vulnerable to varying degrees (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 7-42 combines the CDC SoVI index (as shown in Figure 7-41) with minority and low-income populations (as shown in Figure 7-40) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC SoVI vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in the counties around and including New York City.

Figure 7-43 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 7-43 shows that many vulnerable communities along the coast, especially in the Long Island and New York City Regions are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 7.2.2.2 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

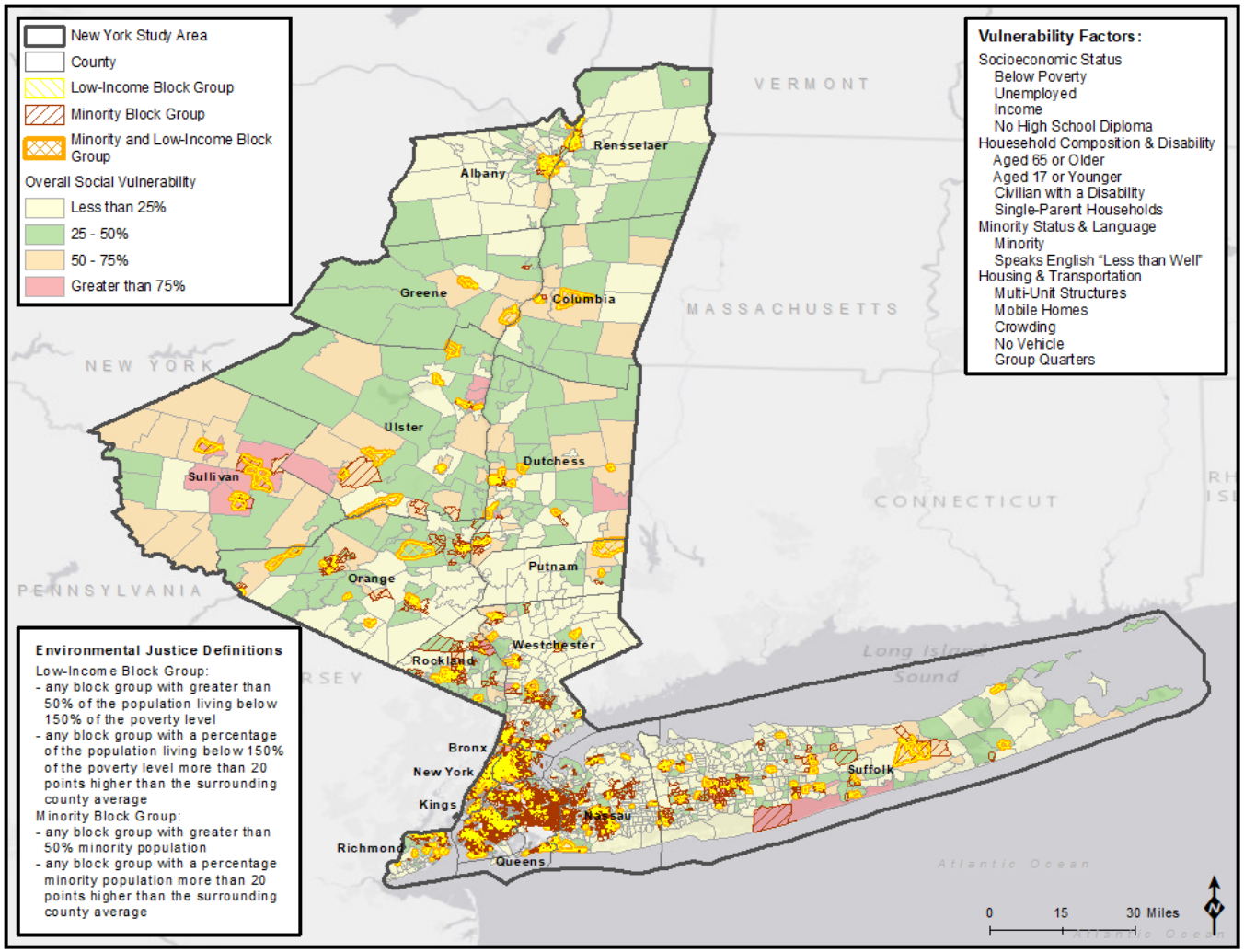
As discussed in Chapter 7.4.5.2, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that the location of socially vulnerable populations is considered when evaluating potential future OCS-related projects.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability in the Study Area exist in all counties of the New York City Region, along the shore of Suffolk County and inland areas, as well as parts of Dutchess, Rockland, Orange, Ulster, Sullivan, Albany and Rensselaer Counties (CDC 2016).



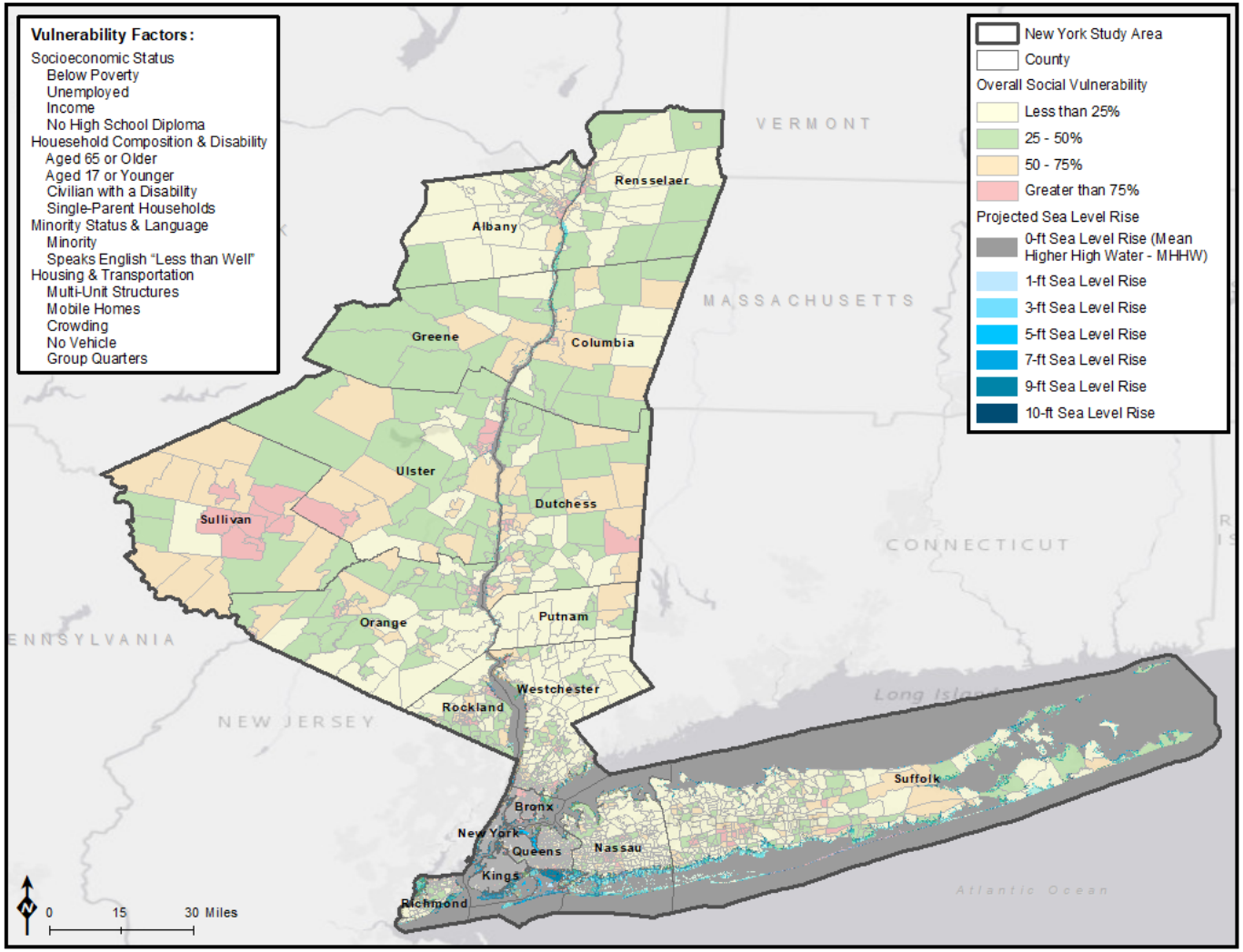
Source: CDC 2016

Figure 7-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the New York Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 7-42. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the New York Study Area



Sources: CDC 2016, NOAA 2018a

Figure 7-43. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the New York Study Area by Census Tract

7.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. Subsets of resource-dependent populations are discussed in the following sections. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.

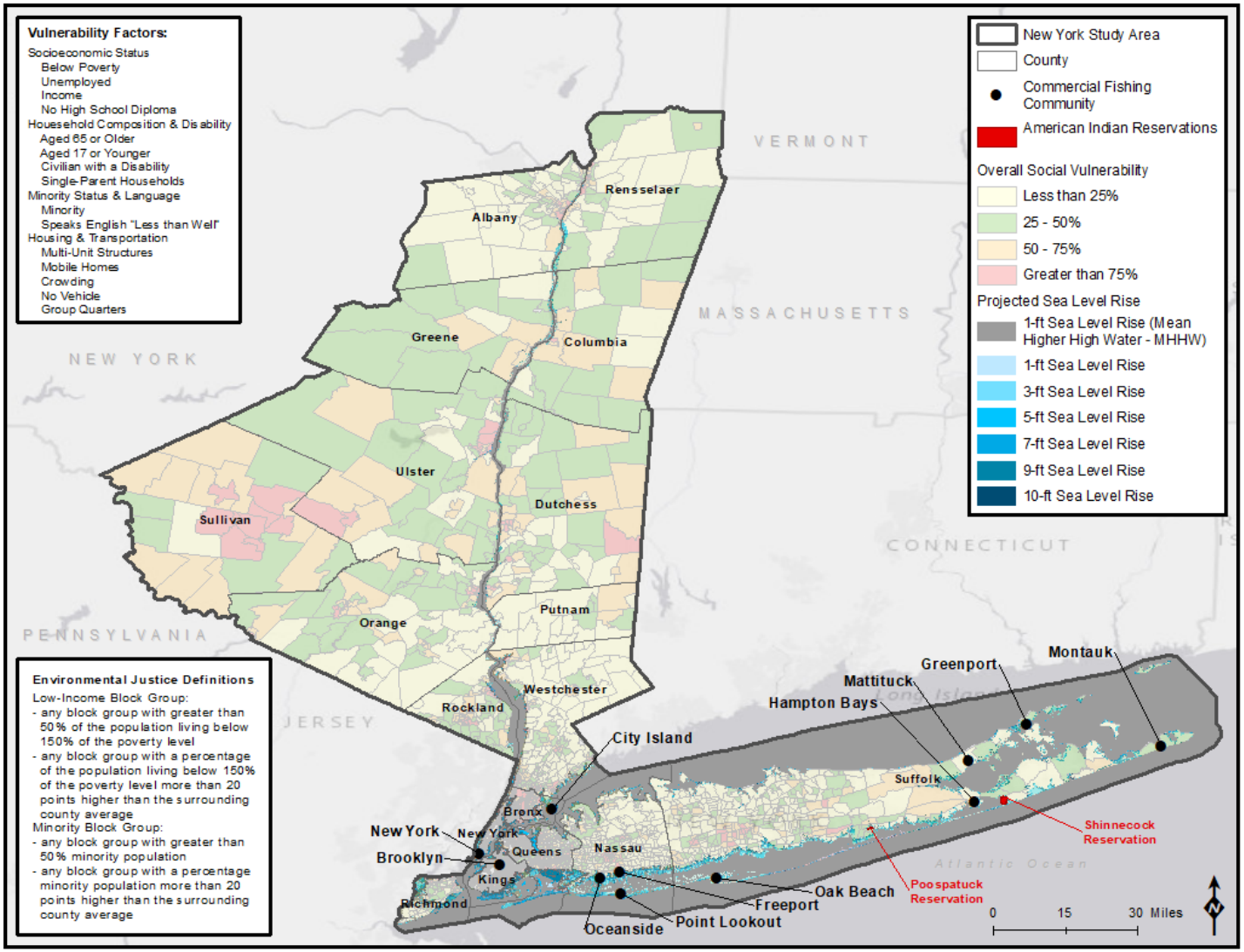
7.4.5.3.1 Fishing Communities

There are 11 fishing communities in the Study Area, as illustrated in Figure 7-44. Most of the communities are located on Long Island (Suffolk County).

The fishing communities located in the New York Study Area are (NOAA Fisheries 2019g):

- Brooklyn, Kings County
- City Island, Bronx County
- Freeport, Nassau County
- Greenport, Suffolk County
- Hampton Bays, Suffolk County
- Manhattan, New York County
- Mattituck, Suffolk County
- Montauk, Suffolk County
- Oak Beach, Suffolk County
- Oceanside, Nassau County
- Point Lookout, Nassau County

As can be seen in Figure 7-44, all 11 of these fishing communities are located within areas vulnerable to sea level rise, and therefore, also vulnerable to associated storm surge impacts. As discussed in Chapter 7.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that the location of fishing communities be considered during OCS-related project analysis. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d). Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Sources: CDC 2016, NOAA 2018a, NOAA Fisheries 2019k

Figure 7-44. Potential Vulnerable Communities in the New York Study Area by Census Tract

7.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, American Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 7-44). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the project analysis. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups, and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations

7.4.5.4 Tribes

There are 13 federally recognized tribes and nine State-recognized tribes that historical ties to New York State. Of the seven tribes that have historical ties to the Study Area, two tribes (Shinnecock Indian Nation and Unkechaug Nation) have tribal lands and/or communities with the Study Area. Table 7-15 lists the federally and State-recognized tribes in New York, along with their historical ties to the study area and where they are currently located. Federally recognized tribal lands are shown in Figure 7-44.

Table 7-15. Federal and State-Recognized Tribes with Historical Ties to New York

Tribe	Federal and/or State Recognition	Historical ties to the Study Area	Geographic Unit(s)
Resident Tribes Within the Study Area			
Shinnecock Indian Nation	Federal and State	Yes	Tribal members reside on an 800-acre reservation in Southampton, on Long Island, in Suffolk County. Historical ties to Albany, Bronx, Columbia, Dutchess, Greene, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Rockland, Sullivan, Ulster, and Westchester Counties
Unkechague Poosepatuck Tribe (Unkechaug Nation)	State	Yes	Historical ties to Long Island and the region. Current reservation is in Mastic, on the Poospatuck Reservation on Long Island, in Suffolk County.
Federally Recognized Tribes Outside the Study Area			
Cayuga Nation	Federal and State	No	Tribal members reside outside of the Study Area in the Finger Lakes Region, (including Cayuga Lake) Currently based in Seneca Falls (Seneca County).
Delaware Nation, Oklahoma	Federal	Yes	Tribal members reside outside of New York (primarily in Oklahoma, but have historical ties to the Study Area (Bronx, Columbia, Dutchess, Greene, Kings, Orange, Nassau, New York, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, and Westchester Counties)
Delaware Tribe of Indians	Federal	Yes	Tribal members reside outside of New York (primarily in Oklahoma, but have historical ties to the Study Area (Albany, Bronx, Columbia, Dutchess, Greene, Kings, Orange, Nassau, New York, Putnam, Queens, Rensselear, Rockland, Sullivan, Ulster, and Westchester Counties)
Mohegan Tribe of Indians of Connecticut	Federal	Yes	Tribal members reside outside of New York (primarily in Connecticut, but have historical ties to the Study Area (Putnam and Westchester Counties)
Oneida Indian Nation	Federal and State	No	Tribal members reside on ancestral lands outside of the Study Area in Oneida (Oneida and Madison Counties) in central New York. Currently based on a portion of these ancestral lands. (Cayuga Nation 2020)
Onondaga Nation	Federal and State	No	Tribal members reside on ancestral lands outside of the Study Area. Currently reside on a 7,300-acre territory south of Syracuse (Onondaga County).
Saint Regis Mohawk Tribe	Federal and State	Yes	Tribal members reside outside of the Study Area (primarily in the Mohawk Valley, as well as Vermont and southern Canada), but have historical ties to the Study Area (Albany, Green, Sullivan, and Ulster Counties). Currently reside in Akwesasne near the St. Regis River (Delaware County).
Seneca-Cayuga Nation	Federal	No	Tribal members primarily reside outside of New York (in Oklahoma); however, one of the three Seneca tribes is located are located in New York (Seneca Nation of Indians). Thus, they have historical ties to New York.
Seneca Nation of Indians	Federal and State	No	Tribal members reside outside of the Study Area with historical ties to the Finger Lakes area and Genesee Valley. Currently hold five reservations (Cattarugus, Allegany, Oil Spring, Niagara, and Buffalo) in western New York.
Stockbridge Munsee Community, Wisconsin	Federal	Yes	Tribal members reside outside of the Study Area (primarily in Wisconsin), but have historical ties to the Study Area (Albany, Columbia, New York, Orange, Putnam, and Sullivan Counties).

Table 7-15. Federal and State-Recognized Tribes with Historical Ties to New York

Tribe	Federal and/or State Recognition	Historical ties to the Study Area	Geographic Unit(s)
Tonawanda Band of Seneca	Federal and State	No	Tribal members reside outside of the Study Area (primarily in the Tonawanda Reservation in western New York). Historical ties to the Seneca Nation of Indians and their lands in western New York.
Tuscarora Nation of New York	Federal and State	No	Tribal members reside outside of the Study Area in western New York (Niagara County).

Sources: Shinnecock Indian Nation 2012, Cayuga Nation 2020, Oneida Indian Nation 2020, Native Heritage Project 2012, Onondag Nation 2020, Saint Regis Mohawk Tribe 2020, Seneca Nation of Indians 2020, The Tonawanda Reservation Historical Society 2020, Access Genealogy 2020

The Shinnecock are an Algonquian-speaking people who originally occupied much of Long Island. Members of the Shinnecock Indian Nation live primarily on the Shinnecock Reservation in the town of Southampton on Long Island in Suffolk County. The reservation lies on the east side of Shinnecock Bay on southeastern Long Island, near Tuckahoe, Shinnecock Hills, and the village of Southampton. The reservation is self-governing and has a museum, shellfish hatchery, education center, cultural and community center, playground, and Presbyterian church. There are currently over 1,200 members. The Shinnecock Nation received Federal recognition in 2010. While the reservation has been recognized by New York State, it has not been recognized by the United States government, despite the tribe's Federal recognition (Shinnecock Indian Nation 2012, Native Heritage Project 2012).

Members of the Unkechaug Nation live on the Poospatuck Reservation in the community of Mastic, north of Poospatuck Creek in Suffolk County. Their reservation is the smallest in New York State (approximately 55 acres) (Native Heritage Project 2012).

The Cayuga Nation, Onieda Indian Nation, Onondaga Nation, Saint Regis Mohawk Tribe, (Kanienkehaka) and Seneca Nation of Indians, are all original members of the Haudenosaunee (The People of the Longhouse) also known as the Iroquois Confederacy. The Tuscarora Nation of New York migrated to the area from North Carolina in the early 1700s and became the sixth member of the Haudenosaunee. This confederation was a unique participatory democracy that served as a model for the Constitution of the United States. Some members of these tribes fought with American forces during the Revolutionary War. Following the war, United States troops entered action against the Haudenosaunee, permanently driving some tribal members and bands out of the region. In 1794, the remaining Haudenosaunee and United States signed the Treaty of Canandaigua which established peace and provided for the sovereignty of the Six Nations of the Haudenosaunee (Cayuga Nation 2020, Oneida Indian Nation 2020, Onondag Nation 2020).

These tribes constitute minority populations as classified under EO 12898 and could constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC SoVI, as shown in Figure 7-43. Overall social vulnerability for Suffolk County is less than 25%; however, some areas of the county have an overall social vulnerability ranging from 25% to greater than 75% (CDC 2016). Also shown in Figure 7-43 is NOAA sea level rise data, indicating that both of these reservations could be subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process

when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

7.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 7-16 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 39.1% of the population do not speak English at home. The New York City Region has the highest percentage (48.9%) of this population within the Study Area. Spanish is the language spoken by the majority (2,654,431 people or 19.7%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 1,451,370 people (10.8%) within the Study Area population (USCB 2017e).

Table 7-16. People who Speak a Language Other than English at Home in the New York Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Capital District	Albany	292,934	37,145	12.7	9,169	15,198	9,992	2,786
	Columbia	58,847	3,999	6.8	1,634	1,900	362	103
	Greene	45,661	3,502	7.7	1,798	1,255	389	60
	Rensselaer	151,274	11,154	7.4	3,992	3,797	2,403	962
	Total Capital District Region	***548,716***	***55,800***	***10.2***	***16,593***	***22,150***	***13,146***	***3,911***
Hudson Valley	Dutchess	281,827	44,145	15.7	23,292	11,312	6,121	3,420
	Orange	353,347	87,175	24.7	48,089	31,129	5,032	2,925
	Putnam	95,024	18,191	19.1	8,725	7,479	1,394	593
	Rockland	300,309	115,169	38.4	40,495	58,243	11,489	4,942
	Sullivan	71,531	10,406	14.5	6,323	3,501	450	132
	Ulster	172,063	19,132	11.1	9,977	5,859	2,193	1,103
	Westchester	919,728	306,398	33.3	182,282	76,129	34,056	13,931
	Total Hudson Valley Region	***2,193,829***	***600,616***	***27.4***	***319,183***	***193,652***	***60,735***	***27,046***
Long Island	Nassau	1,288,754	360,619	28.0	165,978	121,684	57,577	15,380
	Suffolk	1,416,640	321,320	22.7	201,254	82,539	29,277	8,250
	Total Long Island Region	***2,705,394***	***681,939***	***25.2***	***367,232***	***204,223***	***86,854***	***23,630***
New York City	Bronx	1,347,646	798,514	59.3	644,069	71,861	20,967	61,617
	Kings	2,438,989	1,119,287	45.9	391,699	434,451	211,850	81,287
	New York	1,571,780	628,512	40.0	348,477	123,508	125,879	30,648
	Queens	2,192,848	1,228,623	56.0	518,264	345,670	325,766	38,923
	Richmond	448,451	140,559	31.3	48,914	55,855	24,403	11,387
	Total New York City Region	***7,999,714***	***3,915,495***	***48.9***	***1,951,423***	***1,031,345***	***708,865***	***223,862***
	Study Area Total	**13,447,653**	**5,253,850**	**39.1**	**2,654,431**	**1,451,370**	**869,600**	**278,449**
	New York	**18,621,351**	**5,696,716**	**30.6**	**2,810,962**	**1,617,553**	**951,683**	**316,518**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 7-45 illustrates the percent of people who speak a language other than English at home in the New York Study Area. Counties with the highest percentages of these populations were Bronx (59.3%), Queens (56.0%), and Kings (45.9%), all within the New York City Region (USCB 2017e). As seen in Figure 7-42 and Figure 7-43, the New York Region counties also all have various other vulnerability characteristics including minority and low-income communities and vulnerability to sea level rise. This demonstrates that where one vulnerability characteristic is present in a community, others may be as well, thus increasing the vulnerability of that community

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

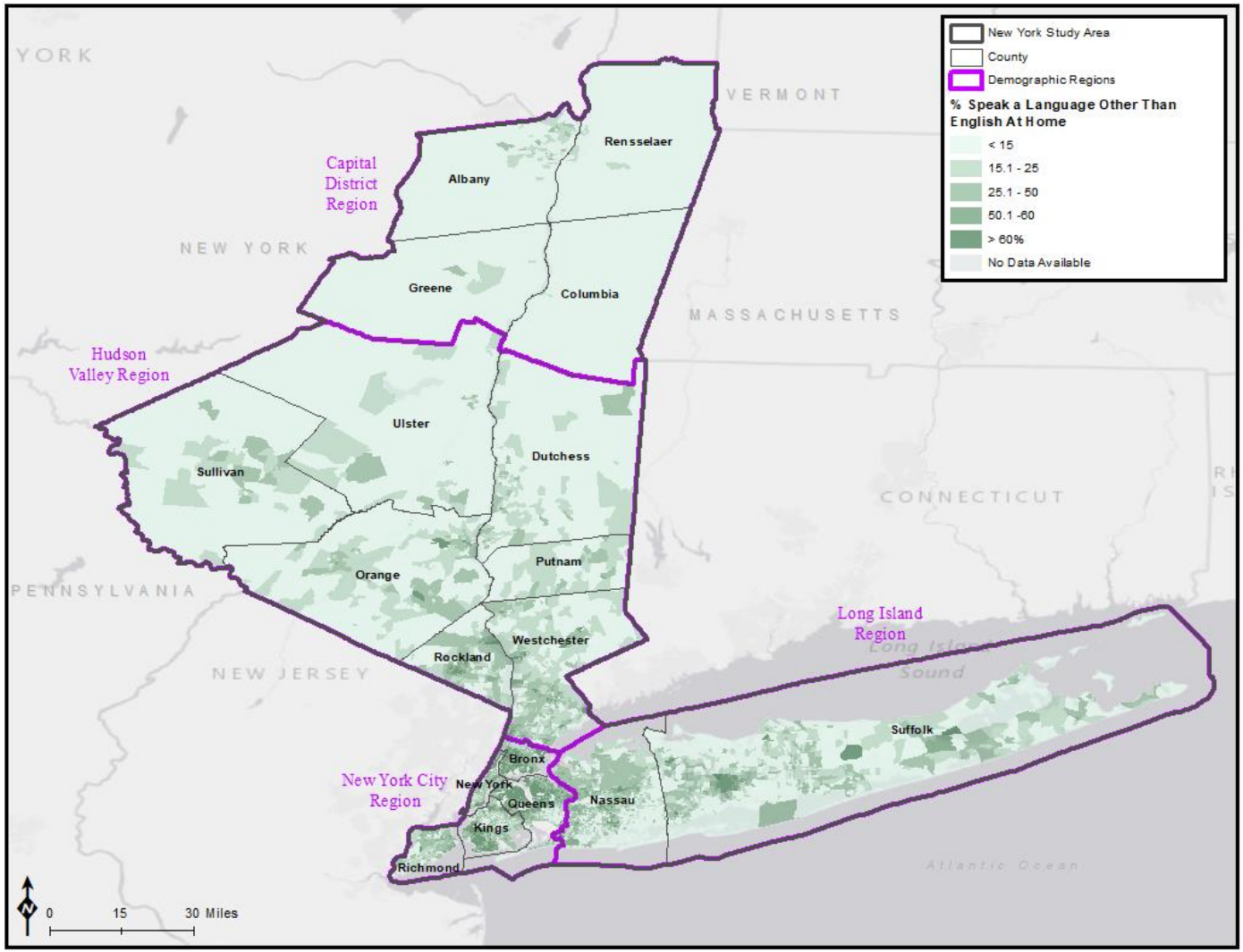
Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and public and for emergency planning.

7.4.6 Summary – Demographics and Socioeconomics

New York's population is increasing but at a rate slower than the Nation. In 2017, the State's population grew 2.2% since the 2010 Census, having added approximately 420,126 people. During the same period, the population of the U.S. grew 4%. Much of the slowdown in the State's population growth is a result of domestic out-migration, an accelerating trend in the State, as more people are moving out of the State than in. In 2018, approximately 180,300 people moved out; this loss was partially offset by a gain of 70,375 residents from international migration, resulting in an overall population loss of 48,510 (USCB 2019b). As noted previously, these values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Northeastern States have higher senior populations as compared to southern and western States. New York, as well as the neighboring States of Connecticut and New Jersey, is experiencing high senior migration losses as a result of National migration pattern toward the southern and western parts of the United States. Other reasons for migration losses include high property and income taxes, high cost of living, and harsh winters (Axelson 2019).

Prior to 2018, most of the population loss in the State was focused in Upstate New York, outside of the Study Area (Platsky 2018). The release of the USCB 2018 estimates indicated domestic out-migration population decline in the New York City, Hudson Valley, and Long Island Regions, which are mostly offset by international immigration gains (Axelson 2019).



Sources: USCB 2017e, USCB 2017r

Figure 7-45. Percent of People Who Speak a Language Other than English at Home in the New York Study Area by Census Block Group

The Study Area represented 72.4% (14.3 million residents) of the overall State population of 19.8 million. The counties (also known as boroughs) within the Study Area are located within four demographic regions defined as Capital District, Hudson Valley, Long Island, and New York City (NYSESD 2016a). The New York City Region is comprised of five counties: Bronx, Kings (Brooklyn), New York (Manhattan and small islands), Queens, and Richmond (Staten Island) (NY.gov 2020). Between 2010 and 2017, the population of the Study Area grew 3.3%, faster than the State (2.2%) but slower than the Nation (4.0%). During the same period, 13 out of 18 counties gained population, while 5 counties lost population (USCB 2017a, USCB 2017d).

Between 2010 and 2017, the New York City Region grew 4.7%, the Hudson Valley Region grew 1.7%, the Long Island Region grew 1.0%, and the Capitol District Region grew 0.3%. Highest population growth was in four of the five New York City county-boroughs. Percentage gains were Kings (Brooklyn) 5.2%, Bronx 5.1%, Queens 4.9%, and New York (Manhattan) (4.3%). Population decreases were in the upstate rural counties of Columbia and Greene, posting decreases of 11.4% and 8.6%, respectively, during the same time period (USCB 2017a, USCB 2017d, USDA 2013). There are two metropolitan areas in the Study Area - Kingston, NY and New York-Newark-Jersey City, NY-NJ-PA. The MSAs are located within the Hudson Valley and New York City Regions of the Study Area (Data.gov 2017).

Population density of the Study Area was 1,687 persons per square mile in 2017, greater than the State (406 persons per square mile) and the Nation (90 persons per square mile), signifying that the coastal counties are more densely populated than the State and the Nation. Population densities in the Study Area ranged from 73 persons per square mile in rural Greene County in the Capital District Region to 72,997 persons per square mile in New York County (Manhattan) in the New York City Region (USCB 2017d, USCB 2017c, USDA 2013).

Population in the Study Area is projected to grow 7.9% by 2040, more than the State (5.0%) but less than the Nation (16.4%). Growth will not be uniform across the Study Area. Projected growth by study region is: New York City (10.8%), Hudson Valley (6.4%), Capital District (1.8%), and Long Island (1.6%) (USCB 2017d, Cornell 2018). Population loss of 11.4% and 8.6% by 2040 are projected in the rural counties of Columbia and Greene, both located in the Capital District Region. Of the 18 counties in the Study Area, 12 geographies are projected to increase population while 6 are projected to decrease population (Cornell 2018, USDA 2013, USCB 2017d).

The State and the Study Area are aging. Sensitive populations of people “Under Age 5” (young children) and “Over Age 65” (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in New York and 6.1% in the Study Area. Projections by the year 2040 indicate this group’s proportional decline in the Nation (5.7%), the State (5.4%), and the Study Area (5.6%). The elderly represented 14.9% of the U.S. population; 15.2% in New York and 14.6% in the Study Area. The number and proportion of elderly are projected to rise, fueled by aging baby boomers. The consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 21.7% in the State, and 21.0% in the Study Area. Each region in the Study Area projects an increase in the elderly population (USCB 2017b, USCB 2018b, Cornell 2018).

The Capital District Region had the smallest percentage (5.0%) of young children in 2017; a further decrease to 4.7% is projected by 2040. It also had the highest percentage of elderly (16.6%) in 2017; a further increase to 23.5% is projected by 2040. These trends are consistent with the broader National pattern of declining and aging populations in rural areas and small cities. By 2040, the rural counties of Columbia and Greene in the Capital District Region are projected to have the largest percentages of this

group (32.5% and 31.2%, respectively). Suffolk County in the Long Island Region is projected to have 26.1% of elderly by 2040 (USCB 2017b, Cornell 2018).

Homeownership in New York was 54.0%, lower than the Nation (63.8%) and higher than the Study Area (48.0%). Renters comprised approximately 46.0% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was higher (52.0%) (USCB 2017m).

Median home values were higher in the Study Area ($347,625) than the State ($293,000) and Nation ($193,500). The New York City Region had the highest median home value ($481,300). The Capital District Region had the lowest median home value ($198,900) (USCB 2017l). Housing affordability for low- and moderate-income workers is a problem in New York. A large proportion of the State (28%) is considered extremely low income, and of these households, 70% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

Home values increased in the State (2.6%) as well as the metropolitan areas within the Study Area. The market temperature of the metropolitan areas was characterized by Zillow as ranging from "hot to very hot" (Zillow.com 2019p). Home vacancy rates in New York (11.5%) in 2017 were lower than the Nation (12.2%) and higher than the Study Area (10.0%)

Highest vacancy rates were in the Long Island Region, near the beach destinations and rental homes in popular towns including East Hampton, West Hampton, South Hampton, and Montauk in Suffolk County (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Airbnb has said that 46,000 Airbnb hosts in New York City have generated more than $2 billion in economic activity. The use of Airbnb and other online short-term rental portals in the New York metropolitan area have various restrictions placed on them by local municipalities (hamptons.com 2020). Counties with negative population growth also had high vacancy rates, most notably Greene County (42.3%) and Columbia County (23.4%) (USCB 2017r).

The Study Area has a total employment of 6.9 million jobs, representing approximately 73.0% of the total jobs in New York and 4.6% of the total jobs in the U.S. (USCB 2017p). The New York City Region dominates the economy of the State and accounts for approximately 56% of its economic output. Financial services and technology are its strongest industry sectors; financial services provide the anchor industry, while technology is the fastest growing industry (NYCREDC 2018).

The dominant employment categories in the Study Area are educational services, and health care and social assistance (27.1%); professional, scientific, and management, and administrative and waste management (12.8%); retail trade (10.1%); and finance and insurance, and real estate and rental and leasing (9.0%). The Study Area had a larger percentage of people working in finance and insurance, and real estate and rental and leasing (9.0%) as compared to the State (8.1%) and the Nation (6.6%), and a lesser percentage of manufacturing jobs (7.5%) as compared to the State (13.9%) and the Nation (10.3%) (USCB 2017p). The greater portion of jobs are located in the New York City Region in the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017r).

New York's ocean economy ranked third in employment among the 30 States included in the U.S. Ocean and Great Lakes economy and accounted for 384,681 maritime jobs in 2016 (approximately 4.2% of New York's employment) (USCB 2017i, NOAA 2016b). Tourism and recreation, which includes eating and drinking establishments, hotels, marinas, boat dealers, and charters, was the dominant sector, accounting for 91.6% (347,001) of maritime jobs. The Study Area had 343,593 maritime jobs, representing 89.3% of total maritime jobs in the State. New York County (Manhattan) had the greatest number of maritime jobs (216,413), representing 77.3% of maritime jobs in the Study Area (USCB 2017i, NOAA 2016b). The Port

of New York (known as the Port of New York and New Jersey, operated by Port Authority of New York and New Jersey) is the third-largest port in the Nation (NYSESD 2016b).

New York had higher median household income and per capita income than the U.S. in 2017. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, New York had a median income of $62,756 (8.9% higher than the Nation's median income) and a per capita income of $35,752 (14.7% higher than the Nation's per capita income). Median and per capita income in the Study Area were higher than the State at $69,156 and $36,807, respectively (USCB 2017k, USCB 2017n).

After the Great Recession, downstate areas comprising the New York City metropolitan area gained jobs and personal income faster than the National average, while upstate counties gained private-sector jobs at one-third the National rate and less than one-quarter the downstate rate. In terms of personal income growth, the upstate areas of New York have yet to recover from the Great Recession (USCB 2017k, USCB 2017n, empirecenter.org 2020).

The average unemployment rate in the Study Area was 6.9%, similar to the State (6.8%) and the Nation (6.6%), reflecting the availability of jobs in high-density urban areas. Within the Study Area, unemployment rates ranged from 4.9% in Nassau County (Long Island Region) to 11.6% in Bronx County (New York City Region) in 2017. Counties with high unemployment rates were: Sullivan (9.3%), Kings (8.1%), and Ulster (7.1%) (USCB 2017h).

In the Study Area, 24.7% of the working-age population earned only a high school diploma; 41.7% earned a college or advanced degree. These rates are lower than the National high graduation rate (27.7%) but higher than the college and advanced degree rate of 36.9 (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 14,327,971 people living in the Study Area, approximately 7,790,279 (54.4%) are minority. Of the 10,776 block groups in the Study Area, approximately 47.7% (5,138 block groups) are considered minority populations. Each of the demographic regions contain census block groups with minority populations. The New York City Region has the highest percentage of census block groups with minority population at 64.0%. The Hudson Valley and Long Island Regions have 26.5% and 22.6%, respectively, of census block groups with minority populations. The Capital District Region has the lowest percentage at 15.1%. The total percent minority population of the Hudson Valley and Long Island Regions fall within a few percent of the National percentage of 38.5%. The Capital District Region is 21.5%, thus significantly lower than the National percentage. The New York City Region is 67.9%, significantly higher than the National percentage (USCB 2017f).

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 14,048,307 people for whom poverty status is determined living in the Study Area, approximately 3,336,352 (23.7%) individuals have incomes less than 150% of the poverty level. Of the 10,776 census block groups in the Study Area, approximately 13.8% (1,482 block groups) are considered low-income populations. The New York City Region's total percent of the population with incomes less than 150% of the poverty level is 29.9%, slightly higher than the National total of 23.7%. The other Study Area Regions are all significantly lower than the National total for low-income populations: Capital District Region 19.6%, Hudson Valley Region 17.5%, and Long Island Region 11.2 which is consistent with housing prices and other economic conditions in these areas (USCB 2017o).

The New York City and Capitol District Regions have the highest percentage of census block groups with low-income populations of 17.2% and 16.2%, respectively. The Long Island Region has the lowest

percentage at 5.2%. Counties with the highest percentages of low-income block group populations are: the Bronx (36.5%), Rensselaer (22.4%), and Kings (17.0%) Counties (USCB 2017o).

Resource-dependent populations include 11 fishing communities and subsistence populations in the Study Area (NOAA Fisheries 2019g). There are eight federally recognized and one State-recognized tribes in New York. The Shinnecock Indian Nation (federally recognized) and the Unkechaug Nation reside in the Study Area.

The output of the CDC tool (SoVI) indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area and less densely populated inland areas. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Bronx, Queens, and Kings Counties (New York Region); Nassau and Suffolk Counties (Long Island Region), Rockland County; southern areas in Westchester County, Sullivan County, and Ulster County (Hudson Valley Region). Many communities along the coast in the New York City and Long Island Regions are at risk for sea level rise and other coastal hazards (CDC 2016, USCB 2017f, USCB 2017o).

Populations that speak a language other than English are present within the Study Area. In the Study Area, 39.1% of the population do not speak English at home. Spanish is the language spoken by the majority (2,654,431 people or 19.7%) of limited-English speakers at home within the Study Area population. Indo European languages are spoken at home by 1,451,370 people (10.8%) within the Study Area population (USCB 2017e). Counties with the highest percentages of these populations were Bronx (59.3%), Queens (56.0%), and Kings (45.9%), all within the New York City Region (USCB 2017e).

Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact community emergency response planning and implementation factors such as sea level rise, storm surge, or (Siegel et al. 2001).

7.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

7.5.1 Regional Observations

Over 8 million people in New York City receive their water supply, including 1.2 billion gallons a day of drinking water, from a system of 19 connected reservoirs, much of it from the Delaware River Basin. Releases to the Delaware River from the Cannonsville, Pepaction, and Neversink Reservoirs via the West Branch Delaware, East Branch Delaware, and Neversink Rivers, respectively, are managed by the DRBC (NYSDEC 2019h, NYSDEC 2019i, NYSDEC 2019j). Another source of water in New York comes from groundwater, with the most productive aquifers located in unconsolidated sand and gravel. About a quarter of Queens, New York receives their drinking water from groundwater. The Long Island Aquifer, spanning the complete island, supplies the majority of the island and is one of the most productive aquifers in the U.S. (NYSDEC 2019h, NYSDEC 2019i, NYSDEC 2019k).

Sea-level rise in the Study Area is complicated by subsidence and ocean currents. Land subsidence in the New York City area is driven by crustal rebounding since the last Ice Age. The relative strength of the Gulf Stream in the area also contributes to local variations in ocean surface elevation that affect sea level rise. As a result, the New York rate of sea level rise is relatively high (Kahn 2012). The New York State Sea Level Rise Task Force (Task Force), established in 2007, assessed sea level rise impacts and identified the greatest threats to coastal communities and natural resources in its final report issued early in 2011.

The New York coastline is also subject to flooding and impacts from storm surge from hurricanes and nor'easters. In response to the threat of storm surge and the resulting loss of coastal marshes, the USACE has proposed to build flood barriers to protect coastal New York (NYSSLRTF 2010, USACE 2019i). In February 2019, the USACE released an interim report for its New York and New Jersey Harbor and Tributaries Focus Area Feasibility Study. The report presents five different alternatives to address sea level rise around New York City, including structural features, nonstructural actions, and natural and nature-based features. Each of these proposals would cost billions of dollars and would dramatically impact the coastline of the city (Kensinger 2019). The proposed solutions for urban areas may require a mixed approach of structural and non-structural solutions (NYSSLRTF 2010).

Predominant land uses in the Study Area are either developed or forested areas. The forested areas could include suburban areas with some development or could be more rural in nature. The urban areas are concentrated around the cities of New York and Albany, as well as along the Hudson River, which has traditionally been a major transportation route throughout the history of the area.

New York requires that zoning decisions be in coordination with a comprehensive plan. Further, the New York State Environmental Quality Review Act has a State environmental review process to evaluate environmental impacts. Adoption or amendment of zoning laws must be evaluated for potential adverse environmental impacts the action may have (NYSDS 2015). Syracuse University created a guidebook for local officials in the process of a developing a comprehensive plan for their municipality (SUEFC 2015).

New York State is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New York State has recommended 514 census tracts to the U.S. Department of the Treasury for designation as Opportunity Zones. Maps of Opportunity Zones are available at https://esd.ny.gov/opportunity-zones (NYSESD 2018). There are also 14 Free Trade Zones in the State of New York (USEC 2019). Future OCS-related projects proposed in these areas may receive higher levels of support than in other areas as they could help promote development in targeted areas.

New York's population is increasing but at a rate slower than the Nation. While New York is affected by the nationwide trend of aging population, the State still gains population from natural increase. Much of the slowdown in the State's population growth is a result of domestic out-migration, an accelerating trend in the State, as more people are moving out of the State than in. Population loss due to domestic out-migration was offset by population gain from international in-migration. Prior to 2018, most of the population loss in the State was focused in Upstate New York, outside of the Study Area (Platsky 2018).

Northeastern States have higher senior populations as compared to southern and western States. New York, as well as the neighboring States of Connecticut and New Jersey, is experiencing high senior migration losses as a result of National migration pattern toward the southern and western parts of the United States. Other reasons for migration losses include a high property and income taxes, high cost of living, and harsh winters (Axelson 2019).

Population density of the Study Area is greater than the State and the Nation due largely to the presence of the New York-Newark-Jersey City, NY-NJ-PA MSA. The position of New York City on Manhattan

Island resulted in building upward as well as outward over time, thus contributing to a higher density of both people and business and industry in the area. The New York-Newark-Jersey City, NY-NJ-PA MSA therefore has a strong influence on the socioeconomics of the Study Area. New York has a higher median household income and per capita income than the U.S. It also has a shortage of approximately 605,313 rental homes affordable and available to extremely low-income households. Homeownership in the Study Area is lower than some of the other States along the Atlantic Coast of the U.S., while renter-occupied units are higher than in other Atlantic Coast States.

New York's ocean economy ranked third in employment among the 30 States included in the U.S. Ocean and Great Lakes economies. In fact, the Port of New York and New Jersey is the largest port on the East Coast and third largest in North America. The Port of Albany is also an important port in the Study Area.

Minority and low-income populations are present throughout the Study Area, with higher concentrations in certain parts of the New York-Newark-Jersey City, NY-NJ-PA MSA. The diversity of minority groups and limited-English speakers is also somewhat higher within the MSA as compared to other States and cities along the Atlantic Coast.

7.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types, if there is adequate space. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. However, the density of existing development in these areas could leave inadequate space for new development. It is likely that future industrial development would want to avoid primarily forested counties, which are much less developed and have a larger proportion of agricultural and undisturbed land covers (excluding the areas counted as open water).
- New York requires that zoning decisions be in coordination with a comprehensive plan. Further, the New York State Environmental Quality Review Act has a State environmental review process to evaluate environmental impacts. Adoption or amendment of zoning laws must be evaluated for potential adverse environmental impacts the action may have (NYSDS 2015). Therefore, future project analysis will need to include evaluation of site-specific zoning laws. Proposed projects that are not consistent with existing zoning laws may face substantial delays or resistance.
- New York State is participating in the Opportunity Zone community development program, which encourages private investment in low-income urban and rural communities. It is likely that future projects in Opportunity Zones would receive greater support than in other parts of the Study Area.
- The organizations, programs, and tax incentives in the Study Area, which are dedicated to encouraging development in the State including the Start-Up NY Program, Recharge New York Program, investment tax credits, and employment incentive credit, should be considered during future project analysis. Consultation with industrial development agencies could also result in useful information or guidance.

- The New York coastal area has a wealth of cultural and historic resources and recreational destinations. Some of these are also protected areas. Future project analysis should consider potential impacts on these resources. With the higher population levels and higher levels of National and international tourist that visit the New York area as compared with some other parts of the coastline, potential projects that impact popular destinations could receive enhanced and possibly even worldwide attention.
- A potential transportation constraint within the Study Area is associated with vulnerabilities primarily from recurrent flooding and projected congestion in and around New York City, Long Island, and the communities directly adjacent to the Hudson River. The NYSDOT is continually assessing the risks posed by climate change and extreme weather. They have also undertaken and identified mitigating strategies to increase resiliency within the entire New York State transportation system posed by these risks (NYSDOT 2019c). Potential future project analysis should consider the impacts of the proposed project on the transportation network and in relation to any mitigation strategies being considered by the NYSDOT at the time.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 8

NEW JERSEY

8 New Jersey

8.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of New Jersey to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

New Jersey is located near the Mid-Atlantic Planning Area. A total of 17 counties are located within the New Jersey Study Area (Study Area) along the New Jersey coastline. Counties range in population size from almost 64,000 in Salem County to almost 938,000 in Bergen County. There are two cities in the Study Area with a population over 250,000; they are Newark with a population of over 285,000 and Jersey City with a population of almost 272,000. There are also two cities with populations over 100,000 in the Study Area; they are Paterson with a population of over 152,000 and Elizabeth with a population of over 132,000 (ESRI 2019a). All four of these cities are located in North New Jersey and could be considered adjacent to New York City. New Jersey cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private) and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. New Jersey's location in the mid-Atlantic has geographical commonalities with many of the other Atlantic States with open coastlines protected by barrier islands. The New Jersey coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes 17 counties located within the State of New Jersey. The Study Area is shown in Figure 8-1 and Figure 8-2 and includes the following counties:

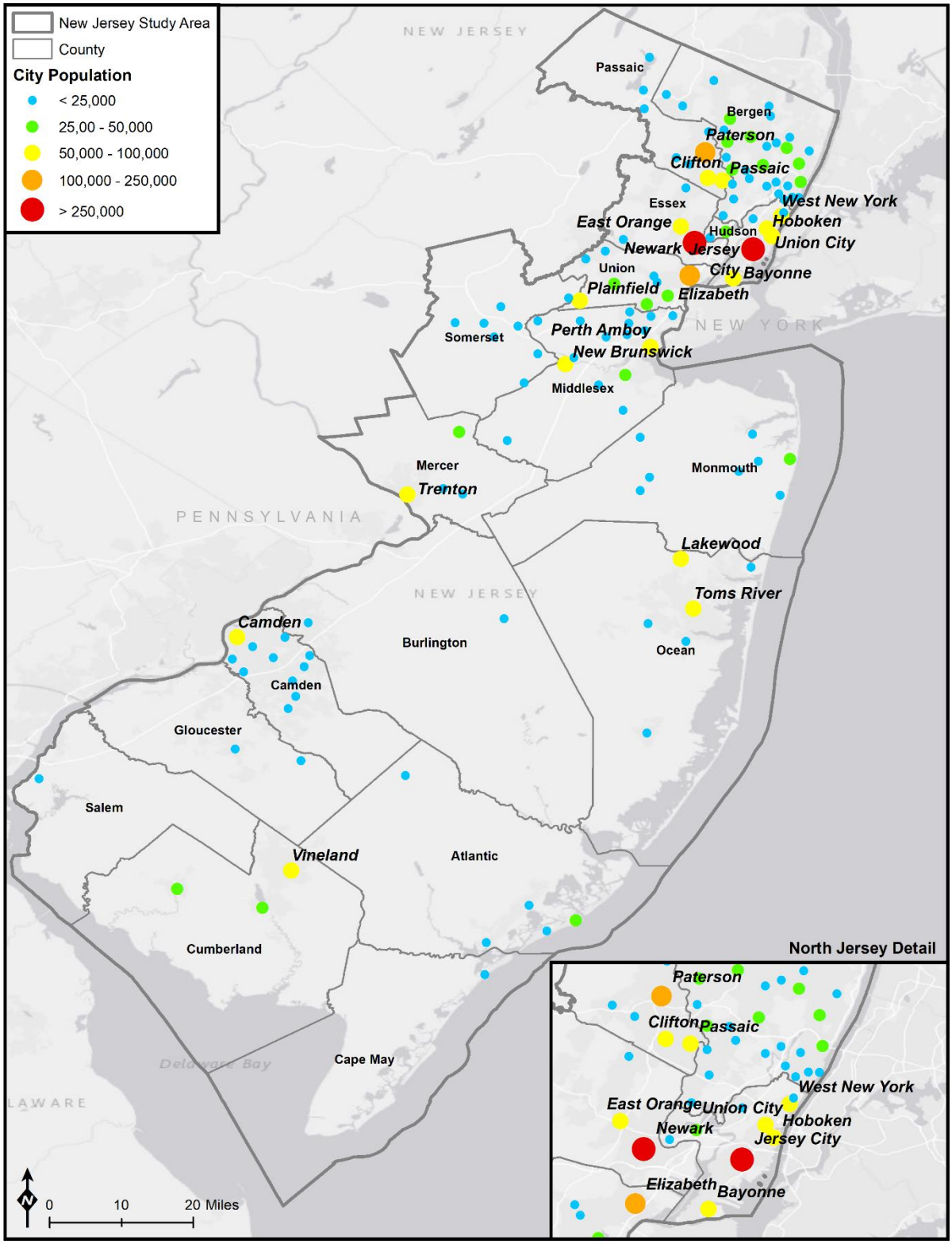
- Atlantic
- Bergen
- Burlington
- Camden
- Cape May
- Cumberland
- Essex
- Gloucester
- Hudson
- Mercer
- Middlesex
- Monmouth
- Ocean
- Passaic
- Salem
- Somerset
- Union

8.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of New Jersey are described below.

Source: ESRI 2019a

Figure 8-1. State of New Jersey Study Area



Source: ESRI 2019a

Figure 8-2. Cities in the New Jersey Study Area

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- New Jersey Department of Environmental Protection
- New Jersey Geographic Information Network
- Delaware Valley Regional Planning Commission

The metadata database for New Jersey specific State, county, and local data sources is included in Appendix A.

8.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

8.2.1 Water Resources

New Jersey's water resources include bays, rivers, lakes, floodplains, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

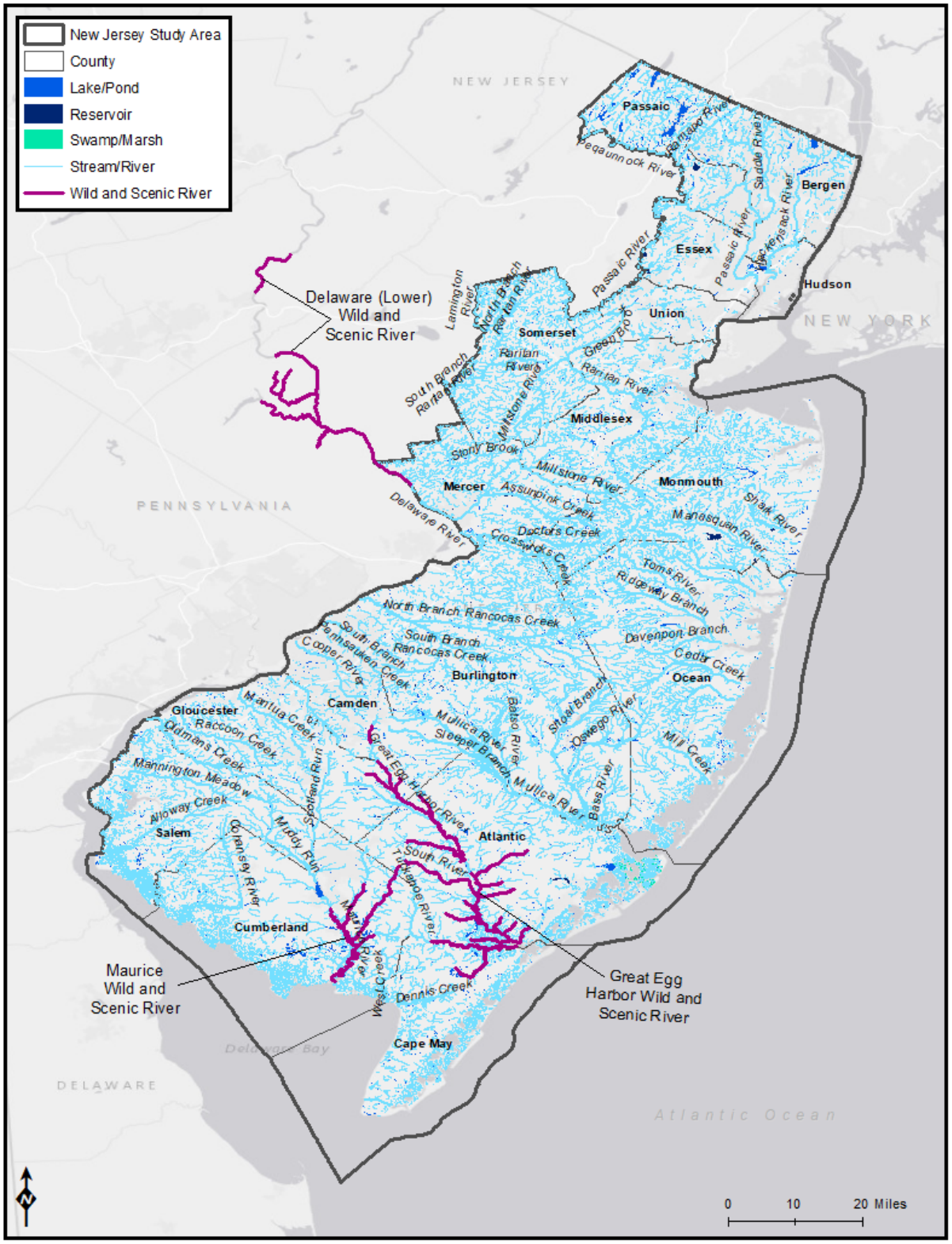
8.2.1.1 Bays

Delaware Bay, shown in Figure 8-3, is part of an estuary, a body of water where fresh and salt water mix. The 133-mile Delaware Estuary extends from the head of tide in Trenton, New Jersey to the mouth of the 747-square mile Delaware Bay at Cape May, New Jersey and Cape Henlopen, Delaware. The Delaware Estuary is tidally dominated with average tidal ranges of 4.25 feet and 8.25 feet at Cape Henlopen, Maryland and at Trenton, New Jersey, respectively. Tidal flow from the Atlantic is estimated to be 300 times greater than the freshwater flow from the Delaware River, D&C Canal, and other tributaries into the estuary (Delaware DNREC 2005, PDE 2017, DSPC 2019, Dupont 2019).

Home to the world's largest spawning horseshoe crab population and an integral link in migratory bird habitat, the Delaware Estuary provides a unique low-energy, intertidal environment. The low-energy environment of the Bay helps reduce the risk of stranding during spawning. The largest horseshoe spawning population on the Atlantic Coast is found in this Bay. The Bay provides the second largest migratory bird area, with horseshoe crab eggs providing essential food for several shorebirds (PDE 2017). Management actions in the Bay include protection of horseshoe crabs to try and provide sufficient population to sustain migratory shorebird populations including the red knot, which doubles its weight in 2 weeks on a diet consisting of more than 90% horseshoe crab eggs (PDE 2017, Delaware DNREC 2019a).

The Delaware Estuary is also home to a large industrial hub with numerous ports located in all three states that border the estuary (PhilaPort 2016a, PhilaPort 2016b, PhilaPort 2019). The New Jersey ports are discussed in greater detail in Chapter 8.3.2.8. Covering over 300 acres, the Port of Wilmington provides deepwater berths, tanker berths, and floating berths as well as access to warehouses, interstates, and railroads (DSPC 2019).

Delaware Bay is ringed with beaches, dunes, and tidal wetlands including tidal salt marshes, freshwater impoundments, and uplands. These tidal wetlands help hold and filter water, removing contaminants and buffering inland areas from coastal storms and flooding, while providing habitat for a diverse array of plants and animals. (USFWS 2012a, USFWS 2014, PDE 2013, DGS 2017).



Source: USGS 2019e

Figure 8-3. Hydrography in the New Jersey Study Area

The health of Delaware Bay/Estuary is threatened by pollution and climate change. Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Dead zones may result from a confluence of tides and currents, along with nutrient-rich fertilizer runoff and wastewater Climate change may result in rising seas, harsher storms of longer duration, and more frequent extreme high tides. Shoreline erosion is magnified by higher seas and increased wind fetch. Inundated by higher seas and more intense storms, beaches and dunes can be washed away. Tidal wetlands can become saltier, no longer providing their unique habitat, possibly becoming over-washed into muddy flats and open water (USFWS 2012b, PDE 2013, DGS 2017).

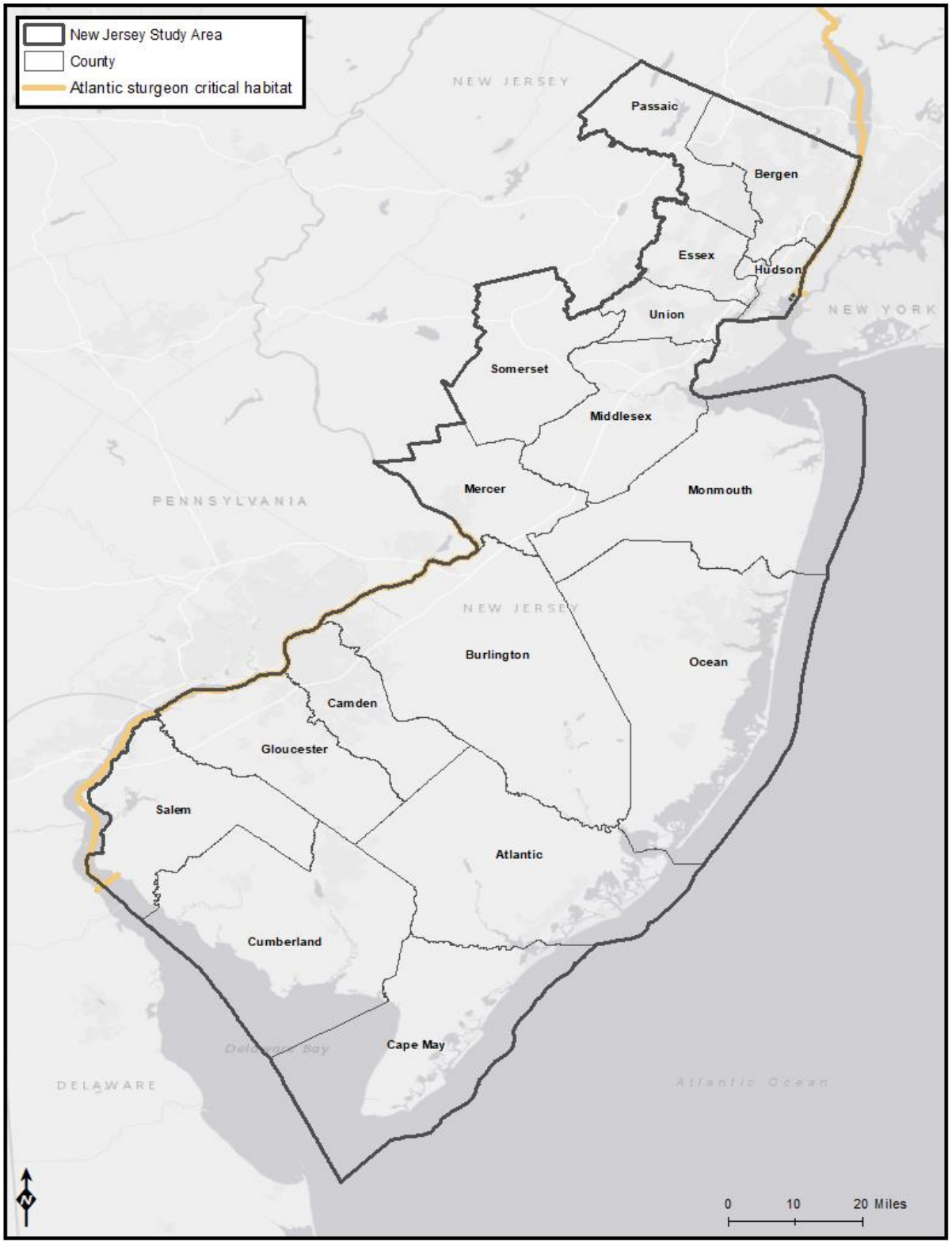
Another important bay in the Study Area is Raritan Bay. Fed by the Raritan River in northern New Jersey and located between Middlesex and Monmouth Counties and Staten Island, New York, Raritan Bay is an important urban estuary. Greater Raritan Bay, encompassing Raritan Bay, both New York and New Jersey shores, and Sandy Hook Bay to the east, stretches over 109 miles with 33,500 acres of inshore bays. The Arthur Kill tidal strait joins Newark Bay to the north to Raritan Bay, making the Bay an important waterway to the Atlantic Ocean. Because the natural bay is less than 20 feet deep, dredged shipping channels range from 80 to 1400 feet wide and between 10 and 35 feet deep (USFWS 1997a).

Restoration efforts in Raritan Bay to help remediate effects from toxins released from historic waste sites and spills in the interconnected bays, rivers, and straits along with plans to prepare and swiftly respond to spills further improve this ecological and economic resource. Although restrictions on the consumption of some seafood remain in place, a variety of pollution reduction programs has improved the health of the estuary. As a result of this improvement, the Bay is home to more than 200 species of fish, including species using the Bay to migrate between the rivers and the ocean. In addition, the greater Bay, including Staten Island and Sandy Hook, hosts more than 20,000 migrant shorebirds with peaks in June and August and with sanderling, ruddy turnstone, and semipalmated sandpiper comprising about 85% of these migratory shorebirds. An important part of the Atlantic Flyway, the Bay hosts over 60,000 migratory and mid-winter waterfowl including greater scaup, Canada goose, American black duck, and mallard (USFWS 1997a, NOAA 2019f).

As shown in Figure 8-4, the coastal area of New Jersey in the Study Area includes designated critical habitat for the New York Bight distinct population segment of the Atlantic sturgeon. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In New Jersey, the designated critical habitat of the Atlantic sturgeon is in the Delaware River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

8.2.1.2 Rivers

As shown in Figure 8-3, The Study Area has two major water basins: part of the Passaic River Basin and the Lower Delaware River Basin. Both of these river basins eventually drain into the Atlantic Ocean.



Sources: USFWS 2019i, USFWS 2019j

Figure 8-4. Critical Habitat within the New Jersey Study Area

In the northern reaches of the Study Area, the Arthur Kill tidal strait is a 10-mile shipping channel connecting Newark Bay to Raritan Bay, flowing along the border between New Jersey to the west and Staten Island, New York to the east. Because waterborne, fine-grained sediments regularly accumulate interfering with safe navigation, the channel is regularly dredged to maintain a 600-foot wide, 40-foot deep channel for ocean going vessels. Ports include the Staten Island New York Container Terminal and the New Jersey Conoco Phillips Oil Terminal. Average flushing time for the strait is 2 weeks with an average diurnal tidal range of more than 5 feet. Although surrounded by densely populated and highly industrial areas, the Arthur Kill retains natural stretches supporting significant wildlife populations. Marshlands and wetlands along the Arthur Kill include important nesting and foraging areas for egrets, herons, ibises, and gulls along with migratory stops for songbirds and raptors (USFWS 1997a, NJCF 2018, USACE 2018b).

Originating from swampy areas in northern New Jersey, the 80-mile Passaic River flows from Morris County to empty into Newark Bay. The Passaic flows south, prescribing the border with Somerset County and the western edge of the Great Swamp, before turning northeast at Millington and prescribing the border with Union County. The Passaic turns north at Chatham, prescribing the border with Essex County, where it is joined by the Whippany and Rockaway Rivers. The Passaic then swings eastward to be joined by the Pompton River, itself fed by the Pequannock, the Wanaque, and the Ramapo Rivers from northeastern New Jersey and New York. The Passaic drops over Little Falls before flowing northeasterly and plunging over the Great Falls at Paterson, New Jersey. The Passaic then swings south to fill Dundee Lake at Dundee Dam before continuing southward towards Newark where it swings clockwise around Ironbend on its southward journey to Newark Bay. The Passaic and the Hackensack River empty into northern Newark Bay, flowing into New York Harbor and the Atlantic Ocean. The tidal reach of the Passaic is considered to be the lower 17 miles of the river (USGS 2000).

In the State of New Jersey, nearly 73% of water used for drinking and industrial purposes is surface water with public supply the largest use. While public water supply in northern New Jersey is nearly 85% surface water, the percentage in southern New Jersey is only 15% surface water, with the remainder from groundwater sources. Groundwater availability in the northern coastal region of New Jersey is not as prolific as southern New Jersey, which is in the coastal geologic region as opposed to the rocky Piedmont Region to the north and west; as such, reservoirs and water transfer systems are used in the more densely populated north. The Passaic is an important water source for northern coastal New Jersey. An aqueduct at Little Falls diverts water to the Wanaque Reservoir for municipal and industrial use. Although flow of the Passaic is affected by these diversions, the mean annual flow of the Passaic at Little Falls from 1897 to 1997 was 1,146 cubic feet per second. In Essex County, the New Jersey American Water Company maintains three reservoirs fed by the Passaic River, the Canoe Brook Reservoirs, which provide 3.1 billion gallons of usable capacity for public supply (USGS 2000).

Flooding has been a long-standing problem in the Passaic River Basin, claiming lives and damaging property. The growth of both residential and industrial development in recent years has increased the threat of serious damage if flooding was to occur. In addition to flood damage, environmental damage from flooding has occurred, causing interruption to businesses and transportation, along with hardship within the basin and region after each flood event (USACE 2019k). Apart from the issue of flooding, the Passaic River has been overcome with pollution stemming from industrialization in the watershed. Since 1984, both fishing and crabbing advisories have been in place to ward against exposure to historic toxins, including mercury, in the sediments and against disease-causing pathogens from sewer overflow events. Concerted efforts among Federal, State, and local agencies continue work to clean and restore the Passaic back from poor land-use management practices that degraded the Passaic River and its shorelines, exposing vulnerable and often immigrant populations to flooding. Stewardship efforts to restore the Passaic while promoting sustainable development include the Lower Passaic Urban Waters Partnership, a

collaboration between the USACE and the USEPA along with State and local representatives from New York and New Jersey (USEPA 2018c).

The Delaware River flows south 330 miles from the Catskill Mountains of New York through Pennsylvania, New Jersey, and Delaware to enter the Atlantic at Delaware Bay. The Delaware River is the longest un-dammed river in the U.S. east of the Mississippi. More than 2,000 tributaries feed into the Delaware, including the Schuykill. The Delaware River, and its basin, provide water for over 15 million people (USGS 2020). Management of this important, multistate resource is through the Delaware River Basin Commission. Composed of the four State governors and a Federal representative, the DRBC manages releases from reservoirs with consideration of water supply, water quality, and ecosystem sustainability while managing flooding risk and damage. Streamflows of the tidal Delaware River fluctuate with freshwater inflows from precipitation, tributaries, and aquifers. Upstream migration of the salt line, the location where the river has more than 250 milligrams chloride per liter water, is monitored. Releases from upstream reservoirs in New York and Pennsylvania are used to help prevent salt-laced water from migrating upstream and corroding the industrial and public water supply systems. Typical salt-line locations are upstream of the Chesapeake & Delaware Canal near the outfall of the Christina River (DRBC 2019a). North of the State of Delaware, consolidated rocks protruding from the Delaware River near Trenton, New Jersey, mark the Fall Line, the transition from the Piedmont's crystalline metamorphic rocks to the Coastal Plains' sedimentary deposits, limiting progress upriver to small, shallow-draft boats and allowing the Delaware to broaden and slow downstream. The Delaware River continues to broaden into a slowly moving river, becoming Delaware Bay (USGS 1997, Delaware DNREC 2005, DRBC 2019b).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Several segments of the Delaware River along the New Jersey border, are designated as wild and scenic river in the Study Area (USFWS 2019a). The lower end of the Delaware River Basin within the Study Area is home to the largest horseshoe crab population and has an active commercial fishery. It is marked by heavy industry and shipping traffic, mainly because the Delaware River Basin includes the largest freshwater port in the country (the Port of Philadelphia), which is also the largest for steel and paper. As much as 70% of the oil shipped to the Atlantic Coast moves through the Estuary (Delaware Riverkeeper Network 2020). According to the Delaware River Basin Commission, the Delaware River has a "Special Protection Waters" anti-degradation policy on the longest stretch of any River in the U.S. (Lower Delaware National Wild & Scenic River 2016).

As shown in Figure 8-3, other wild and scenic rivers in the Study Area include the Great Egg Harbor River and the Maurice River in southern New Jersey. Nearly 263 miles of New Jersey's 6,450 miles of river are designated wild and scenic. In the Study Area, in addition to the Delaware River, 129 miles of the Great Egg Harbor River and its tributaries provide 30.6 scenic miles and more than 98 recreational miles of exceptional river. And on the southern extent of the Study Area, more than 35 miles of the Maurice River and its tributaries provide almost 29 scenic miles and 6.5 recreational miles of exceptional river (USFWS 2019z).

8.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to

EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 8-5, floodplains comprise a small portion of land area in all counties in the Study Area. Table 8-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 8-1. Floodplains in the New Jersey Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Atlantic	69,084	19.4	2,976	0.8
Bergen	27,287	18.3	3,671	2.5
Burlington	90,619	17.7	6,504	1.3
Camden	16,007	11.3	2,512	1.8
Cape May	90,611	56.3	8,221	5.1
Cumberland	98,951	32.0	13,828	4.5
Essex	13,074	16.2	3,609	4.5
Gloucester	28,266	13.7	3,839	1.9
Hudson	20,934	70.8	1,454	4.9
Mercer	15,817	11.0	2,042	1.4
Middlesex	30,632	15.5	4,774	2.4
Monmouth	38,479	12.8	5,079	1.7
Ocean	143,263	35.6	8,447	2.1
Passaic	15,842	13.3	4,397	3.7
Salem	57,275	27.0	10,527	5.0
Somerset	19,823	10.3	2,979	1.5
Union	8,453	12.9	3,166	4.8
Study Area Total	**784,417**	**21.9**	**88,024**	**2.5**

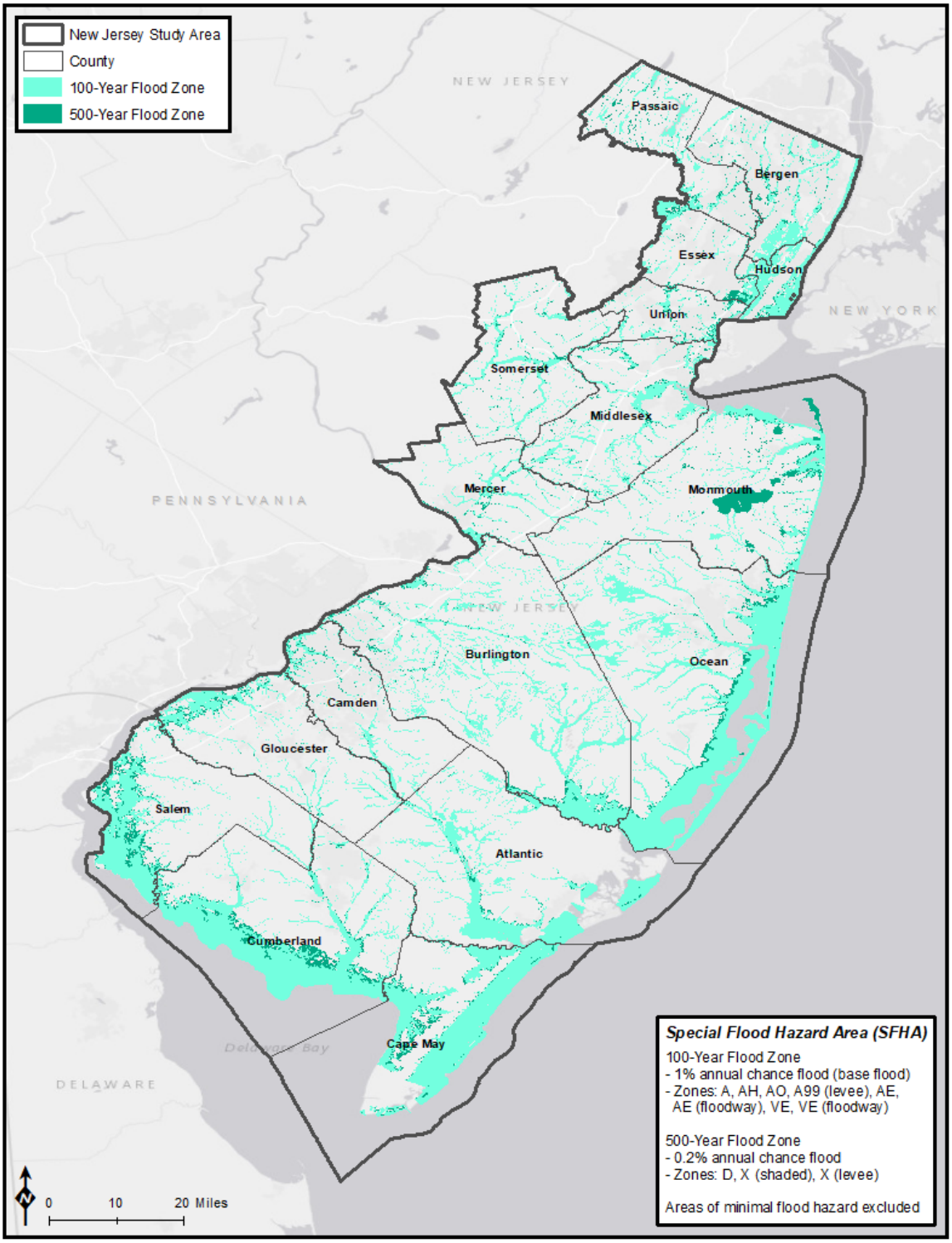
Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

8.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 8-6, wetlands are a large part of the land area in many of the Study Area counties.

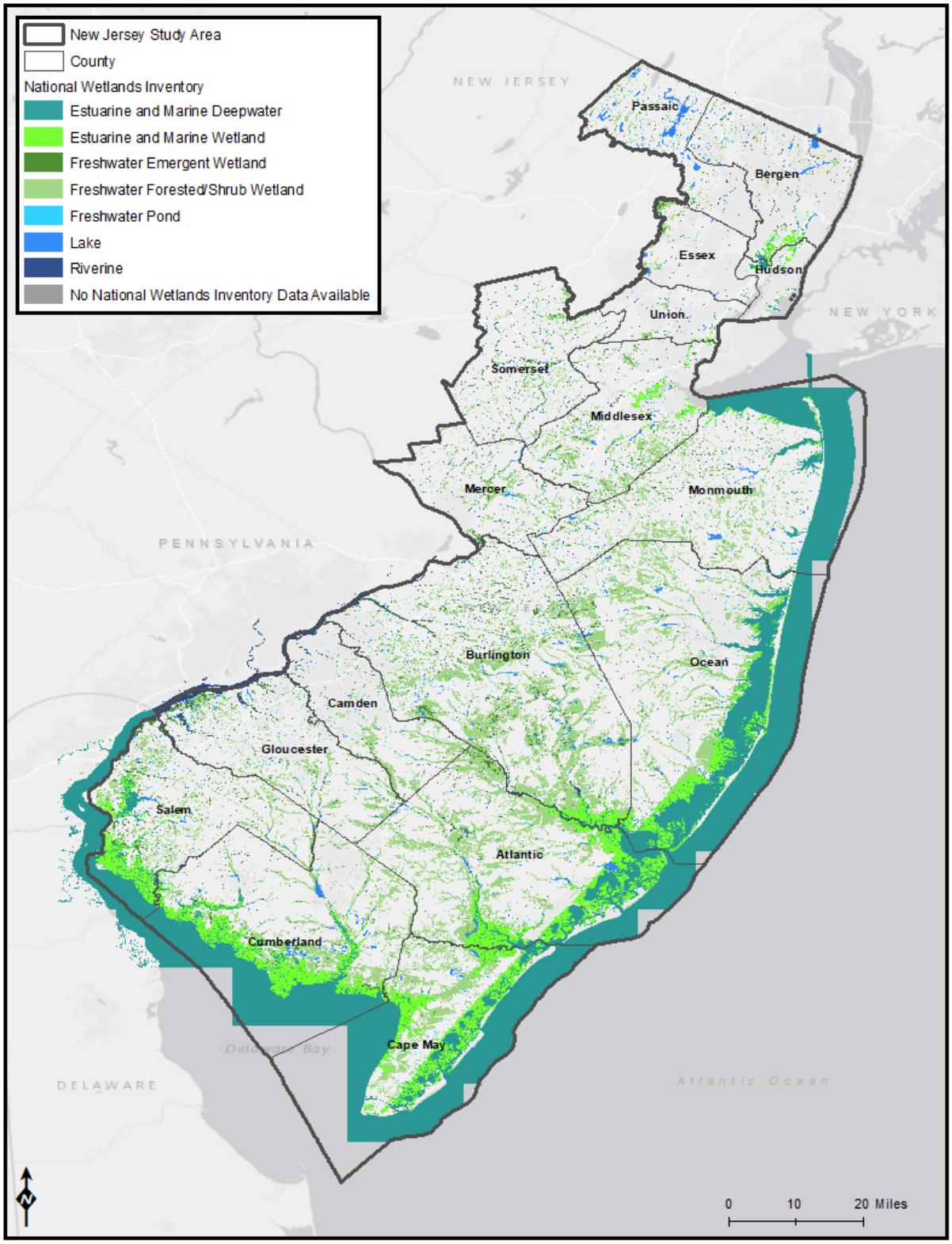
As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in

wetlands). Table 8-2 details the wetland acreage in the Study Area along with other water resources (FGDC 2013, USFWS 2019c).



Source: FEMA 2019b

Figure 8-5. Floodplains of the New Jersey Study Area



Source: USFWS 2018a

Figure 8-6. Wetlands in the New Jersey Study Area

Table 8-2. Wetlands in New Jersey Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Atlantic	198,948	43,824	3,198	78,277	67,666	3,026	1,331	1,625
Bergen	19,830	2,988	426	5,654	6,021	2,034	740	1,966
Burlington	158,871	7,861	12,626	118,433	2,442	4,045	3,630	9,833
Camden	24,024	0	1,190	17,947	0	488	1,045	3,354
Cape May	232,036	44,281	1,005	33,379	151,323	1,051	929	68
Cumberland	199,418	44,686	2,791	44,390	101,324	3,990	1,016	1,221
Essex	8,666	44	878	4,947	1,082	746	187	782
Gloucester	44,281	0	5,010	27,099	8	1,214	1,657	9,292
Hudson	13,202	1,688	65	36	11,268	0	99	46
Mercer	21,066	0	2,019	14,542	0	841	736	2,928
Middlesex	44,437	4,490	2,558	25,896	7,068	1,224	1,242	1,958
Monmouth	148,478	3,052	2,742	34,991	101,346	2,283	1,813	2,250
Ocean	279,456	29,848	2,905	68,746	172,730	2,498	1,983	747
Passaic	17,366	0	327	7,103	0	7,412	947	1,578
Salem	83,926	20,072	5,583	28,701	23,696	1,673	1,426	2,776
Somerset	21,837	0	2,400	15,225	0	310	748	3,154
Union	4,672	388	253	1,782	1,263	187	183	617
Study Area Total	1,520,513	203,222	45,976	527,147	647,237	33,023	19,713	44,196

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

8.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. The NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

8.2.2.1 Sea Level Rise

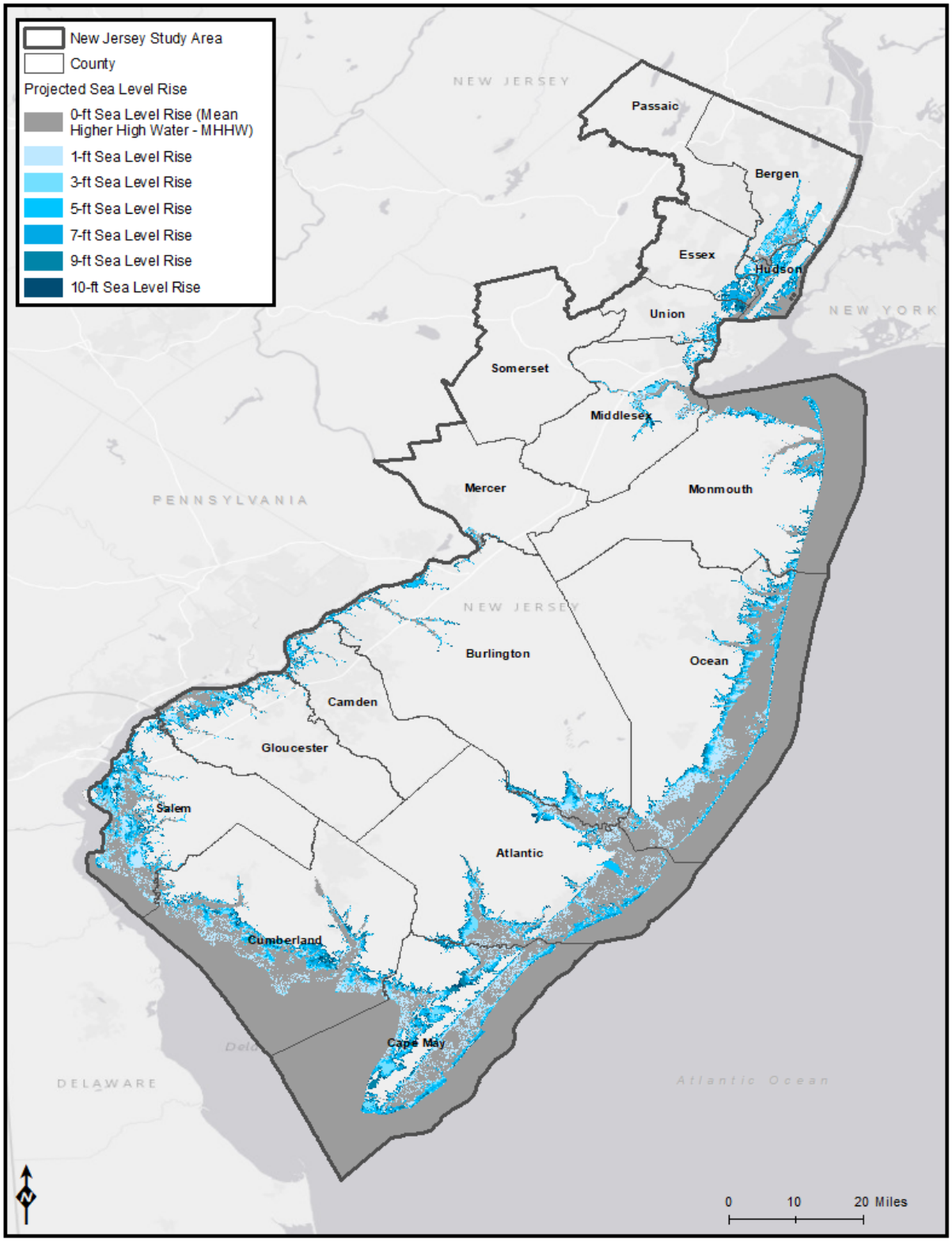
Figure 8-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.

As shown in Figure 8-7, sea level rise will impact the Study Area primarily at the Northern Hudson Waterfront, Hudson River and Newark Bay, the Raritan River in Middlesex County, Delaware River and Bay, Great Bay at Atlantic City, most of Cape May, all barrier islands, Tom's River, and the Tuckahoe-Corbin City Fish and Wildlife Management Area.

Since 1900, New Jersey has experienced a sea level rise about 1.4 feet faster than the global average rate (Kopp et al. 2019). The faster rate of sea level rise in New Jersey is due to both subsidence, a natural sinking of the land, and changing ocean currents. Subsidence in the mid-Atlantic is due to the Earth's crust rebounding in the approximately 20,000 years following the last Ice Age (Wright 2019). Also contributing to sea level rise are ocean currents, specifically the Gulf Stream, which have slowed down, leaving more water on the East Coast (SeaLevelRise.org 2019). The sea level around Atlantic City, New Jersey has risen by 12 inches since 1950. In the last 10 years, the rate of sea level rise has accelerated to over 1 inch every 5 years (0.2 inches a year) (SeaLevelRise.org 2019). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.17 inches/year (NOAA 2019b).

New Jersey is likely to experience 1 to 2 feet of sea level rise by 2050 (Rutgers 2019). In general, predictions of sea level rise become increasingly variable after 2050, depending on impacts from global climate change. Scientists predict sea level rise of a minimum of 2 feet in New Jersey if greenhouse gas emissions are controlled by 2100, but it would rise between 4 and 8 feet or more at current emissions (Rutgers 2019). A Rutgers University study predicts sea level rise for two landform types in the Study Area, both at communities situated on bedrock (Bayonne, Trenton, and Camden) and along the New Jersey shore. The study predicts sea level rise to averages of 0.7 feet by 2030, 1.3 feet by 2050, and 3.1 feet by 2100 in bedrock locations and an additional 0.1, 0.2, and 0.4 feet by 2030, 2050, and 2100, respectively, for the Jersey shore (Miller et al. 2014).

Approximately 600,000 people in New Jersey live at elevations within 10 feet of the high tide level (Kopp et al. 2019). Sea level rise has increased the frequency of nuisance flooding by 20 times since the 1950s. During Hurricane Sandy in 2012, sea level rise contributed to the 8.9-foot storm surge that accounted for an additional 40,000 people in New Jersey to experience flooding and caused $37 billion in damages to the State. With 3.5 feet of sea level rise, approximately 180,000 people and $80 billion of property will experience annual flooding. With 7.5 feet of sea level rise, flooding will reach 580,000 people and $180 billion of property (Kopp et al. 2019, SeaLevelRise.org 2019).



Source: NOAA 2018

Figure 8-7. Projected Sea Level Rise throughout the New Jersey Study Area

8.2.2.2 Storm Surge

Figure 8-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. Because of its northerly position, it is unlikely that a Category 5 hurricane would strike the New Jersey coastline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts to a Category 5 hurricane. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario.

New Jersey experiences both summer tropical storms (hurricanes) and winter nor'easters; these storm systems are described in greater detail in Chapter 1.4.2.2. In the Study Area, an 8.9-foot storm surge hit Atlantic City from Hurricane Sandy (SeaLevelRise.org 2019). The highest tides in New Jersey occur during nor'easters when storm surge combines with higher tides from natural lunar cycles (SeaLevelRise.org 2019). New Jersey has geographic characteristics that make it more susceptible to storm surge than other States, specifically lower than average elevations of nearshore areas. Of the 50 States, New Jersey has the fourth highest risk for storm surge flooding and has over 475,000 homes at risk (CoreLogic 2019).

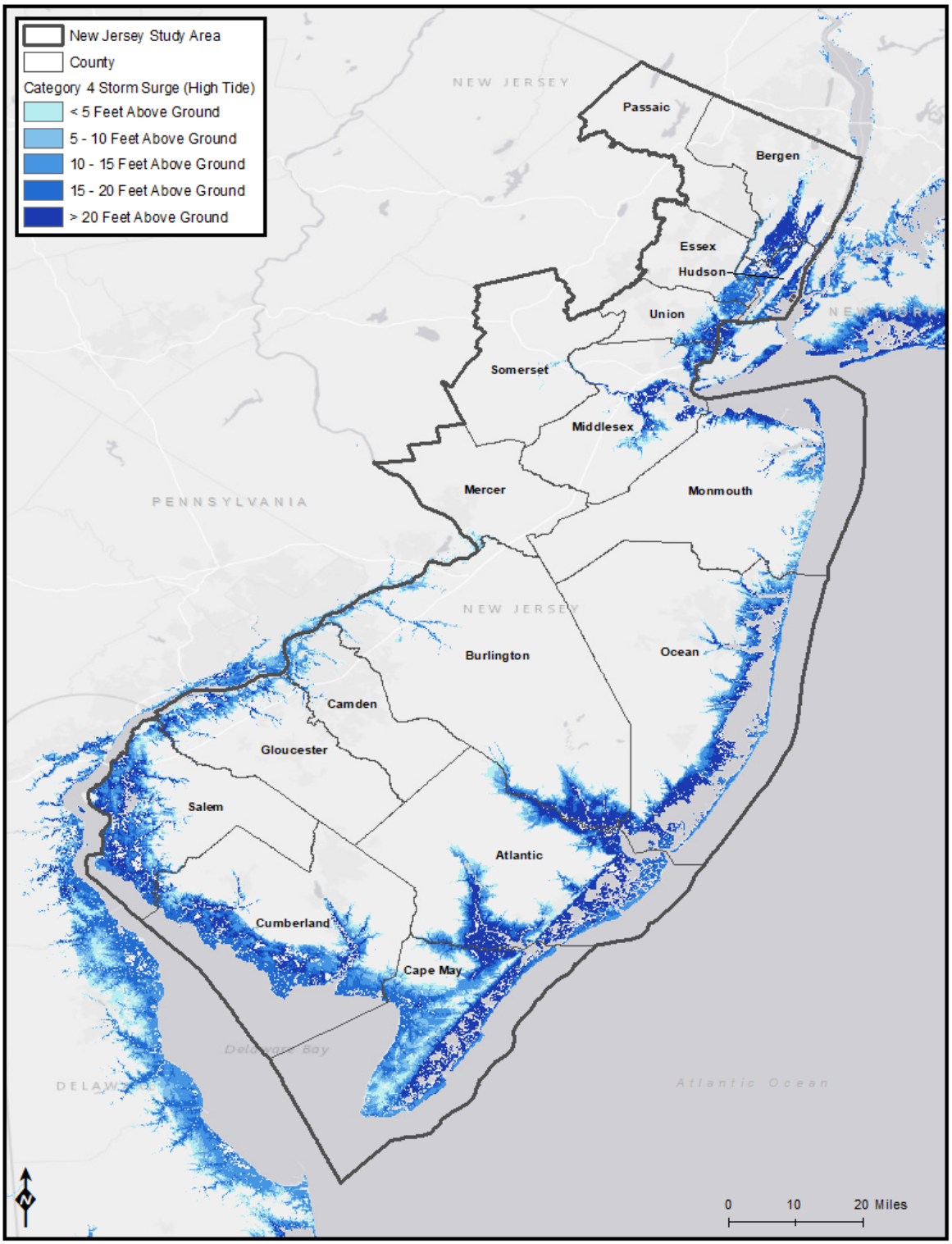
8.2.3 Summary – Physical Characteristics

Water resources in the Study Area include the Delaware Bay, Delaware Estuary, Raritan Bay, the Arthur Kill tidal strait, and the Passaic and Delaware River Basins in addition to other rivers, floodplains, and wetlands. These water resources are a major component of the New Jersey ecosystem, are the source of drinking water for the population, provide significant recreational activities, and are a major component of the State's economy (both with regard to fishing and with the major ports in the area).

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. As shown in Figure 8-7, sea level rise will impact the Study Area primarily at the Northern Hudson Waterfront, Hudson River and Newark Bay, the Raritan River in Middlesex County, Delaware River and Bay, Great Bay at Atlantic City, most of Cape May, all barrier islands, Tom's River, and the Tuckahoe-Corbin City Fish and Wildlife Management Area.

The sea level in the Study Area has risen by 12 inches since 1950, and the rate is accelerating. Sea level in the Study Area is rising faster than the global average rate due to subsidence and a slowing Gulf Stream, especially in shoreline communities (Kopp et al. 2019, SeaLevelRise.org 2019). For example, Rutgers University predicts over 37 inches of sea level rise in bedrock communities and up to an additional 4.8 inches higher at the shore by 2100 (Miller et al. 2014). Impacts from sea level rise in the Study Area include increases in extent and frequency of nuisance flooding and higher storm surges. New Jersey has geographic characteristics that make it more susceptible to storm surge, primarily due to relatively low nearshore elevations (CoreLogic 2019). With 7.5 feet of sea level rise, flooding will reach 580,000 people and $180 billion of property (Kopp et al. 2019, SeaLevelRise.org 2019).

In summary, physical characteristics of the Study Area influence land use and land cover, and demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic region. Developers of potential future OCS-related activities within these areas will need to be cognizant of the projected changes in sea level and storm surge. Potential future projects could exacerbate impacts if built in areas projected to experience sea level rise and increased storm surge if these expected changes are not taken into account during the planning and design process. Early consideration of projected future changes is beneficial to the project as well to avoid potential future expenditures for costly repairs or relocations should sea level rise and/or storm surge affect project facilities and/or equipment.



Source: NOAA 2020a

Figure 8-8. Projected Storm Surge throughout the New Jersey Study Area for a Category 4 Hurricane

8.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

8.3.1 Land Cover

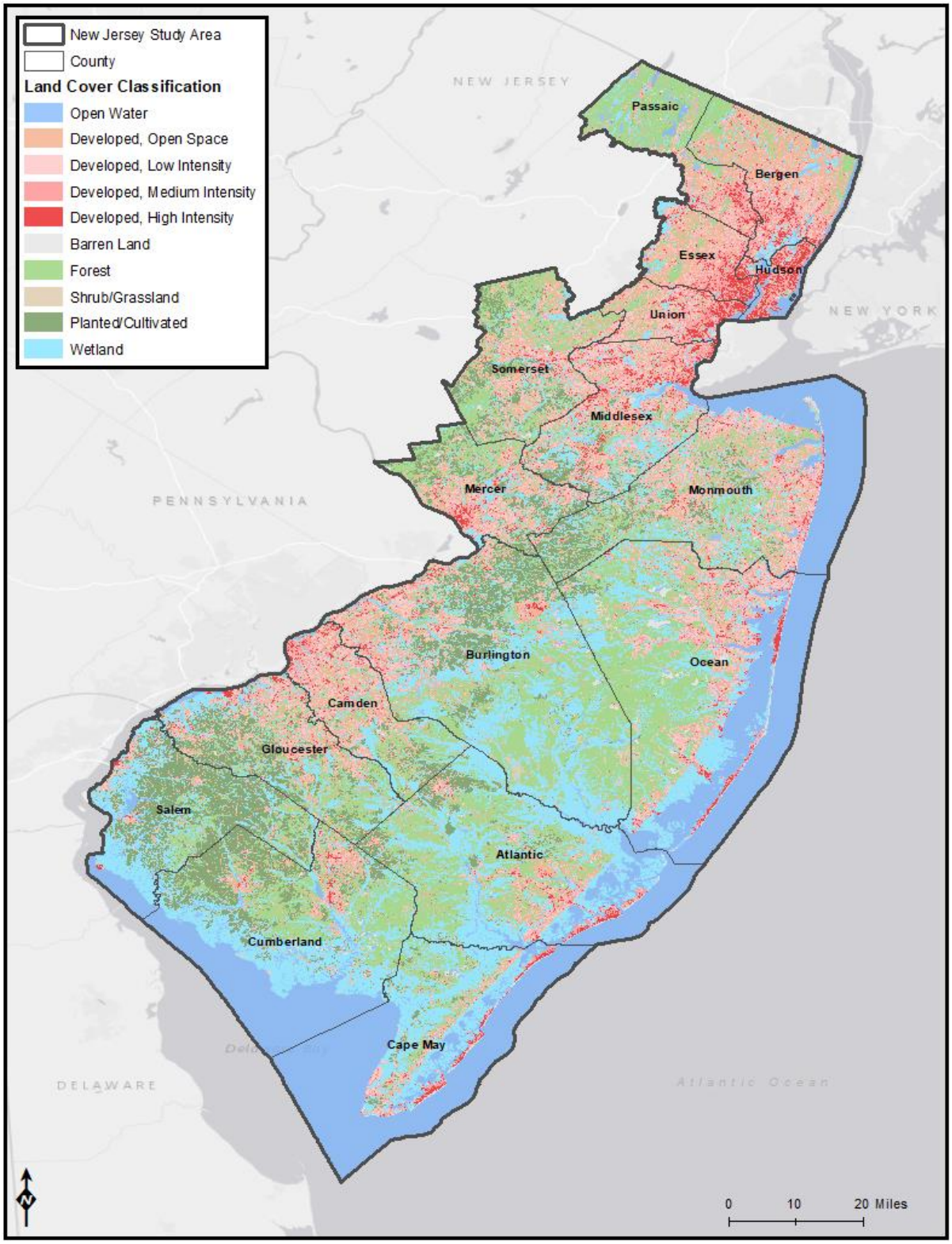
Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available.

Figure 8-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 8-3 presents the NLCD data for each county within the State by acreage. Table 8-4 presents the NLCD data for each county within the State by percentage and presents a summary of the overall land cover trend for each geographic unit. Open water land use was excluded in Table 8-4 because this type of land cover would not be considered in future industrial development. Each county was then categorized based on its land cover trend as shown in Table 8-4 and Figure 8-10. The following section discusses the key findings of this analysis.

The general land cover within the 17 counties in the Study Area varies greatly. Some counties are largely urban, whereas others are more undeveloped. It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serve as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of New Jersey may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of "forest" is very broad.

Table 8-4 presents an assessment of the general land cover for each of the 17 counties in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 8-4, Figure 8-10 shows the majority land cover type within each county in the Study Area.

As shown in Table 8-5, 10 of the counties within the Study Area are predominantly covered by forest or a mix of forest and urban development. As described previously, "forest" land cover in the State of New Jersey could range from natural forested areas to neighborhoods in suburban areas. These are likely indicative of wooded suburban landscapes. Counties with dense urban development mixed with forest tend to be those approaching the urban centers in the area. Bergen, Essex, Hudson, Middlesex, Union, and Passaic Counties are adjacent to New York City, New York. Camden County and the western portion of Burlington County are adjacent to Philadelphia, Pennsylvania. The eastern portion of Burlington County is more heavily forested and/or wetland all the way to the coastline. Mercer County contains Trenton, New Jersey. Somerset County is located between Philadelphia and Trenton. Monmouth County has a large proportion of urban development but no large urban center, rather development is at low densities throughout the county. Barrier islands and the coastline in Ocean, Atlantic, and Cape May Counties are densely populated while the interiors of these counties are more heavily forested and/or wetlands. Cumberland and Salem Counties along the Delaware Bay are more agricultural and wetland with forested and some urban areas (NLCD 2016a).



Source: NLCD 2016a

Figure 8-9. National Land Cover in the New Jersey Study Area

Table 8-3. Acres of Land Cover by NLCD Classifications in the New Jersey Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Atlantic	429,971	29,159	19,201	12,345	4,676	1,990	116,249	3,855	26,798	140,725	29,159	74,972
Bergen	157,719	53,767	27,675	21,482	8,429	111	23,740	683	439	13,344	53,767	8,049
Burlington	524,919	49,038	38,639	16,570	6,025	1,849	157,506	10,815	68,482	164,723	49,038	11,271
Camden	145,549	26,764	28,340	15,222	5,816	758	30,125	1,664	10,102	23,627	26,764	3,131
Cape May	396,980	11,918	10,240	7,072	5,226	3,320	24,982	1,883	7,324	88,984	11,918	236,032
Cumberland	433,821	22,338	12,146	5,563	2,380	2,540	78,594	5,211	66,454	109,575	22,338	129,020
Essex	82,829	23,120	16,485	17,187	9,371	38	7,559	124	174	6,937	23,120	1,834
Gloucester	215,534	31,622	23,464	9,865	4,295	519	42,671	3,355	48,342	43,191	31,622	8,210
Hudson	39,932	1,240	2,818	10,336	11,917	134	280	610	62	1,741	1,240	10,792
Mercer	146,467	29,333	20,089	11,497	4,773	341	31,241	1,082	26,276	19,874	29,333	1,962
Middlesex	206,662	33,029	44,290	31,392	13,955	781	21,207	2,629	14,060	37,468	33,029	7,853
Monmouth	425,891	60,413	50,940	21,719	6,109	2,576	68,157	3,754	38,006	50,361	60,413	123,857
Ocean	585,485	35,763	50,482	26,965	10,281	9,363	141,741	11,455	6,830	111,895	35,763	180,711
Passaic	126,969	18,776	12,738	11,053	4,568	453	59,948	872	565	10,371	18,776	7,623
Salem	238,433	13,209	6,683	2,458	1,492	263	26,155	1,466	91,405	70,710	13,209	24,593
Somerset	195,170	41,015	24,998	10,471	2,915	1,194	58,603	3,464	31,860	19,840	41,015	811
Union	67,513	15,069	16,754	14,854	8,971	173	6,890	291	51	3,114	15,069	1,347
Study Area Total	**4,419,844**	**495,573**	**405,981**	**246,051**	**111,199**	**26,404**	**895,648**	**53,212**	**437,230**	**916,478**	**495,573**	**832,068**

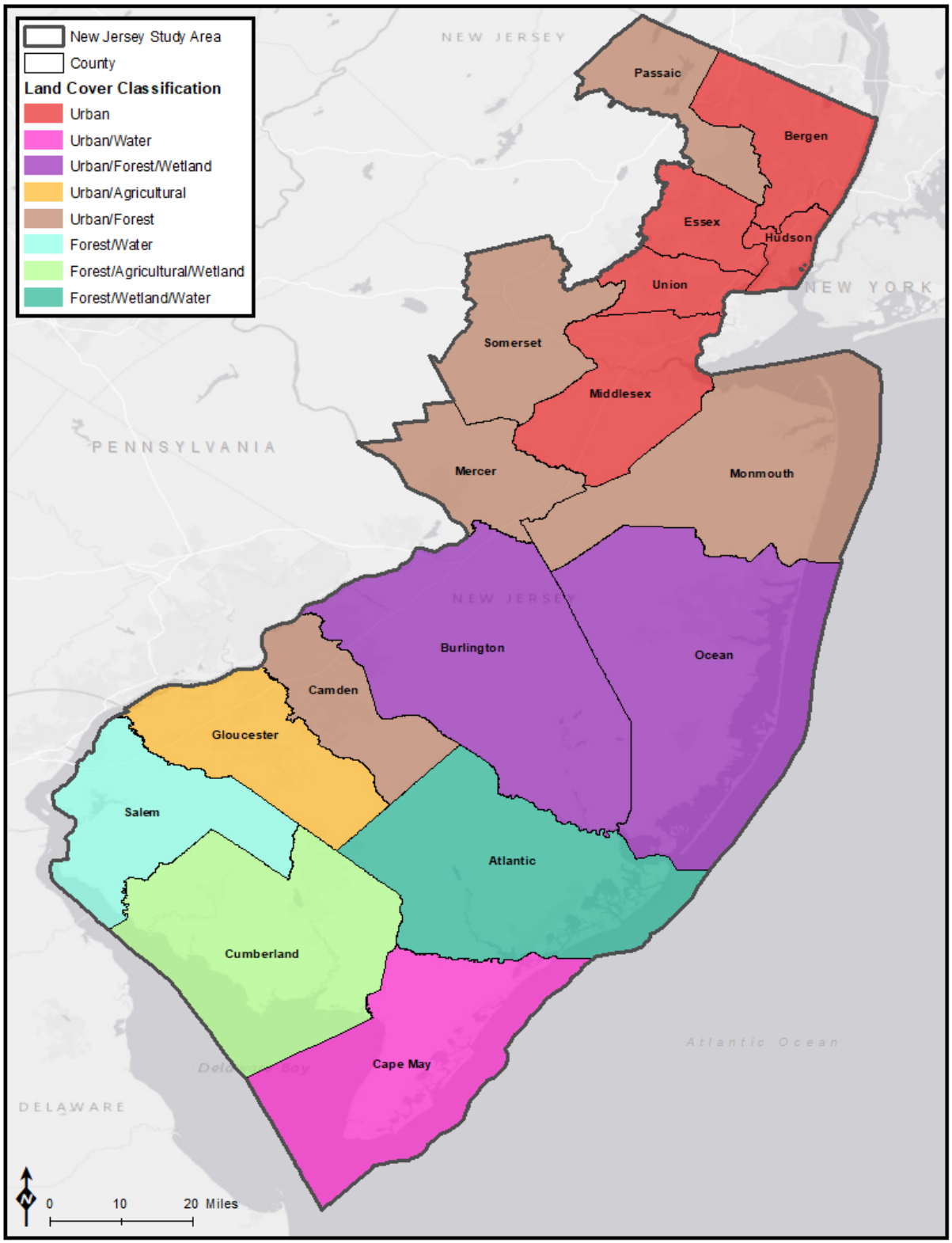
Source: NLCD 2016a
Note: Due to the vast quantity of data involved, land cover calculations are not provided at the State or national level.

Table 8-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties in the New Jersey Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Atlantic	8.21	5.41	3.48	1.32	18.42	0.56	32.75	1.09	7.55	39.64	Forest/Wetland
Bergen	35.92	18.49	14.35	5.63	74.40	0.07	15.86	0.46	0.29	8.92	Urban
Burlington	9.55	7.52	3.23	1.17	21.47	0.36	30.66	2.11	13.33	32.07	Urban/Forest/Wetland
Camden	18.79	19.90	10.69	4.08	53.46	0.53	21.15	1.17	7.09	16.59	Urban/Forest
Cape May	7.40	6.36	4.39	3.25	21.41	2.06	15.52	1.17	4.55	55.29	Urban/Wetland
Cumberland	7.33	3.98	1.83	0.78	13.92	0.83	25.79	1.71	21.80	35.95	Forest/Agricultural/Wetland
Essex	28.55	20.35	21.22	11.57	81.69	0.05	9.33	0.15	0.21	8.56	Urban
Gloucester	15.25	11.32	4.76	2.07	33.40	0.25	20.58	1.62	23.32	20.83	Urban/Agricultural/Wetland
Hudson	4.26	9.67	35.47	40.90	90.29	0.46	0.96	2.09	0.21	5.98	Urban
Mercer	20.30	13.90	7.96	3.30	45.46	0.24	21.62	0.75	18.18	13.75	Urban/Forest
Middlesex	16.61	22.28	15.79	7.02	61.70	0.39	10.67	1.32	7.07	18.85	Urban
Monmouth	20.00	16.87	7.19	2.02	46.08	0.85	22.57	1.24	12.58	16.67	Urban/Forest
Ocean	8.84	12.47	6.66	2.54	30.51	2.31	35.02	2.83	1.69	27.64	Urban/Forest/Wetland
Passaic	15.73	10.67	9.26	3.83	39.50	0.38	50.23	0.73	0.47	8.69	Urban/Forest
Salem	6.18	3.13	1.15	0.70	11.15	0.12	12.23	0.69	42.74	33.07	Agricultural/Wetland
Somerset	21.10	12.86	5.39	1.50	40.85	0.61	30.15	1.78	16.39	10.21	Urban/Forest
Union	22.77	25.32	22.45	13.56	84.10	0.26	10.41	0.44	0.08	4.71	Urban
Study Area Total	13.81	11.32	6.86	3.10	35.09	0.74	24.96	1.48	12.19	25.54	Urban/Forest/Wetland

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2016a

Figure 8-10. Summary of Major Land Cover Classification for the New Jersey Study Area

Table 8-5. Major Land Cover within Each County in the New Jersey Study Area

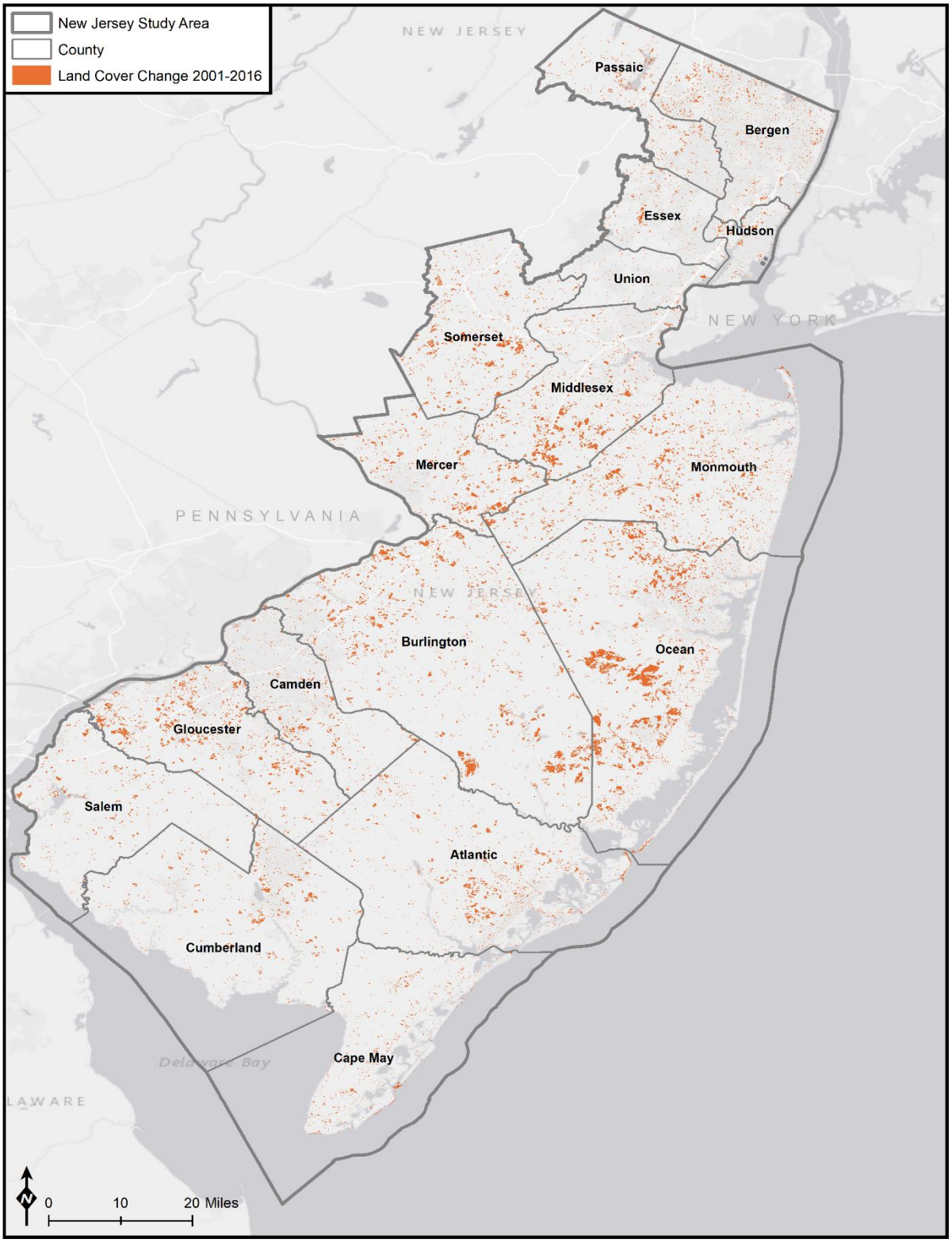
Predominant Land Cover Type(s)	Count	Geographic Units
Urban	5	Bergen, Essex, Hudson, Middlesex, Union
Urban/Forest	5	Camden, Mercer, Monmouth, Passaic, Somerset
Urban/Forest/Wetland	2	Burlington, Ocean
Forest/Wetland	1	Atlantic
Urban/Wetland	1	Cape May
Forest/Agricultural/Wetland	1	Cumberland
Urban/Agricultural/Wetland	1	Gloucester
Agricultural/Wetland	1	Salem

Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). A total of 3.7% of the land cover in the Study Area changed at least once. Figure 8-11 and Table 8-6 show the land cover change within the Study Area from 2001 to 2016. Middlesex County experienced the most significant land cover change at 6.1%, followed closely by Gloucester at 6.0%. Cape May County experienced the least land cover change at 1.1% followed closely by Union County at 1.4%. The majority of these changes appear to be from or to the developed land cover types (MRLC 2016). Changes in urban developed land cover throughout the Study Area is unsurprising given the number and density of large urban areas within and surrounding the Study Area.

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development (the urban and urban/forest categories from Table 8-5) as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. However, counties with lower intensity development may be easier to develop, such as Burlington, Cumberland, and Gloucester. It is also likely that future industrial development would want to avoid counties such as Atlantic, Cumberland, and Salem, which are much less developed and have a larger proportion of agricultural and undisturbed land covers.

Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including Bergen, Burlington, Camden, Cumberland, Gloucester, Middlesex, Mercer, Monmouth, Passaic, and Somerset would be the most suitable to accommodate future industrial coastal projects.



Source: NLCD 2001-2016

Figure 8-11. Land Cover Change in the New Jersey Study Area

Table 8-6. Land Cover Change in the New Jersey Study Area

Geographic Unit	County Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Atlantic	429,975	10,467	2.4
Bergen	157,719	6,778	4.3
Burlington	524,919	22,499	4.3
Camden	145,549	4,898	3.4
Cape May	396,996	4,330	1.1
Cumberland	433,824	7,162	1.7
Essex	82,829	2,457	3.0
Gloucester	215,534	12,871	6.0
Hudson	39,932	1,411	3.5
Mercer	146,467	8,247	5.6
Middlesex	206,662	12,550	6.1
Monmouth	425,904	17,281	4.1
Ocean	585,497	32,745	5.6
Passaic	126,969	4,067	3.2
Salem	238,433	4,376	1.8
Somerset	195,170	9,407	4.8
Union	67,513	962	1.4
Study Area Total	**4,419,891**	**162,509**	**3.7**

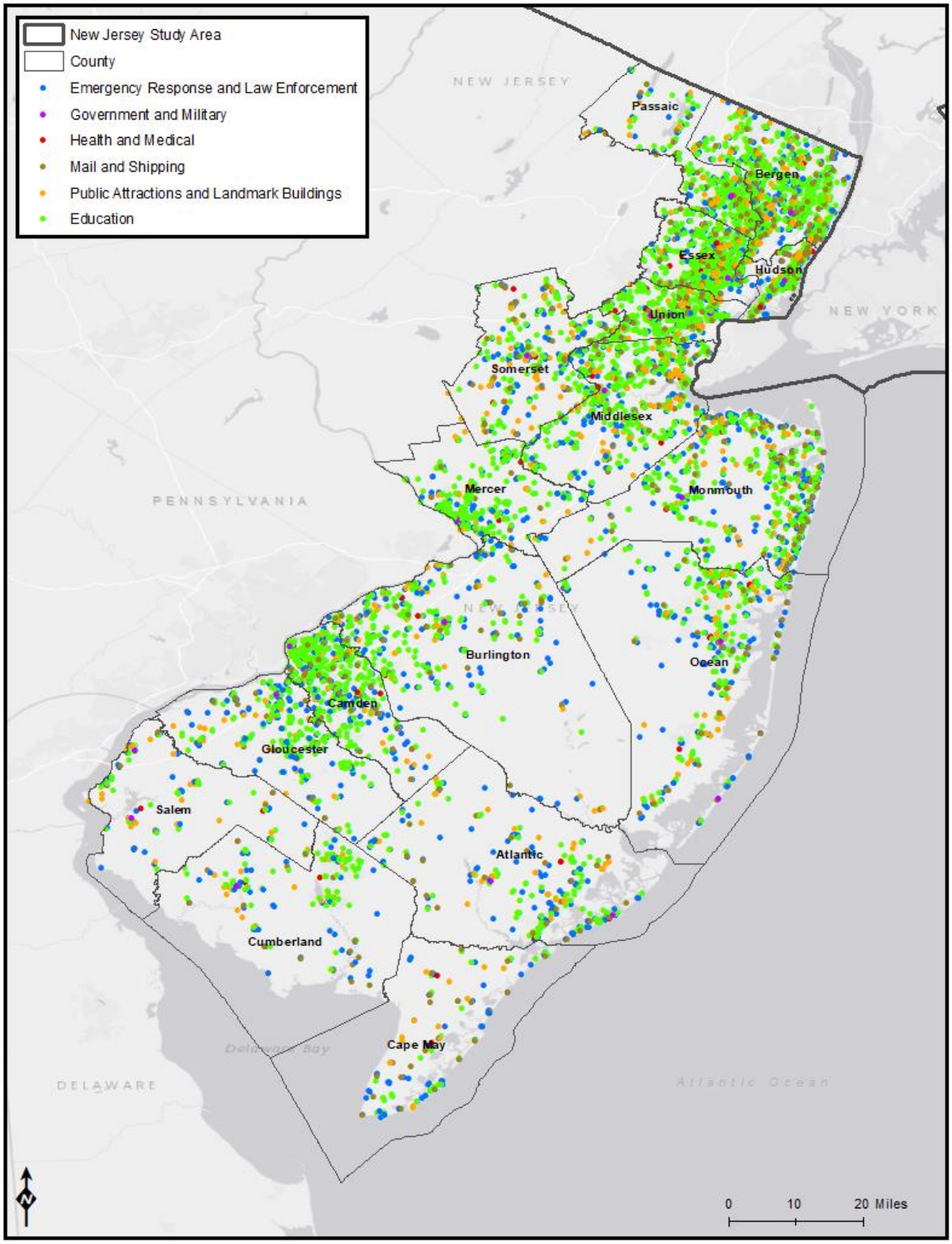
Source: NLCD 2001-2016

8.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

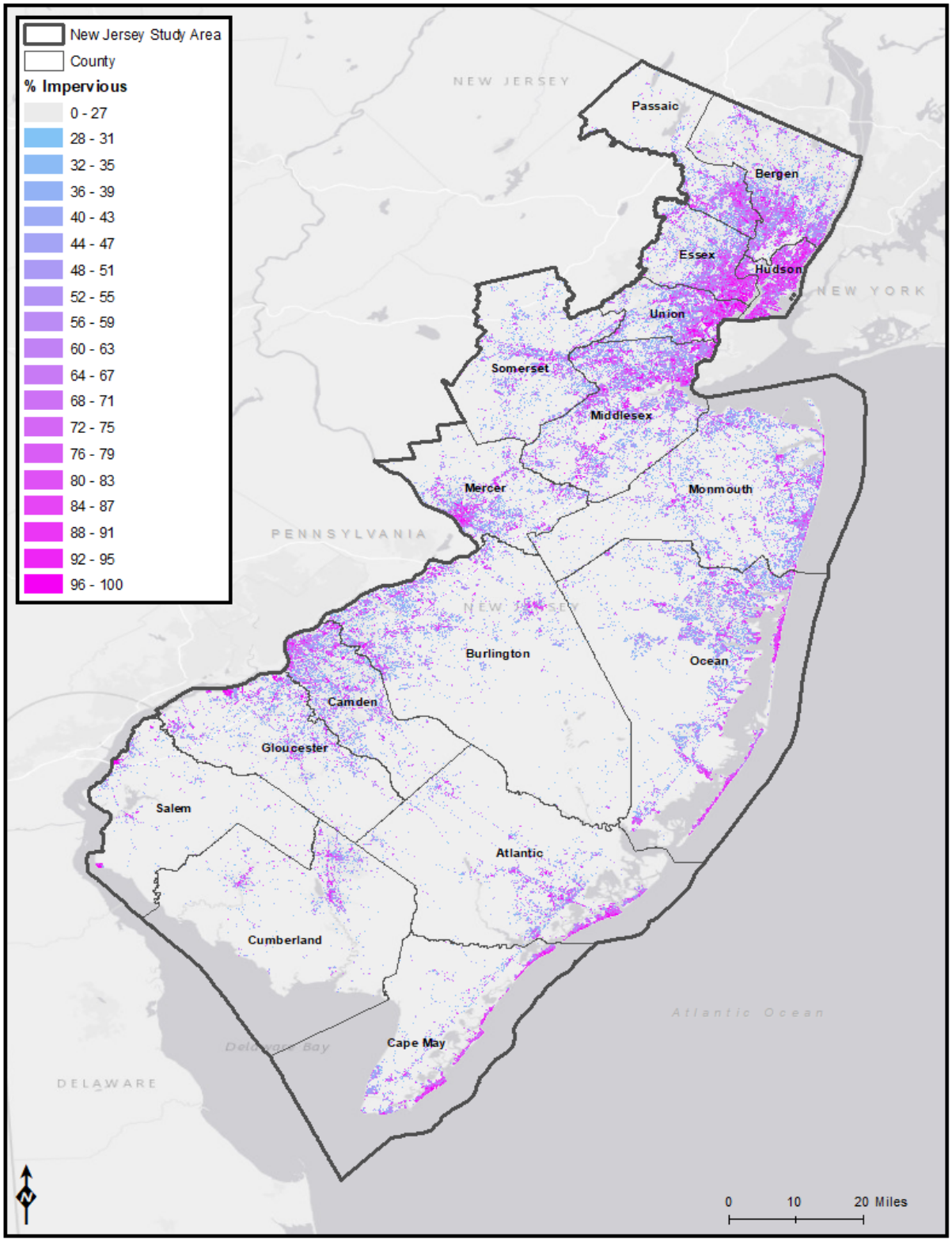
8.3.2.1 Existing and Future Land Use

The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 8-12 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 8-13 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 8.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 8-12. Select Existing Land Uses within the New Jersey Study Area



Source: NLCD 2016b

Figure 8-13. Impervious Surfaces within the New Jersey Study Area

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Each county within the Study Area is likely to have developed a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 8.3.2.2.

In summary, existing land use data show there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data show the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses. Structures and impervious cover in the Study Area mirror land cover trends for urban development. Counties with more intense land use tend to be those approaching the urban centers in the area, such as Bergen, Camden, Essex, Hudson, Middlesex, Monmouth, Union, Passaic, and Somerset Counties. The barrier islands are also highly developed.

In 2015, the New Jersey Department of Environmental Protection (NJDEP) released an update of its land use/land cover data set, which indicates how and where New Jersey both uses and preserves its land. According to the results, 33.5% of the State's land is urbanized and 32.5% is forest, with another 11.6% in agricultural use and 21.2% in wetlands (Evans 2019). This is fairly consistent with the results for the Study Area as described in Chapter 8.3.1.

In recognition of the relationship between land use and the health and quality of natural resources, the New Jersey legislature has given the NJDEP the responsibility of managing land use as a critical function of the overall environmental protection strategy. The NJDEP Division of Land Use Regulation regulates land use activities through a permit process in accordance with the following statutes: Freshwater Wetlands Protection Act (N.J.S.A. 13:9B *et seq*.), Flood Hazard Area Control Act (N.J.S.A. 58:16A), Wetlands Act of 1970 (N.J.S.A. 13:9A-1 *et seq*.), Coastal Area Facility Review Act (N.J.S.A. 13:19-1 *et seq*.), Waterfront Development Law (N.J.S.A. 12:5-3), Tidelands Act (N.J.S.A. 12:3), New Jersey Water Pollution Control Act (N.J.S.A. 58:10A *et seq*.), and the Highlands Water Protection and Planning Act (P.L. 2004, c.120) (NJDEP 2020). Although NJDEP manages land use, local municipalities have the power to plan and zone for development under the Municipal Land Use Law (NJSA 40:55D-1) (New Jersey Future 2020).

New Jersey lost a lot of farmland to urbanization; farming is still an important industry in approximately one-sixth of the state. Farm products include a large variety of fruits and vegetables, such as blueberries, cranberries, peaches, asparagus, bell peppers, and the famous New Jersey tomatoes (Kerney et al. 2020). Because New Jersey's farmland is in such high demand by developers and other non-agricultural interests, New Jersey's Department of Agriculture has a Strategic Plan containing a goal of preserving 20,000 acres of farmland per year. The Department's programs encourage county adoption of comprehensive farmland preservation plans, coordinating farmland preservation efforts with economic

development strategies at county and municipal levels, proactive strategies that link the land, products, processing and workforce with marketing opportunities, and long-term land value appreciation (NJDA 2020).

New Jersey State is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New Jersey's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 169 census tracts in 75 municipalities approved by the U.S. Department of the Treasury in 2018 (State of New Jersey 2020). An interactive map of opportunity zones is located at https://njdca.maps.arcgis.com/apps/webappviewer/index.html?id=96ec274c50a34890b23263f101e4ad9b.

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). Counties and municipalities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

In general, the principals of New Jersey Municipal Master Plans include:

- "Smart Growth" to prevent sprawl by directing growth to areas of existing infrastructure
- "Carrying Capacity Analysis" to balance the importance of natural resources and infrastructure limitations with growth
- "Sustainable Development" to ensure that resources can satisfy current and future demands
- "Low Impact Development" to reduce disturbance to natural landscapes (Rutgers 2003).

8.3.2.2 Zoning

The State adopted a master plan in 1992 to direct growth toward existing infrastructure in the existing urban and older suburban areas while at the same time protecting the State's natural resources. The plan also committed to acquiring and developing new open space and reducing suburban sprawl (Kerney et al. 2020).

As described in Chapter 8.3.2, although NJDEP manages land use, local municipalities have the power to plan and zone for development under the Municipal Land Use Law (N.J.S.A. 40:55D-1) (New Jersey Future 2020). As the Study Area covers multiple municipalities, within multiple counties, there are, therefore, a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances should be considered during OCS-related project analysis. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed.

Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

8.3.2.3 Industrial Incentives

New Jersey offers a variety of business incentives to promote and develop business and grow industries in the State. The New Jersey Economic Development Authority is an independent State agency that offers an array of financial programs and support to stimulate business development, job creation, and community revitalization in New Jersey (NJEDA 2020). The following are programs, and financial and business incentives provided by the State of New Jersey that could benefit a company associated with OCS-related activities.

The Brownsfield Loan Program provides financing to buyers or owners of current brownfield sites. In order to qualify, the site owners must develop commercial properties related to retail, mixed-used developments, or reuses (NJEDA 2020).

The Grow NJ Assistance Program is a job creation incentive program that benefits businesses with tax credits per job created or retained within the State, with additional bonus credits available awarded annually. The tax credits offered by the program range from $500 to $5,000 per job, per year and the bonus credits range from $250 to $3,000 per job, per year (NJEDA 2020).

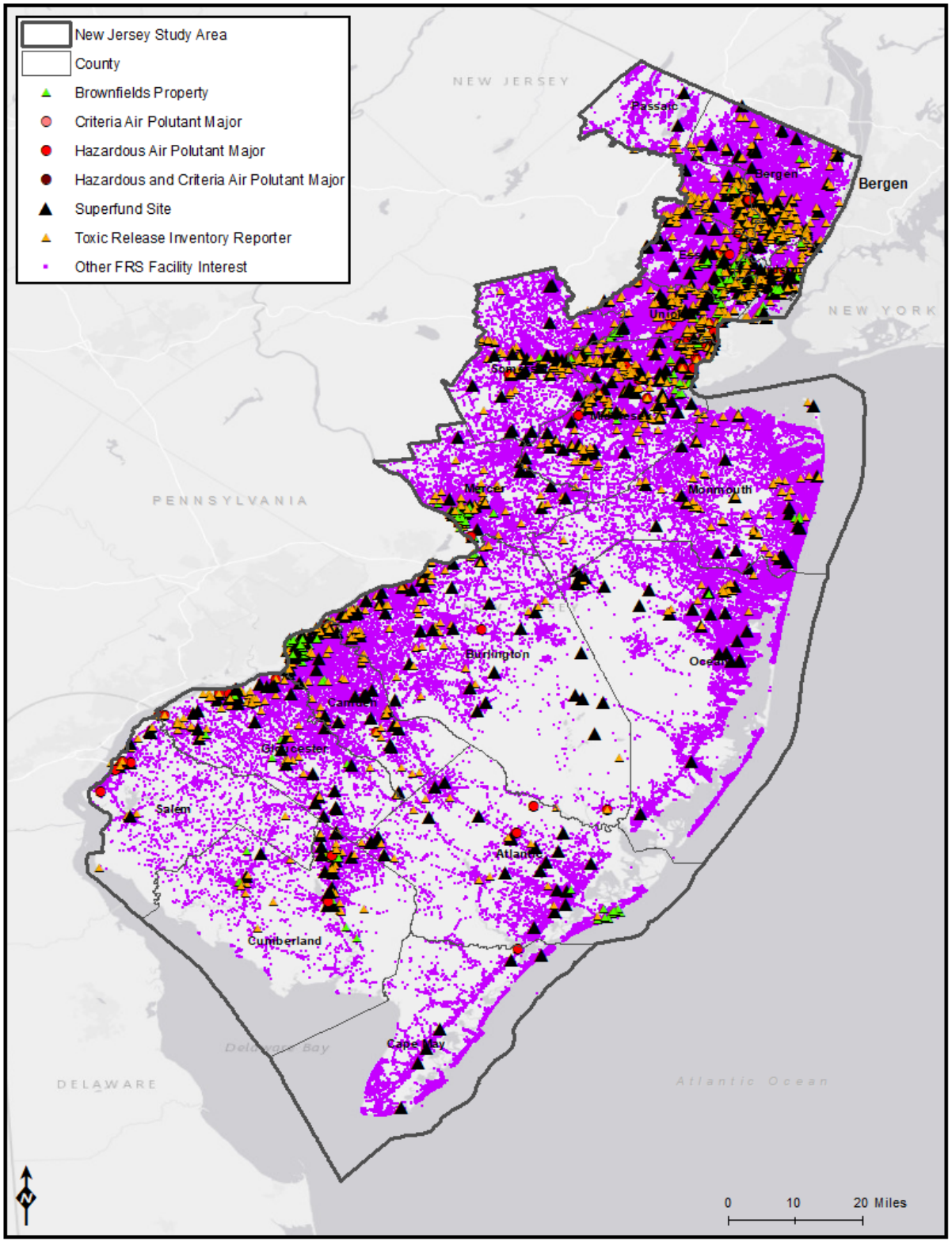
The Hazardous Discharge Site Remediation Fund is targeted towards businesses, individuals, or municipalities that reside in New Jersey. In order to receive financing in the form of loans or grants, these entities must perform the remediation and/or cleanup of contaminated and underused sites(NJEDA 2020).

The Sales and Use Tax Exemption Program is for companies with 1,000 or more employees that need to make purchases for the construction and renovation of a new business location. Eligible businesses may be able to take advantage of a sales tax exemption certificate for the purchases of equipment and building materials for temporary storage at the site location until project completion (NJEDA 2020).

Many OCS-related ventures may not qualify for certain incentives offered by the State, and other programs and incentives may apply to businesses associated with OCS-related activities that are not listed. Therefore, it is recommended that the New Jersey Economic Development Authority be approached for further assistance. In addition, the New Jersey Business Action Center is available to support new and existing businesses in the State and can also assist in business services associated with export through New Jersey ports (NJDS 2020a).

8.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 8-14 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:



Source: USEPA 2018a

Figure 8-14. USEPA Facility Register Service Record for the New Jersey Study Area

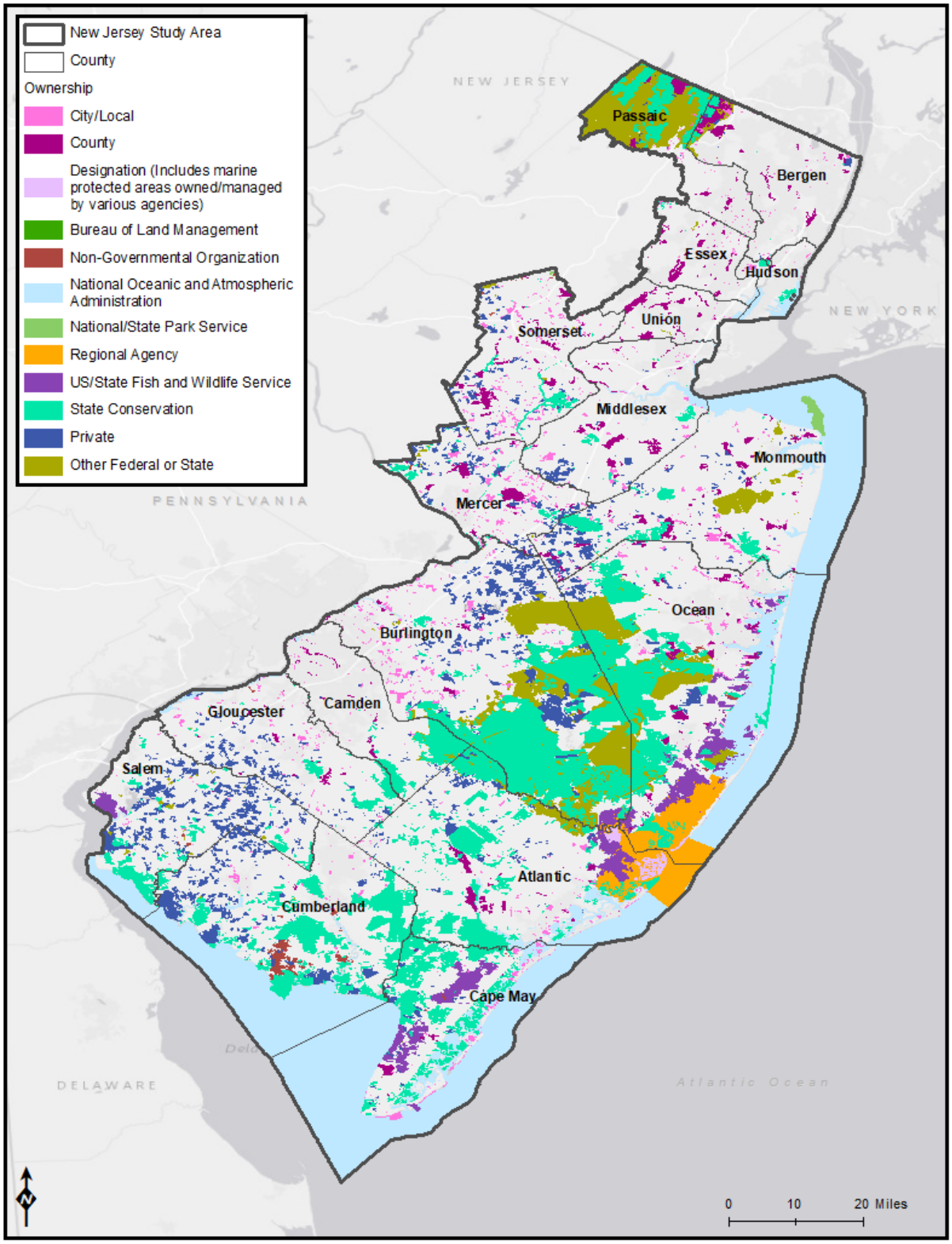
- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory-listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

New Jersey is heavily urbanized in areas around northern Camden County and in the areas east and north of New York City (Figure 8-10). According to the location of USEPA-tracked facilities shown in Figure 8-14, the majority of industry within the Study Area is concentrated in the major urban centers of Camden, Middlesex, Union, Essex, and Hudson Counties. Southeast Burlington County, west Ocean County, and east Cumberland County have the lowest number of such facilities (Figure 8-14). Chapter 8.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

8.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 8-15 presents the protected areas within the Study Area.

As can be seen in Figure 8-15, the majority of Passaic County is protected lands consisting primarily of State parks and State forests. The “designation” category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS. Protected areas in the northern region of the Study Area (Bergen, Essex, Hudson, Union, Somerset, Middlesex, Mercer, and Monmouth Counties) are mostly small parcels of land owned by the county or private entities. Most notable is the large portion of the protected areas across Ocean, Burlington, and Atlantic Counties in the center of the Study Area. These protected lands include several State forests, wildlife management areas, State natural areas, and the Jacques Cousteau National Estuarine Research Reserve (NOAA 2018c). There are also several State conservation areas along the southern coast of the Study Area in Salem, Cumberland, and Cape May Counties. These include primarily wildlife management areas and wildlife refuges. Information on State forests and State parks in the Study Area can be found on the New Jersey Department of Environmental Protection’s website (NJDEP 2017). Information on wildlife management areas can be found on the Department of Environmental Protection’s Division of Fish and Wildlife’s website (NJDEP 2020).



Source: USGS 2019f

Figure 8-15. Protected Areas within the New Jersey Study Area

Protected areas will need to be considered during analysis of potential future OCS-related projects. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

8.3.2.6 Cultural and Historic Resources

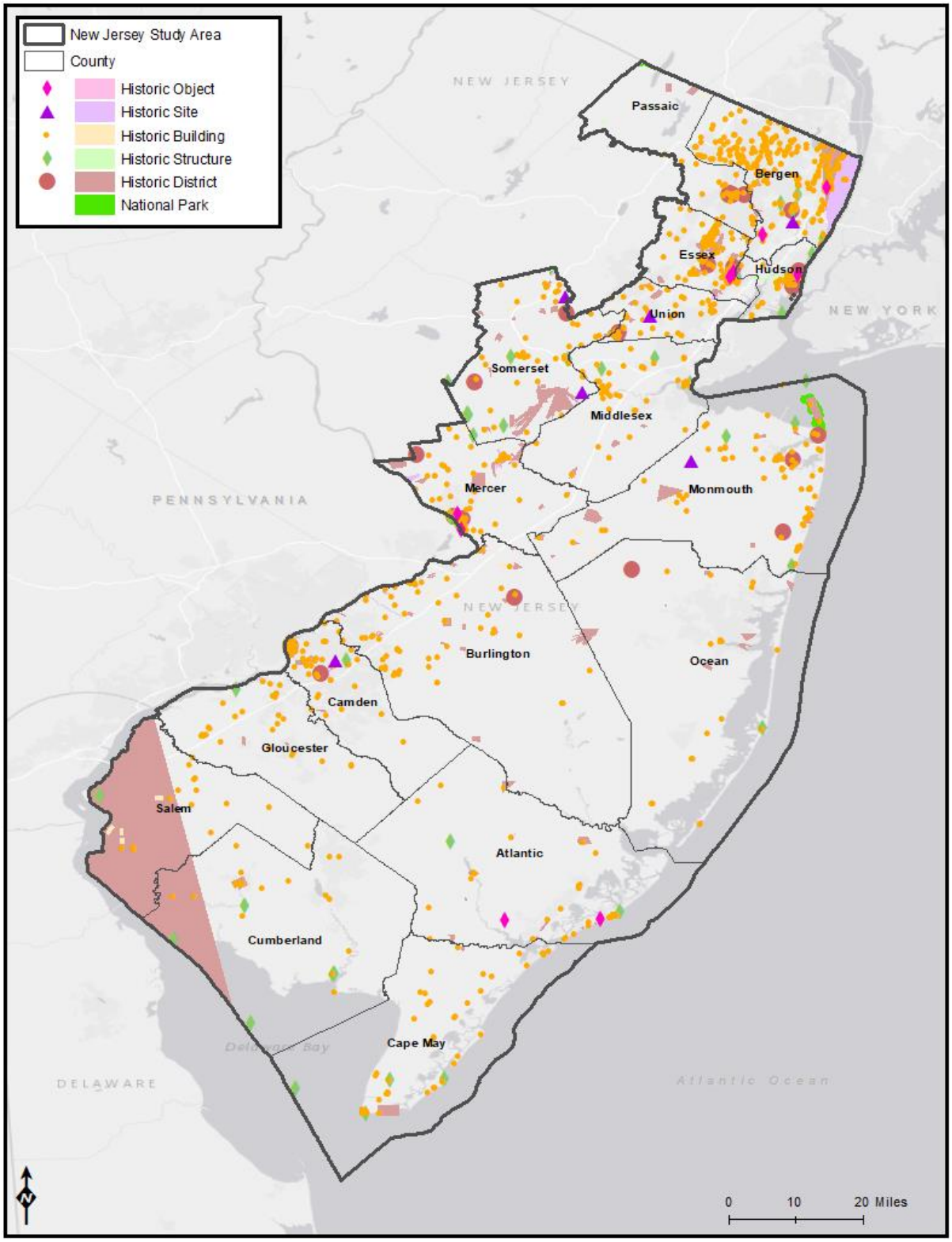
The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The Delaware (or Lenni Lenape) Indians occupied the area that became known as New Jersey for some time prior to the arrival of the Europeans. Italian explorer Giovanni da Verrazano became the first European to reach New Jersey in 1524. English navigator Henry Hudson arrived in 1609 and sent a party of explorers to Sandy Hook Bay. Bergen (now Jersey City in Hudson County) was the first permanent European settlement, established by the Dutch in 1660. In 1664, the colony came under English rule. A single governor ruled the combined area of New Jersey and New York until 1738 (Kerney et al. 2020).

New Jersey was a central battleground of the American Revolution. Over 100 battles were fought within the boundaries of the state, earning it the nickname Crossroads of the Revolution. Two significant battles included the Battle of Trenton on December 26, 1776, and the Battle of Princeton on January 3, 1777. At the Battle of Trenton, General George Washington and his troops crossed the Delaware River from Pennsylvania in a surprise attack on a garrison of German mercenaries in Trenton (in Mercer County), capturing the city. At the Battle of Princeton, Washington let the majority of his army to a surprise attack on the British troops stationed in Princeton. Long Pond Ironworks and Batsto Iron Works (both founded 1766 in New Jersey) supplied munitions to American troops throughout the war (Kerney et al. 2020).

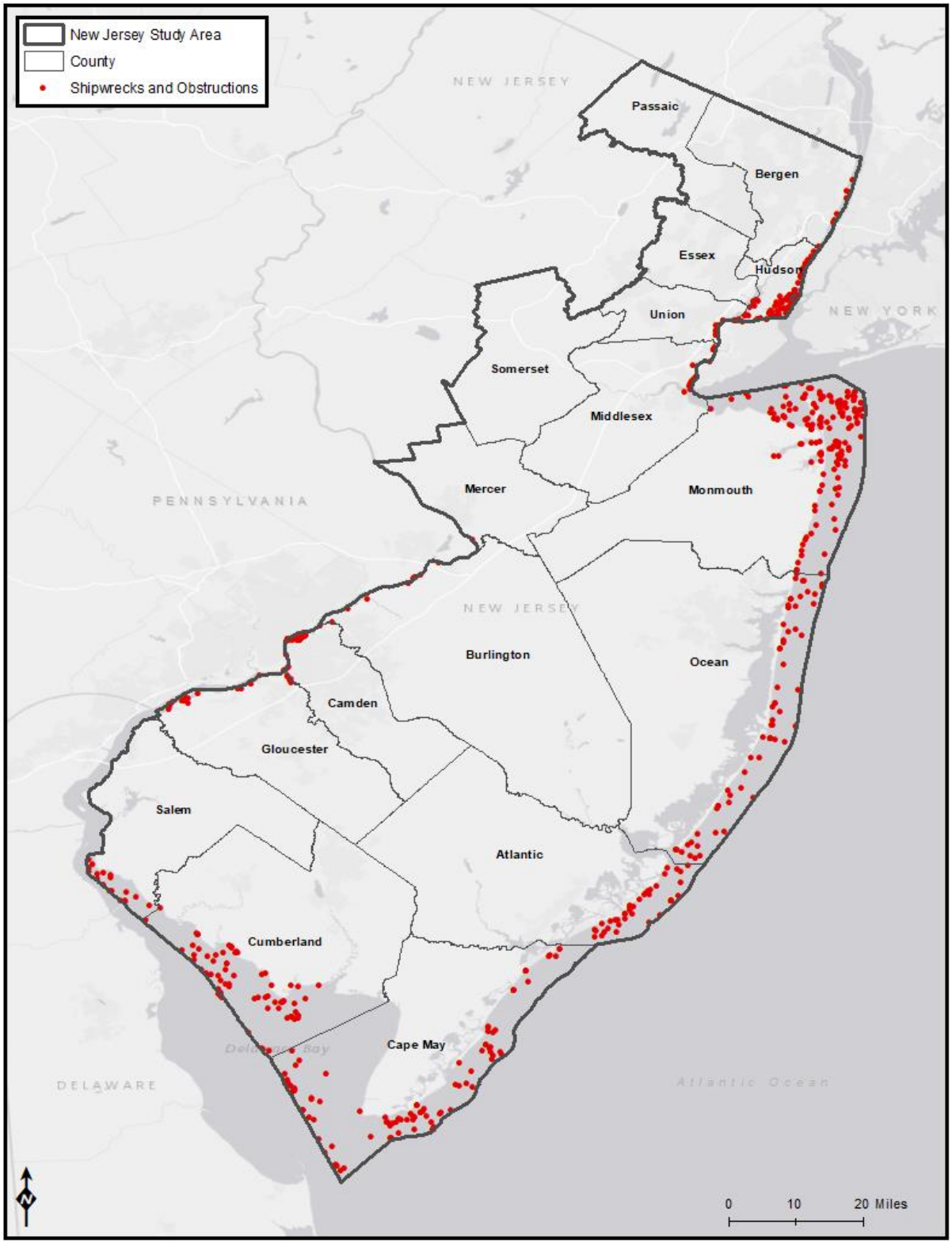
The years following the Revolutionary War was a period of industrial development throughout New Jersey, partially driven by the construction of canals and railroads. The New Jersey railroads factored into the political arena surrounding the “robber baron” era of industrial expansion. During that same period, a majority of the largest corporations in the U.S. established their headquarters in the state because of liberal tax laws. However, in response to growing public concern over the situation, Governor Woodrow Wilson (1911–13) eventually signed legislation providing for tighter regulation of corporations (Kerney et al. 2020).

Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with Native Americans, early colonial settlements, the, American Revolution, the War of 1812, the American Civil War, the Industrial revolution and World War I and II. Figure 8-16 and Figure 8-17 present a summary of many of these historic locations, including maritime sites and shipwrecks in the Delaware Bay, Delaware River, Great Egg Harbor, Great Bay, Hackensack River, and the Atlantic Ocean.



Sources: NPS 2014

Figure 8-16. Cultural and Historic Sites within the New Jersey Study Area



Source: NOAA 2016a

Figure 8-17. Shipwrecks and Obstructions within the New Jersey Study Area

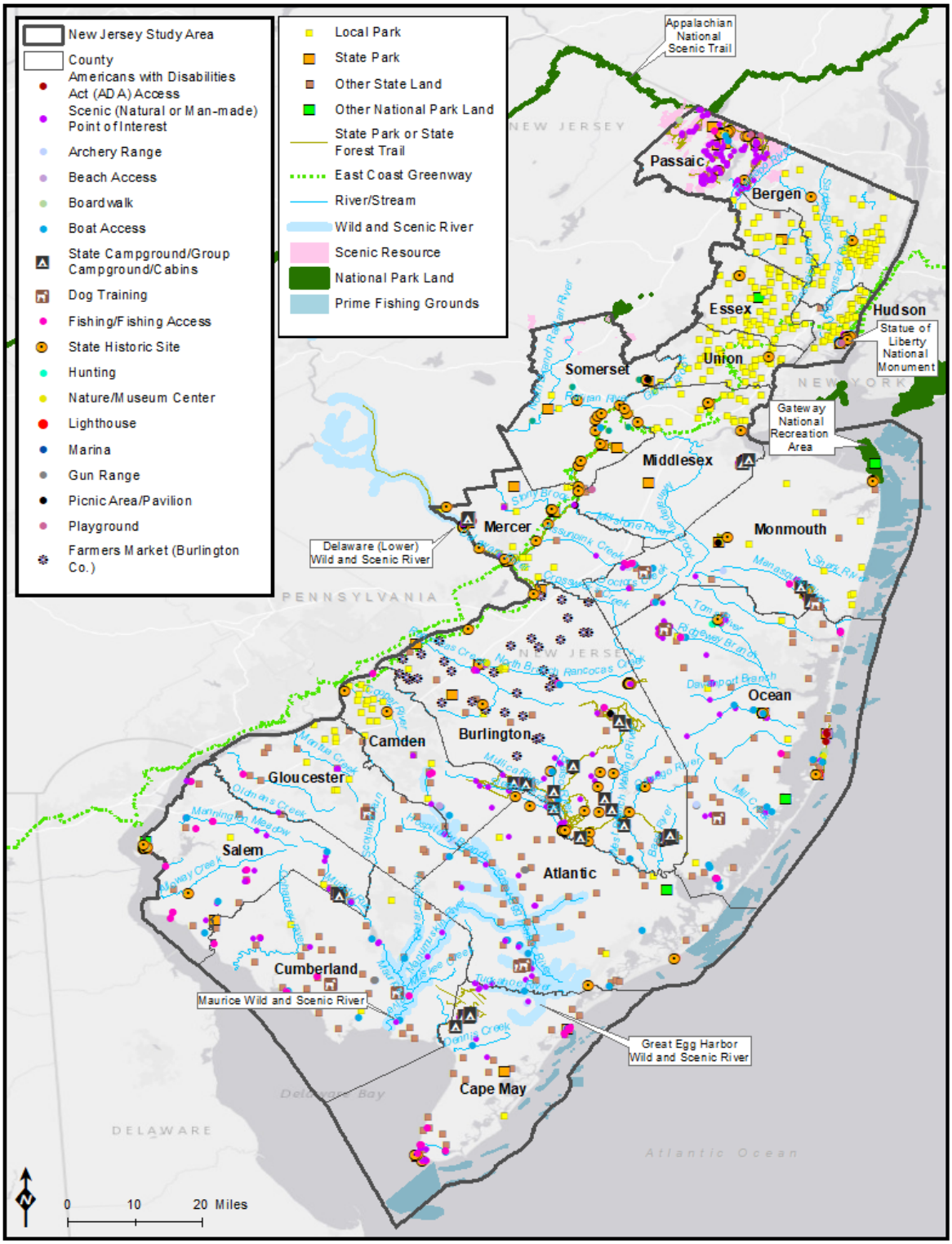
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including New Jersey) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 8-16 and Figure 8-17; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future OCS-related projects and would need to be evaluated under the National Register of Historic Places criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of New Jersey's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

8.3.2.7 Recreation

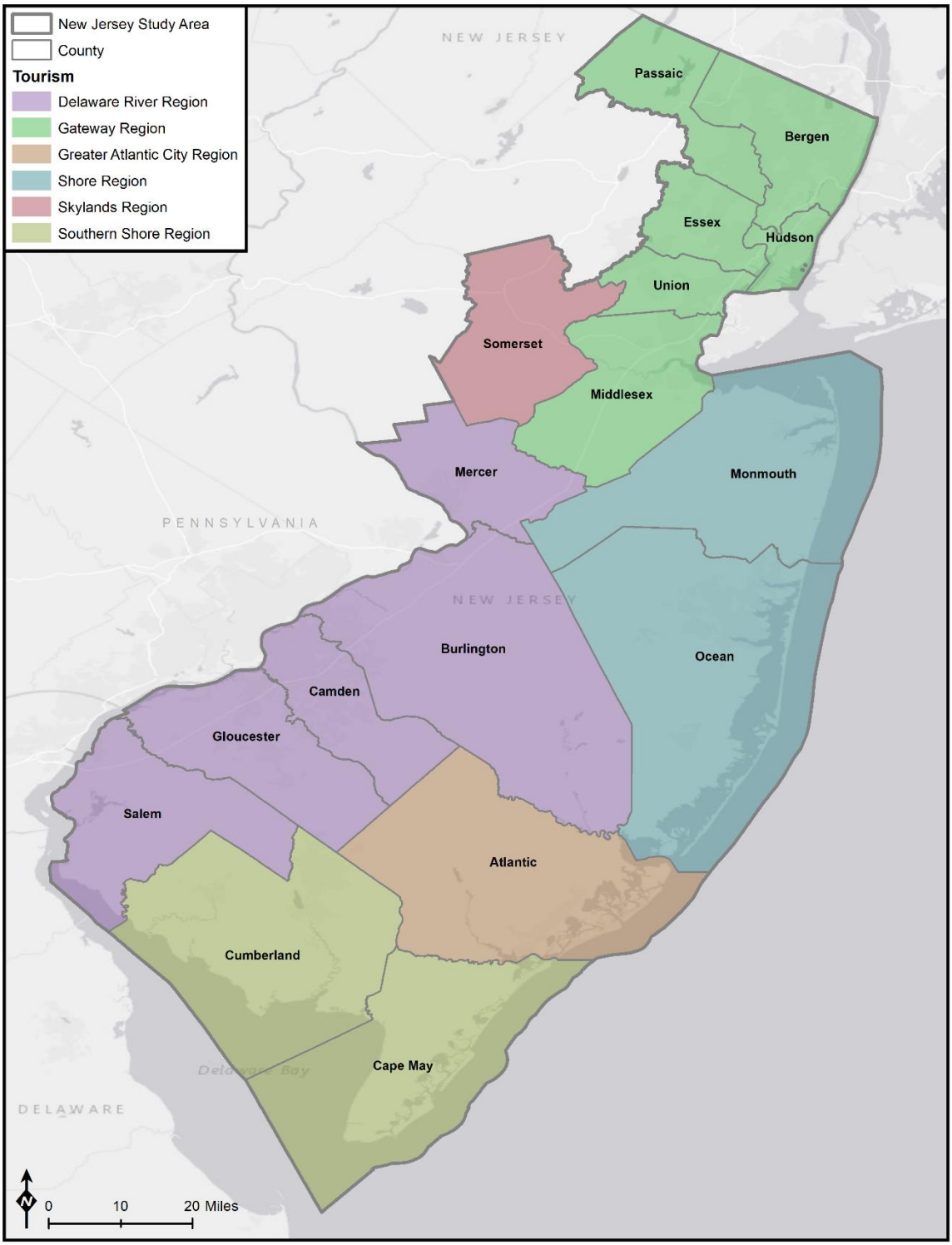
The Study Area has diverse recreational opportunities including beaches, State forests, State parks, local parks, and modern built experiences. A selection of major recreational resources in the Study Area is shown in Figure 8-18. The cultural and historic resources shown in Figure 8-16 and Figure 8-17 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 8-15. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 8.3.2.6), transportation (Chapter 8.3.2.8), tourism employment (included in Chapter 8.4.4), and rental housing (included in Chapter 8.4.3).

According to the official tourism website of New Jersey, the Study Area is divided into six tourism regions: Gateway Region, Skylands Region, Shore Region, Delaware River Region, Greater Atlantic City Region, and Southern Shore Region, as shown in Figure 8-19. New Jersey's tourism website also provides lists of popular cities within each region, including tourist attractions for each city (e.g., arts and culture, amusements and activities, outdoor and sport recreation, dining, shopping, and entertainment, and annual festivals) (Visit NJ 2020a).



Sources: NJGIN 2014a, NJGIN 2020, NJGIN 2019a, NJGIN 2019b, NJGIN 2019c, NJGIN 2019d, NJGIN 2019e, NJGIN 2019f, NPS 2014, USFS 2019b

Figure 8-18. Select Recreational Resources within the New Jersey Study Area



Sources: NJGIN 2014a, NJGIN 2019a, NJGIN 2019b, NJGIN 2019c, NJGIN 2019d, NJGIN 2019e, NJGIN 2019f, NJGIN 2020, NPS 2014, USFS 2019b

Figure 8-19. Tourism Regions within the New Jersey Study Area

Greater Atlantic City Region

The most popular tourist destination in the Study Area is Atlantic County, also referred to as the Greater Atlantic City Region. In 2018, over 20.6 million people visited the Greater Atlantic City Region, resulting in $7.4 billion in direct spending and supporting 51,687 tourism jobs (Tourism Economics 2019a). Some of the most popular attractions are the beaches, Atlantic City Boardwalk, the Steel Pier, the Atlantic City Aquarium, Absecon Lighthouse, and dining, shopping, and entertainment at the Quarter at Tropicana and the Playground (VacationIdea 2020a). Atlantic City has several casino hotels (CRDA 2020a) and local cruises for sightseeing and dolphin watching (Vacations Made Easy 2020, Atlantic City Cruises 2018). Atlantic County also has several festivals and events throughout the year, including the Miss America Pageant (January), Atlantic City Beer and Music Festival (April), and Atlantic City Air Show (June) (CRDA 2020b, Top Events USA 2014b).

Southern Shore Region

Cape May County and Ocean County were the second and third most popular counties visited by tourists in the Study Area while Cumberland County was a less popular tourist destination. In 2018, 9.82 million people visited Cape May County, spent $6.6 billion, and supported 26,572 tourism jobs. Attractions in Cape May County include the Cape May Lighthouse, museums and theaters, tours of historic places, summer concerts, art shows along the boardwalks, aquariums, golf courses, county park and zoo, and Belleplain State Forest (Cape May County 2020). Annual festivals in Cape May County include the Wildwoods International Kite Festival (May), Wings and Water Festival (July), and Weird Week (August) (Top Events USA 2014b). In 2018, 8.69 million people visited Ocean County, spent almost $4.8 billion, and supported 26,599 tourism jobs (Tourism Economics 2019a). Popular attractions in the Shore Region include fishing, golfing, museums and arcades, State parks, tours, Jenkinson's Aquarium, amusement parks, and water parks (Visit NJ 2020c). Annual festivals in the Shore Region (Ocean and Monmouth Counties) include the New Jersey Seafood Festival (June), Riverfest Food and Music Festival (May-June), and Festival of the Sea (September) (Top Events USA 2014b). There are several popular beaches and State parks in the Southern Shore Region (Cape May County and Cumberland County) and the Shore Region (Ocean County and Monmouth County). A list of beaches and State parks in the Study Area can be found on New Jersey's tourism website and sorted by region (Visit NJ 2020b).

Gateway Region

The Gateway Region includes Bergen, Essex, Hudson, Middlesex, Passaic, and Union Counties. This northernmost region in the Study Area is just outside of New York City and contains 7 of the 10 largest cities in the State of New Jersey (NJ Demographics 2018). Most counties in the Gateway Region are popular with tourist visiting New York City, especially Bergen and Hudson Counties. Popular attractions in the Gateway Region include Liberty State Park, Liberty Science Center, Thomas Edison National Historic Park, Paterson Great Falls National Historic Park, and Gateway National Recreation Area (27,000-acre urban park that had over 1.7 million visitors in 2018) (Dearsley 2019, NPS 2018a, NPS 2019e). The Gateway Region is also home to several professional sports teams including the New Jersey Devils (hockey), New York Red Bulls (soccer), New York Jets and New York Giants (football). There are also several festivals and events throughout the year in the Gateway Region (Visit NJ 2020d).

Delaware River Region

The counties of the Delaware River Region, ranked in order from least impacted by tourism (i.e., visitation, tourism direct sales, and direct tourism employment) to most include Salem, Gloucester, and Camden Counties (Tourism Economics 2019a). The primary attractions in the Delaware River Region (Burlington, Camden, Gloucester, Mercer, and Salem Counties) are hiking on trails, camping, boating, canoeing, and kayaking along the Delaware Bay, Delaware River, and in Wharton State Forest (a

122,880-acre park in eastern Burlington County) (Visit NJ 2020e, NJDEP 2018). Other attractions include visiting the *USS New Jersey* battleship, wineries, museums, Adventure Aquarium, and the Camden Children's Garden.

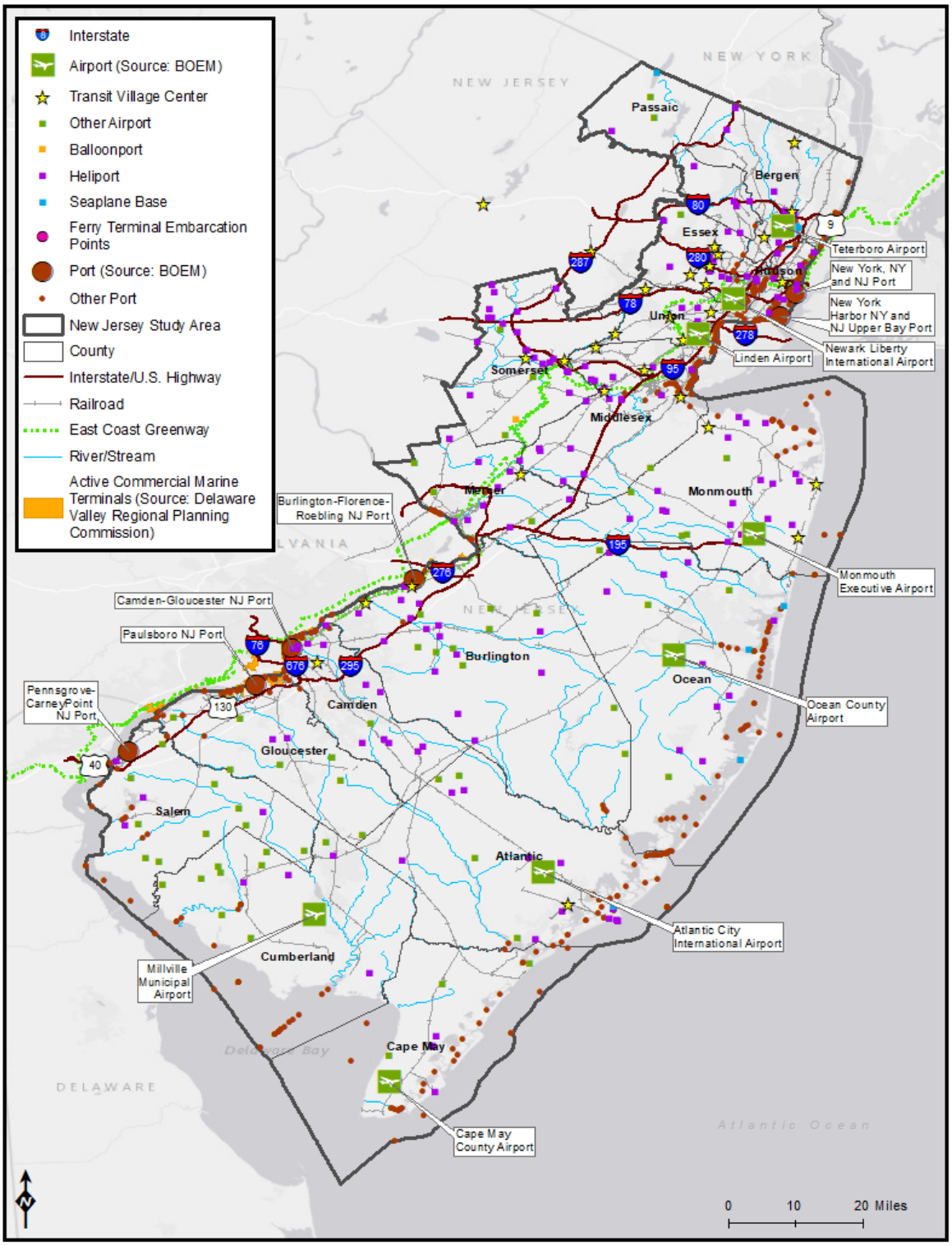
In summary, while there are many recreational activities available in the western region of the Study Area, the counties along the east coast are most impacted by tourism and recreation because of the numerous beaches, boardwalks, amusement parks, restaurants, and shops. Atlantic County (Greater Atlantic City Region) is the most visited county in the Study Area, followed by Cape May County and Ocean County. Because of the climate and beach-related recreational opportunities in these counties, the summer months are the peak tourist months in much of the Study Area. Bergen, Essex, and Hudson Counties in the northern Study Area (Gateway Region) are also popular tourist destinations because of their proximity to New York City. Because of this, there is no official peak season for tourism in this northern region of the Study Area and it is likely that travel costs (e.g., hotels) will be consistent year-round. Also, there are several annual festivals and events that occur throughout the year in the Study Area, especially in Atlantic County. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages. Therefore, future developers should consider the potential impacts on recreation during the planning phase and site-selection process.

8.3.2.8 Transportation Resources

The New Jersey Department of Transportation (NJDOT) is responsible for planning, designing, construction, maintenance, and operation of the State transportation system. The State transportation system includes multimodal travel options that link rural and urban communities through an interconnected highway network, airport system, transit, rail, and maritime transportation systems. NJDOT planning and projects to address transportation infrastructure, congestion, and other issues are described in various long range and strategic planning documents. These documents include *New Jersey's Long-Range Transportation Plan* (NJDOT 2008), the *New Jersey Statewide Freight Plan* (NJDOT 2017a), and the *New Jersey Statewide Transportation Improvement Program Fiscal Years 2018-2027* (NJDOT 2017b).

Figure 8-20 shows the transportation resources throughout the Study Area. The highway freight network is critical to the New Jersey economy as over 70% of goods in the State move by truck via the highway freight network (NJDOT 2017a). The New Jersey highway freight network (NJ Access Network) is part of the National Highway Freight Network (NHFN). All the New Jersey NHFN interstates are located entirely within or run through part of the Study Area. Two additional routes (U.S. Route 1 and Essex County Route 577) are also part of the New Jersey NHFN. The NJDOT has also proposed additions to the NHFN totaling 155 miles (NJDOT 2017a). These roadways provide interstate connections utilized for goods movement and link the currently designated NHFN to major port facilities. The New Jersey Access Network also includes approximately 2,000 miles of New Jersey, U.S., county, and local routes that traverse the State.

Seventeen freight railroads operate within New Jersey, including two Class I Railroads – Norfolk Southern, CSX Transportation; one Class II Regional Railroad – the New York, Susquehanna, and Western Railway; eight Class II and III Local Railroads; and six Switching and Terminal Railroads (NJDOT 2017a). Most of these railroads are located along the eastern portion of the Study Area. Railroads located in the southern portion of the Study Area provide a freight and passenger link with Pennsylvania and the city of Philadelphia. Portions of the track mileage operated by freight railroads are owned by freight railroads and portions are owned by passenger railroads. Many sections of track are shared with passenger operations operated by Amtrak, NJ TRANSIT, and the Southeastern Pennsylvania Transportation Authority.



Sources: NJGIN 2017, NJGIN 2014b, NJGIS 2019, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 8-20. Transportation Resources within the New Jersey Study Area

The NJDOT, through its Bureau of Aeronautics, has general oversight of 42 public use airports and almost 400 restricted use facilities, including airstrips, heliports, and balloon ports. The majority of New Jersey's airports support the operation of general aviation aircraft, but the State hosts three airports that offer commercial flight operations: Newark Liberty International Airport, Trenton-Mercer Airport, and Atlantic City International Airport. Additionally, there are eight advanced service airports that support corporate/executive and private-use general aviation activities (NJDOT 2020). Seven of the eight advanced service airports are located within the Study Area. Air cargo also serves a critical role in New Jersey's supply chain. Air freight tends to be the highest unit cost to move cargo and commodities that move by air generally are time sensitive, light in weight, and high in value. Newark Liberty International Airport dominates New Jersey's air cargo market. Cargo operations also exist at New Jersey's other primary airports, including Atlantic City and Trenton-Mercer. In addition to these two airports, Millville Airport in South Jersey (operated by the Delaware River & Bay Authority) has been identified as having potential cargo opportunities, especially since it is part of Foreign Trade Zone 142 (NJDOT 2017a).

Because New Jersey's geographic boundaries are largely defined by waterways (Delaware River and Delaware Bay to the west and south; and the Atlantic Ocean, Raritan Bay, Arthur Kill, and Hudson River to the east), maritime resources are an important component of New Jersey's multimodal transportation system. New Jersey's marine freight network consists of the approved National Marine Freight Network, proposed additions to that network, key New Jersey marine highways, bridges that can impact waterborne freight, and marine ports. The National Marine Freight Network includes two marine highways that serve New Jersey ports – the M-87 and M-95 Marine Highway Corridors. New Jersey's marine ports are intermodal hubs, with access to rail and highway connections and in close to proximity to warehousing, manufacturing, and light industrial operations (NJDOT 2017a).

Ports and waterways along the Delaware River are an important resource for transportation and trade. The Delaware River flows along the western border of the State, draining into the Delaware Bay and then Atlantic Ocean on the southwestern side of the Study Area (Figure 8-3). There are 12 ports located along the Delaware River half of which are located in the Study Area (the others are in neighboring States). From north to south, the six ports in the Study Area are the Port of Trenton, Port of Pennsauken, Port of Camden, Gloucester Marine Terminal, Port of Paulsboro, and Deepwater Point (in Penns Grove) (WPS 2020b). Collectively, the ports in the tri-state area along the Delaware River make up the largest freshwater port in the world. The Study Area ports serve one of the greatest concentrations of heavy industry in the State including chemical, oil refining, and other industries. In 2017, over 90 tons of petroleum and petrochemical products, container cargo, forest products, and automobiles moved through Delaware River ports in the tri-state area. These ports are essential in import of steel, paper, meat, cocoa beans, Chilean and other South American fruit, and bananas from Central America (DRBC 2020c).

In northern New Jersey, the Port of New York and New Jersey is one of the largest concentrations of containerized and non-containerized marine freight in the world. On the New Jersey side, it consists of public marine terminals leased to private terminal operators for the handling of containers, automobiles, and other cargo and a diverse array of private terminals (which handle the majority of the Port of New York and New Jersey tonnage in the form of crude and refined petroleum, industrial chemicals, construction materials, and other bulk materials). There are four major container terminals in New Jersey: Port Newark Container Terminal, Maher Terminal, APM, and GCT Bayonne. Bulk and breakbulk cargos are largely handled at Elizabeth-Port Authority Marine Terminal/Port Newark terminals, along with a variety of private terminals along the Kill Van Kull, Arthur Kill, the Passaic and Hackensack Rivers, and northern Newark Bay. Southern New Jersey ports are located along the Delaware River and Delaware Bay. New Jersey Delaware River Ports include public port terminals managed by the South Jersey Port Corporation, with three terminals in Camden and one in Salem City along with privately run ports and terminals in Camden-Gloucester and Paulsboro (NJDOT 2017a).

With New Jersey's increasing population, its multimodal transportation network faces several challenges and constraints including aging infrastructure, congestion, and increased demand for public transit. Vulnerabilities from climate impacts (see Chapter 8.2.2) also contribute to transportation constraints. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., sea level and an increase in the frequency and intensity of large storm systems). New Jersey's transportation infrastructure is especially vulnerable to climate change because of a densely populated coastline, the presence of critical trade nodes, the location of critical infrastructure in a low-lying area, and a high dependence on public transit services when compared to the rest of the Nation (NJCAA 2014). In 2010, a partnership of New Jersey State agencies and Metropolitan Planning Organizations was awarded a grant from the Federal Highway Administration to conduct a Vulnerability and Risk Assessment of transportation infrastructure from the impacts of climate change. The results of the Vulnerability and Risk Assessment were presented in a final report issued in 2012 (NJTPA 2012).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site-selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Available maritime ports are large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

8.3.3 Summary – Land Cover and Land Use

New Jersey land cover is largely urban or urban/forest in the northeastern part of the Study Area nearest New York City, urban/forest/wetland in the central part of the Study Area, and trends more toward forest/agricultural/wetland land cover in the southern part of the Study Area.

The New Jersey legislature has given the NJDEP the responsibility of managing land use as a critical function of the overall environmental protection strategy. The NJDEP Division of Land Use Regulation regulates land use activities through a permit process in accordance with the following statutes: Freshwater Wetlands Protection Act (N.J.S.A. 13:9B *et seq.*), Flood Hazard Area Control Act (N.J.S.A. 58:16A), Wetlands Act of 1970 (N.J.S.A. 13:9A-1 *et seq.*), Coastal Area Facility Review Act (N.J.S.A. 13:19-1 *et seq.*), Waterfront Development Law (N.J.S.A. 12:5-3), Tidelands Act (N.J.S.A. 12:3), NJ Water Pollution Control Act (N.J.S.A. 58:10A *et seq.*), and the Highlands Water Protection and Planning Act (P.L. 2004, c.120) (NJDEP 2020). Although NJDEP manages land use, local municipalities have the power to plan and zone for development under the Municipal Land Use Law (N.J.S.A. 40:55D-1) (New Jersey Future 2020).

Because New Jersey's farmland is in such high demand by developers and other non-agricultural interests, New Jersey's Department of Agriculture has a Strategic Plan containing a goal of preserving 20,000 acres of farmland per year. The Department's programs encourages county adoption of comprehensive farmland preservation plans; coordinating farmland preservation efforts with economic development strategies at county and municipal levels; proactive strategies that link the land, products, processing, and workforce with marketing opportunities; and long-term land value appreciation (NJDA 2020).

New Jersey State is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. New Jersey's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 169 census tracts in 75 municipalities approved by the U.S. Department of the Treasury in 2018 (State of New Jersey 2020). An interactive map of opportunity zones is located at https://njdca.maps.arcgis.com/apps/webappviewer/index.html?id=96ec274c50a34890b23263f101e4ad9b.

The majority of financial and industrial incentives provided by the State of New Jersey focus on small business or the redevelopment or remediation of contaminated sites. Of the programs or other incentives that could be of use to a business associated with OCS-related activities, the incentives would benefit job addition and retention, the redevelopment of previous industrial sites, and the purchase of machinery and industrial supplies for construction of a business.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. Protected lands provide essential ecosystem services. Cultural resources and recreational areas may overlap with protected areas, and additionally, these specific land uses tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Future analysis will need to carefully assess the nature of sites that are potentially impacted by future OCS-related projects and consider whether alternatives sites may have lesser impacts to these areas.

New Jersey's transportation infrastructure is especially vulnerable to climate change because of a densely populated coastline, the presence of critical trade nodes, the location of critical infrastructure in a low-lying area, and a high dependence on public transit services when compared to the rest of the Nation (NJCAA 2014). In 2010, a partnership of New Jersey State agencies and Metropolitan Planning Organizations was awarded a grant from the Federal Highway Administration to conduct a Vulnerability and Risk Assessment of transportation infrastructure from the impacts of climate change. The results of the Vulnerability and Risk Assessment were presented in a final report issued in 2012 (NJTPA 2012)

8.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related development.

8.4.1 Population

New Jersey's population is increasing, but at a rate slower than the Nation. Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. According to the USCB, New Jersey's estimated population was 8.9 million in 2017. As shown in Table 8-7, the population of New Jersey grew 1.9% since the 2010 Census, having added approximately 171,627 people. During the same period, the population of the U.S. grew 4.0% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Table 8-7. 2010 and 2017 Total Population and Population Projections Through 2040 in the New Jersey Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
North Jersey	Bergen	905,116	937,920	967,500	1,031,500	1,030,400	3.6	9.9
	Essex	783,969	800,401	808,300	829,800	916,000	2.1	14.4
	Hudson	634,266	679,756	708,100	747,400	817,300	7.2	20.2
	Middlesex	809,858	837,288	873,400	932,200	1,023,100	3.4	22.2
	Monmouth	630,380	627,551	633,400	655,300	696,900	-0.4	11.1
	Ocean	576,567	589,699	600,300	644,100	801,600	2.3	35.9
	Passaic	501,226	510,563	521,700	536,100	601,300	1.9	17.8
	Somerset	323,444	333,316	342,900	366,700	376,600	3.1	13.0
	Union	536,499	557,320	573,000	605,600	638,500	3.9	14.6
	Total North Jersey Region	***5,701,325***	***5,873,814***	***6,028,600***	***6,348,700***	***6,901,700***	***3.0***	***17.5***
Delaware Valley	Burlington	448,734	449,192	459,344	475,978	488,026	0.1	8.6
	Camden	513,657	510,996	514,006	520,189	525,101	-0.5	2.8
	Gloucester	288,288	291,372	307,766	340,425	366,383	1.1	25.7
	Mercer	366,513	373,362	377,328	389,219	398,669	1.9	6.8
	Total Delaware Valley Region	***1,617,192***	***1,624,922***	***1,658,444***	***1,725,811***	***1,778,179***	***0.5***	***9.4***
South Jersey	Atlantic	274,549	272,926	286,400	305,600	318,200	-0.6	16.6
	Cape May	97,265	94,549	94,700	86,600	79,500	-2.8	-15.9
	Cumberland	156,898	154,952	162,600	169,900	176,200	-1.2	13.7
	Salem	66,083	63,776	65,200	64,900	62,900	-3.5	-1.4
	Total South Jersey Region	***594,795***	***586,203***	***608,900***	***627,000***	***636,800***	***-1.4***	***8.6***
	Study Area Total	**7,913,312**	**8,084,939**	**8,295,944**	**8,701,511**	**9,316,679**	**2.2**	**15.2**
	New Jersey	**8,791,894**	**8,960,161**	**9,088,074**	**9,363,317**	**9,470,012**	**1.9**	**5.7**
	United States	**308,745,538**	**321,004,407**	**332,527,548**[4]	**357,975,719**[4]	**373,528,000**[4]	**4.0**	**16.4**

Sources: 1 – USCB 2017a; 2 – USCB 2017d; 3 – NJTPA 2013, SJTPO 2016, DVRPC 2016; 4 – USCB 2018b

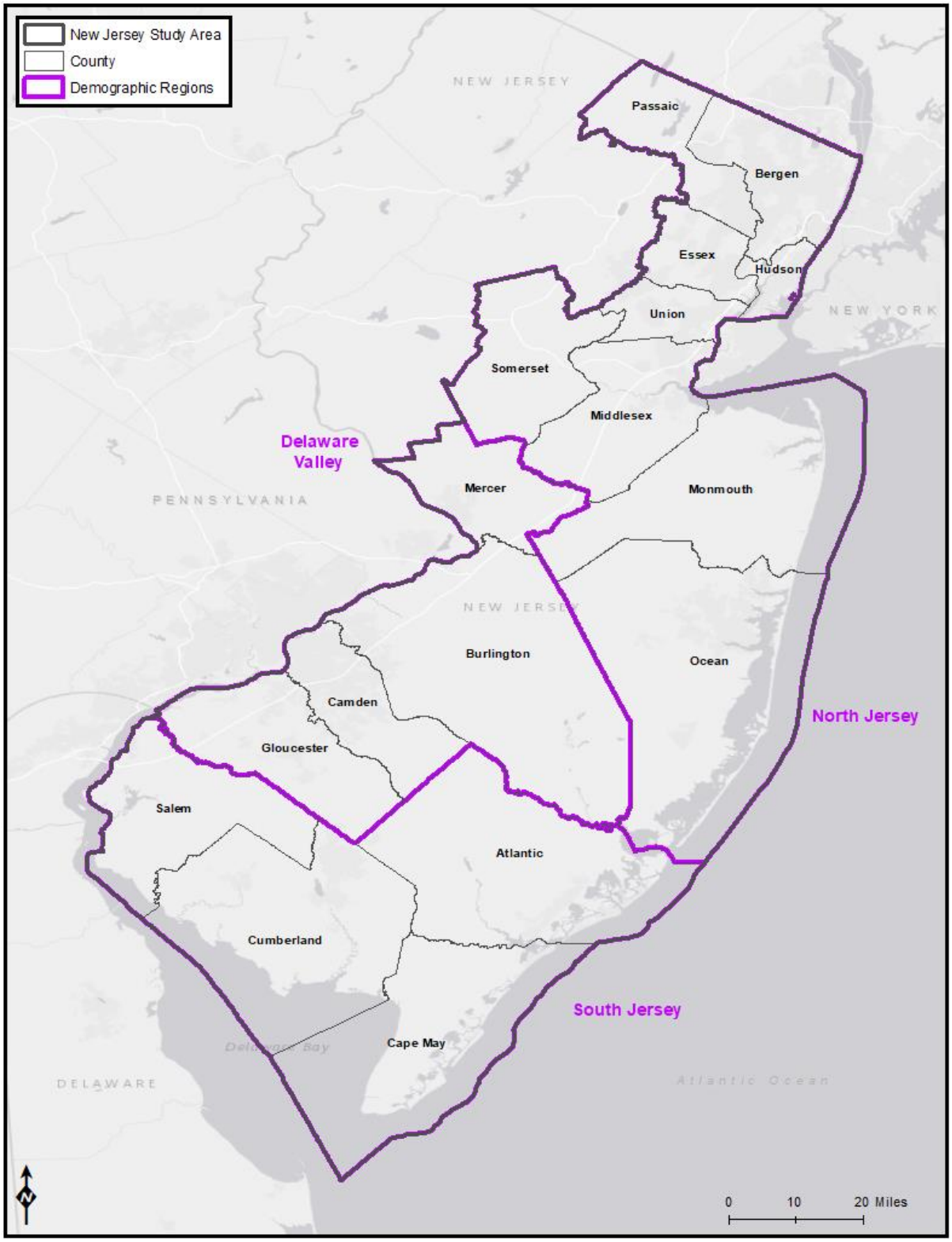
Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a).

New Jersey is affected by the nationwide trend of aging population as indicated by its declining rate of natural increase. According to USCB 2018 estimates, the rate declined 24.8% between 2016 and 2018. Despite the decline, natural increase continues to contribute to population growth. Large numbers of people are moving out of the State; however, new international residents are moving in. According to 2018 estimates, the State gained approximately 23,856 residents from natural increase; and approximately 46,660 residents from international migration. These population gains offset the loss of approximately 50,591 residents from domestic out-migration resulting in an overall population gain of approximately 19,977 residents in 2018 (USCB 2017b). These values are USCB estimates. As estimates they contain "residuals" that necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Northeastern States have higher senior populations as compared to southern and western States. New Jersey, as well as the neighboring States of New York and Connecticut, is experiencing high senior migration losses as a result of national migration pattern toward the southern and western parts of the U.S. According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather. This trend was stalled by the Great Recession (which lasted from 2007 to 2009) due to the housing crisis and unemployment (Rich 2013). Migration resumed slowly after the recession as the economy recovered (Frey 2019). Other reasons for migration losses include poor employment outlook (realprocity.com 2019). During 2018, the largest domestic out-migration flows were from New Jersey to New York, Pennsylvania, Florida, California, and Texas (USCB 2019c).

8.4.1.1 Study Area Trends

Figure 8-21 shows the three demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 8.2 (e.g., physiographic regions) because they are derived from official demographic regions used by the Delaware Valley Regional Planning Commission, South Jersey Transportation Planning Organization, and the North Jersey Transportation Planning Authority. The counties within the Study Area are located within three demographic regions defined as North Jersey, South Jersey, and Delaware Valley (DVRPC 2016, SJTPO 2016, NJTPA 2013). According to 2017 population estimates, the Study Area represented 90.2% (8.1 million residents) of the overall State population of 8.9 million. Table 8-7 shows population growth and decline in the Study Area counties, as well as their location with the demographic regions. Between 2010 and 2017, 11 out of 17 counties gained population; 6 counties lost population. During the same period, the population of the Study Area grew 2.2%, faster than the State (1.9%) and the Nation (4.0%) (USCB 2017a, USCB 2017d). Some Study Area counties are affected by growth inhibiting obstacles such as high property taxes. Parts of the State are still in recovery from Hurricane Sandy (2012) and the Great Recession (Stirling 2018).



Source: DVRPC 2016, SJTPO 2016, NJTPA 2013

Figure 8-21. Demographic Regions of the New Jersey Study Area

Between 2010 and 2017, the North Jersey and Delaware Valley Regions grew 3.0% and 0.5%, respectively. The South Jersey Region had a population loss of 1.4%, reflecting a trend toward urbanization (USCB 2017a, USCB 2017d). In general, urban towns and cities, especially those with walkable downtowns, access to public transit, and in commuting distance to New York City and Philadelphia with access to public transit, experienced growth (Stirling 2018).

Most counties in the Study Area's region grew between 2010 and 2017. Hudson County led the region with 7.2% growth. The county, and its growing cities of Hoboken and Jersey City, are in close proximity to New York City and public transit. Populous Bergen County, connected to New York City via the George Washington Bridge, grew 3.6%. The counties of Union, Middlesex, and Essex have public transit access and urban areas with central downtowns, preferred by homebuyers. These counties grew 3.9%, 3.4%, and 2.1%, respectively. Monmouth County, the only Study Area county in North Jersey to lose population, was hit by Hurricane Sandy and is a long commute to New York City. Ocean County, which grew 2.3% during the same period, has a growing Orthodox Jewish community and is known as a retirement destination (Stirling 2018).

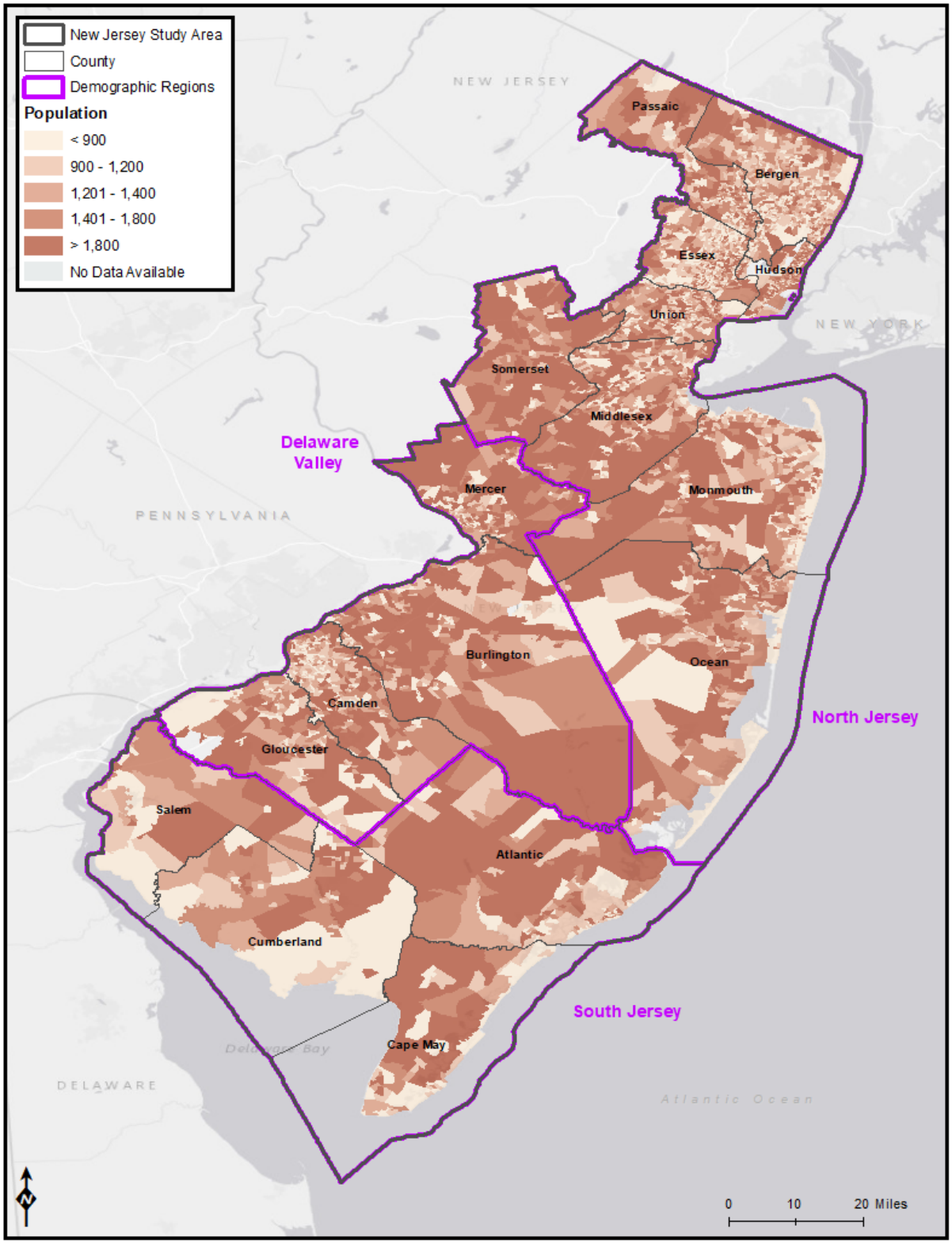
Counties in the Delaware Valley Region had slower growth than North Jersey counties, in spite of proximity to Philadelphia and the State capital in Trenton. All South Jersey counties in the Study Area experienced population loss. These areas were impacted by Hurricane Sandy and have long commutes to city centers. The decline of once popular casino hub Atlantic City, once the only city to have legalized gambling outside of Las Vegas, impacted population loss in Atlantic County (McCarthy 2019, Jacobs 2017).

Figure 8-22 shows population counts in census block groups within the 18 counties located in the North Jersey Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 8-23, the MSAs present in the Study Area are:

- Atlantic City-Hammonton, NJ;
- New York-Newark-Jersey City, NY-NJ-PA;
- Philadelphia-Camden-Wilmington, PA-NJ-DE-MD;
- Ocean City, NJ;
- Trenton, NJ; and
- Vineland-Bridgeton, NJ.

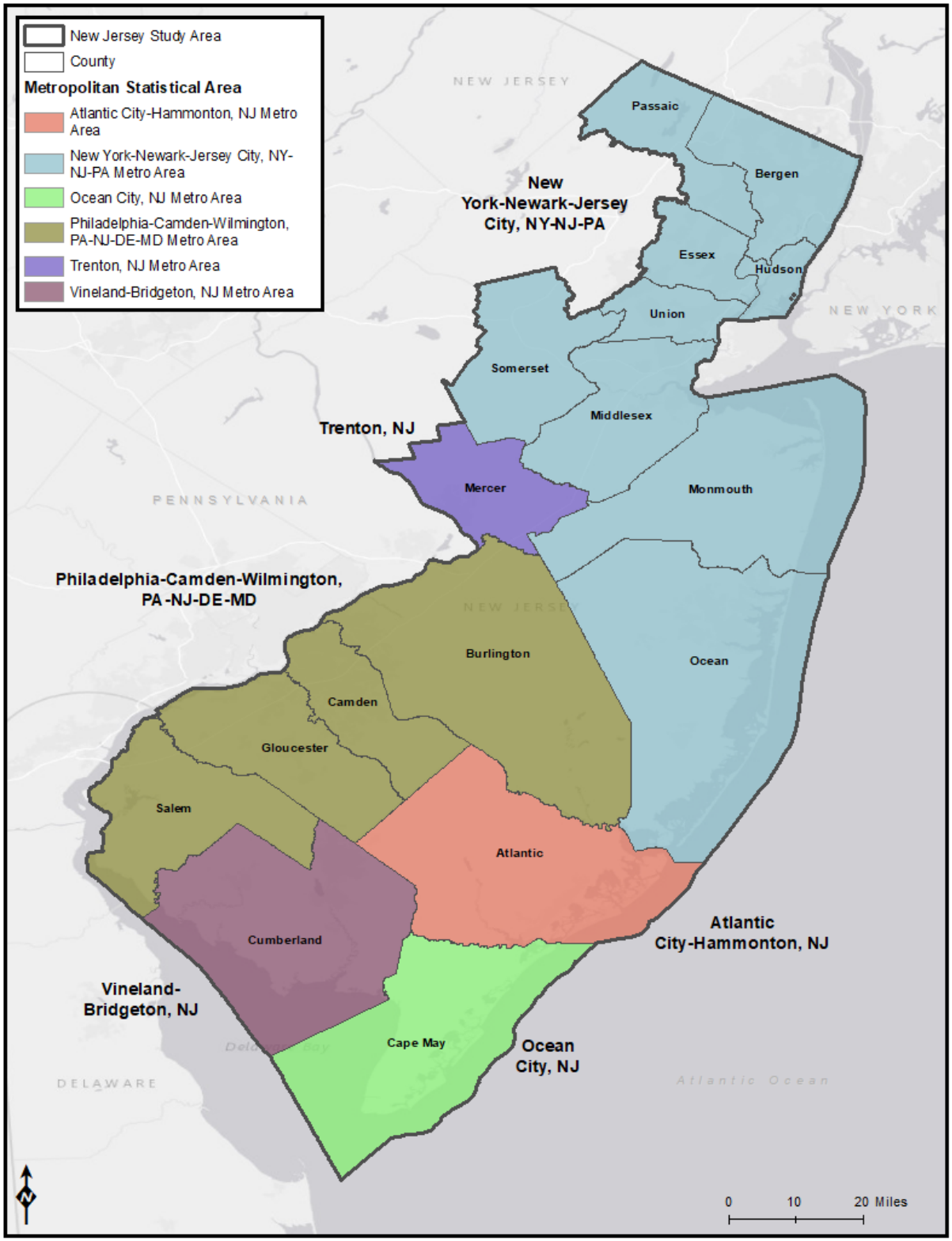
Each county within the Study Area is located in a MSA (Data.gov 2017).

As shown in Table 8-8, the population density of the Study Area was 1,446 persons per square mile in 2017, greater than the State (1,208 persons per square mile) and the Nation (91 persons per square mile), signifying that the coastal counties are more densely populated than the State and the Nation. Figure 8-24 illustrates population per square mile in the Study Area. There are geographic high-density concentrations in major urban areas surrounded by contiguous low-density areas comprising the "less than 901 to 1,200 persons per square mile" category. Population densities in the Study Area ranged from 192 persons per square mile in Salem County (located in the South Jersey Region) to 14,716 persons per square mile in Hudson County, located in the populous North Jersey Region, part of the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017d, USCB 2017c).



Source: USCB 2017r

Figure 8-22. Population in the New Jersey Study Area Counties by Census Block Group



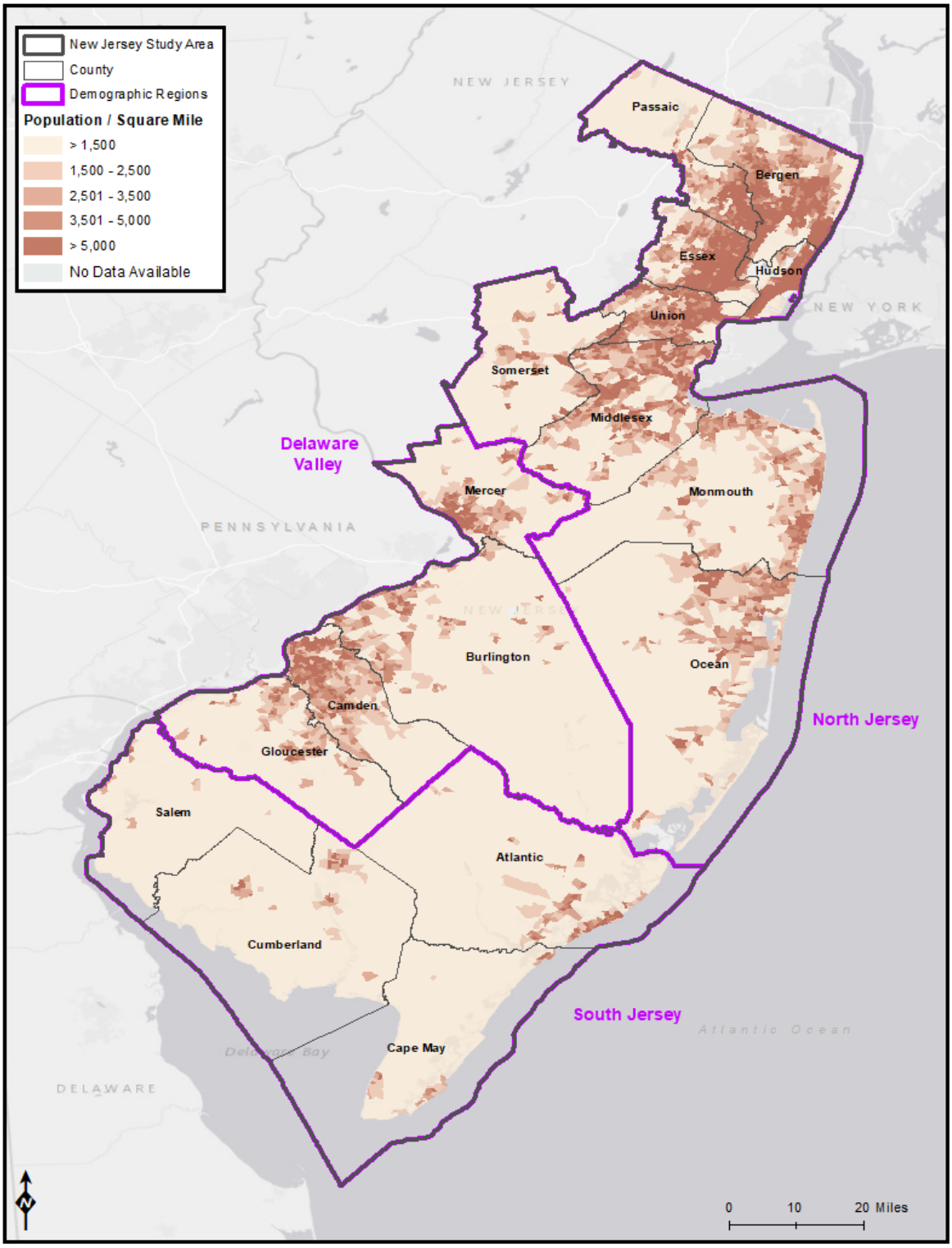
Source: USCB 2017s

Figure 8-23. Metropolitan Statistical Areas Located within the New Jersey Study Area

Table 8-8. 2017 and 2040 Population Density in the New Jersey Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
North Jersey	Bergen	937,920	1,030,400	233	4,029.1	4,426.4
	Essex	800,401	916,000	126	6,348.1	7,265.0
	Hudson	679,756	817,300	46	14,716.4	17,694.2
	Middlesex	837,288	1,023,100	309	2,707.8	3,308.7
	Monmouth	627,551	696,900	468	1,340.4	1,488.6
	Ocean	589,699	801,600	628	938.5	1,275.7
	Passaic	510,563	601,300	186	2,744.8	3,232.6
	Somerset	333,316	376,600	302	1,104.2	1,247.6
	Union	557,320	638,500	103	5,423.2	6,213.2
	Total North Jersey Region	***5,873,814***	***6,901,700***	***2,401***	***2,445.9***	***2,874.0***
Delaware Valley	Burlington	449,192	488,026	799	562.0	610.5
	Camden	510,996	525,101	221	2,308.5	2,372.3
	Gloucester	291,372	366,383	322	905.0	1,137.9
	Mercer	373,362	398,669	224	1,663.6	1,776.3
	Total Delaware Valley Region	***1,624,922***	***1,778,179***	***1,567***	***1,036.9***	***1,134.7***
South Jersey	Atlantic	272,926	318,200	556	491.3	572.8
	Cape May	94,549	79,500	252	375.9	316.1
	Cumberland	154,952	176,200	483	320.6	364.5
	Salem	63,776	62,900	332	192.2	189.5
	Total South Jersey Region	***586,203***	***636,800***	***1,622***	***361.4***	***392.5***
	Study Area Total	**8,084,939**	**9,316,679**	**5,591**	**1,446.1**	**1,666.4**
	New Jersey	**8,960,161**	**9,470,012**	**7,419**	**1,207.7**	**1,276.5**
	United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: USCB 2017d, USCB 2017c, USCB 2018b, SJTPO 2016



Source: USCB 2017r

Figure 8-24. Population Density in the New Jersey Study Area by Census Block Group

8.4.1.2 Population Projections

According to the Delaware Valley Regional Planning Commission, South Jersey Transportation Planning Organization, and the North Jersey Transportation Planning Authority, New Jersey's population is projected to grow 5.7% (9.5 million residents) by 2040. Population in the Study Area is projected to grow 15.2% (9.3 million residents), faster than the State but less than the Nation (16.4%). Table 8-7 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040, delineated by region (USCB 2017d, USCB 2017c, USCB 2018b, NJTPA 2013, SJTPO 2016, DVRPC 2016). Figure 8-25 shows the overall projected percent change in population in each county during the same period.

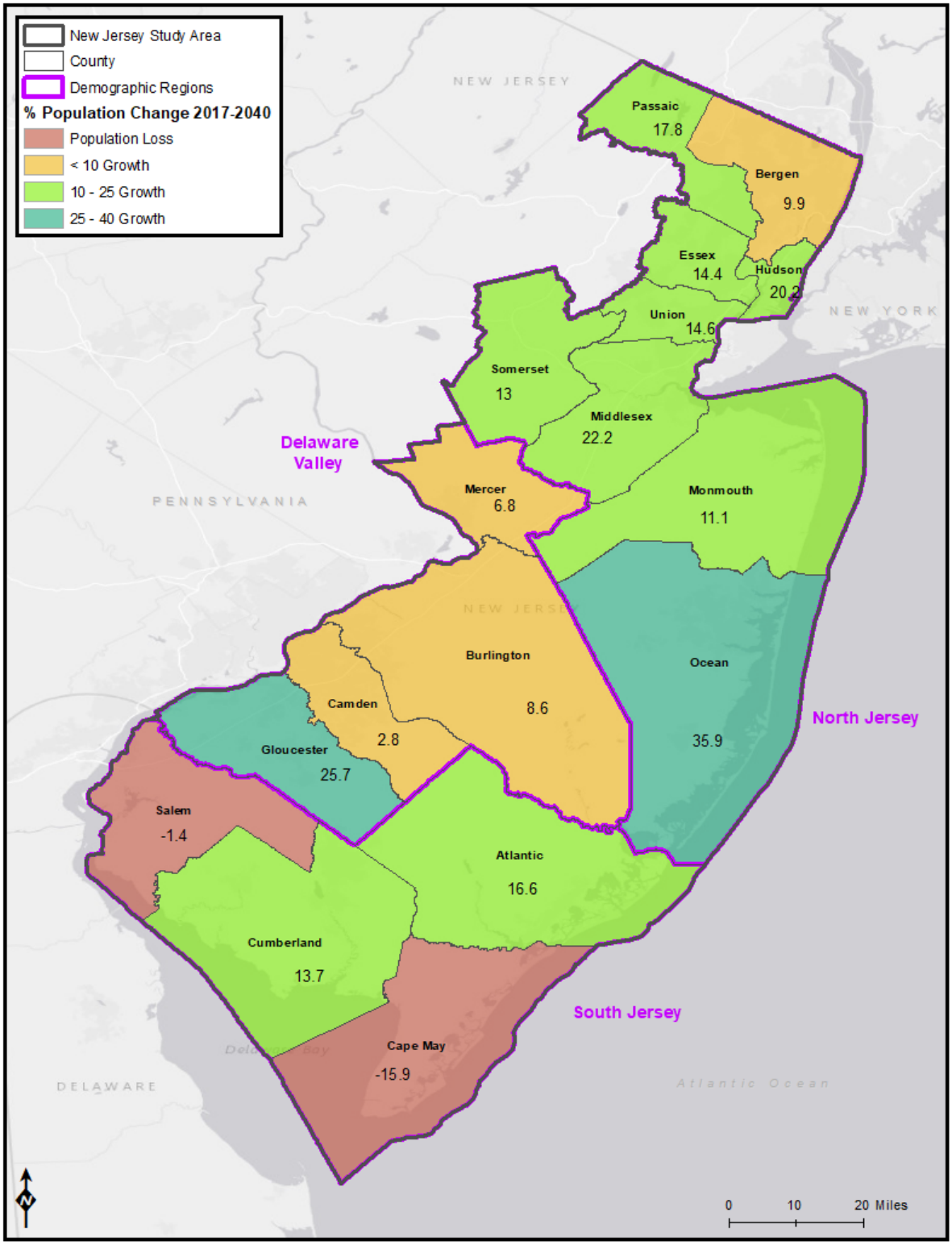
Population in coastal counties is projected to grow between 2017 and 2040. As shown in Table 8-7, projections indicate that 98.4% (9.3 million people) of the State's population will reside in the Study Area by 2040 as compared to 90.2% (8.1 million people) in 2017. Projected growth by study region is North Jersey (17.5%), Delaware Valley (9.4%), and South Jersey (8.6%). No regions are expected to decline in population. Ocean County, which attracts retirees and orthodox Jewish communities with large families, is projected to grow 35.9%. Strong growth is projected in Middlesex, Hudson, and Gloucester Counties. Of the 17 counties in the Study Area, 15 are projected to increase in population, while two (Cape May and Salem Counties) are projected to decrease in population (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017d).

As shown in Table 8-8, population density is projected to increase from 1,446 persons per square mile in 2017 to 1,666 persons per square mile in the Study Area between 2017 and 2040 (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017d, USCB 2017c). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

8.4.2 Demographics

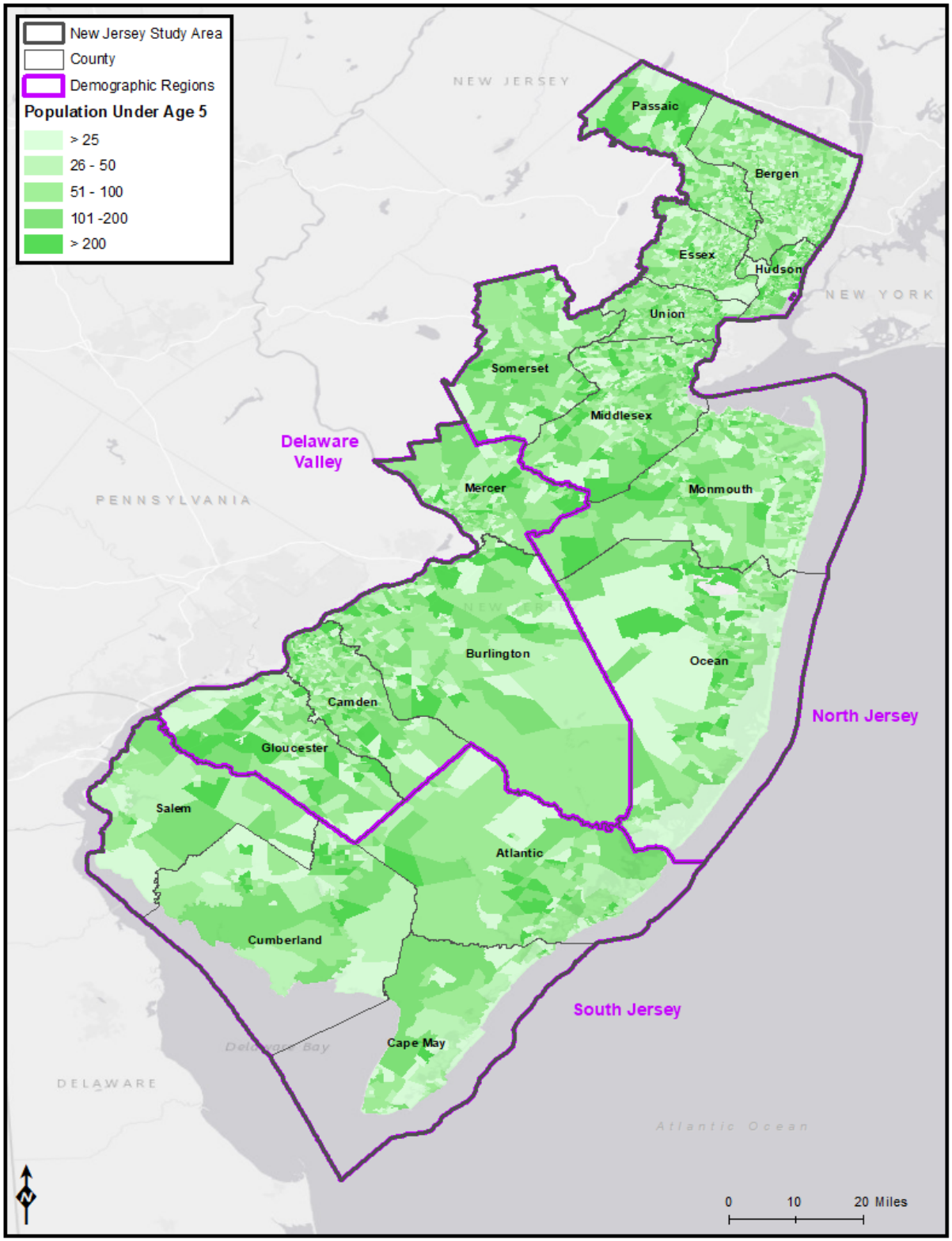
As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact New Jersey and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 8-26 and Figure 8-27 show the 2017 estimated population Under Age 5 and Over Age 65, respectively; 2040 projected population in the U.S., New Jersey, and the Study Area was not available on the county level (Brookings Institute 2018, NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017b).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in New Jersey and 6.0% in the Study Area. Table 8-9 shows the breakdown by demographic region. The Delaware Valley Region had the smallest percentage (5.7%) of young children in 2017, and the North Jersey Region had the highest percentage (6.1%). While the population of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline to 5.7% in the Nation but grow to 6.0% in the State by 2040. Projections with breakdown by age group were not available for the Study Area (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017b, USCB 2018b).



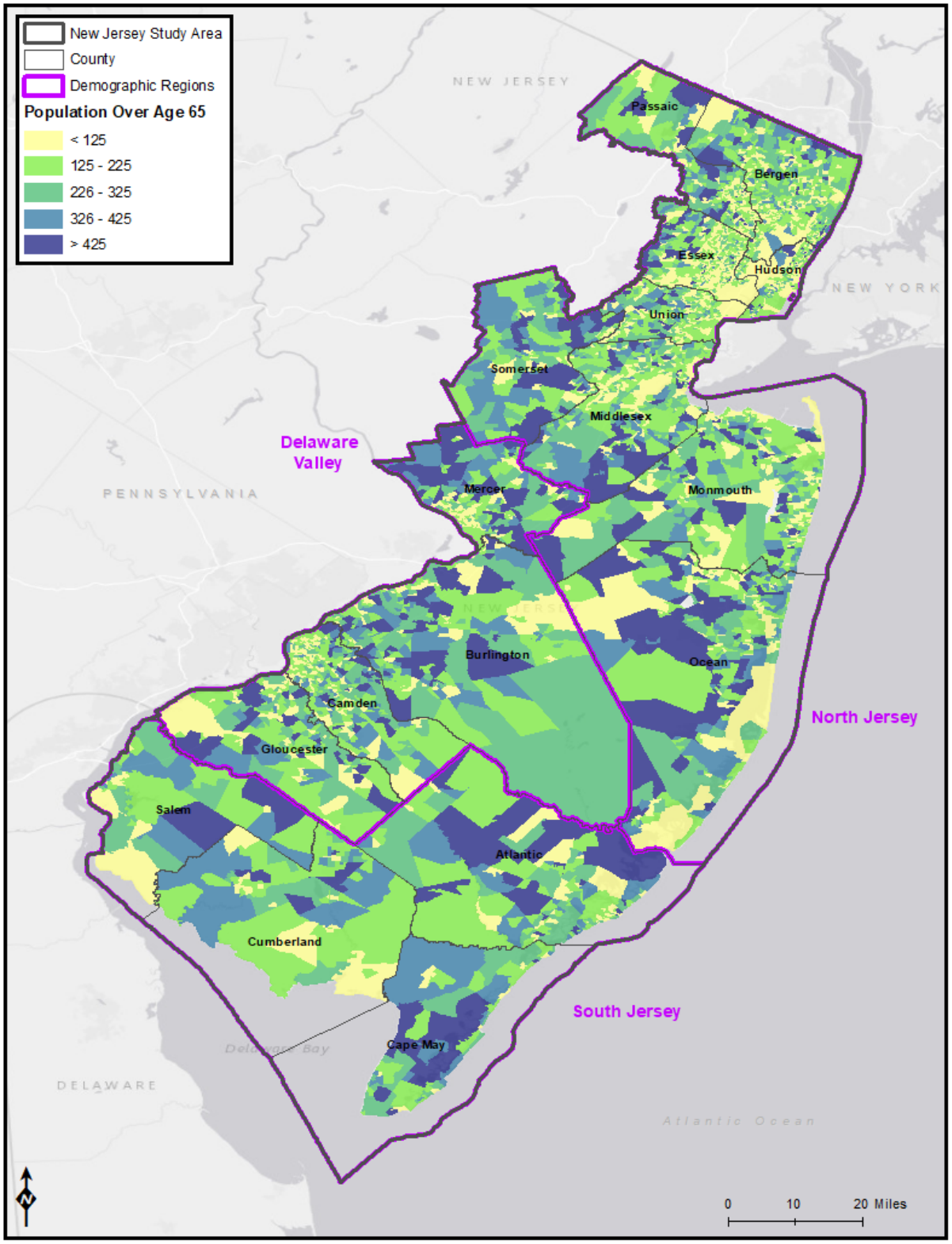
Sources: NJTPA 2013, SJTPO 2016, DVRPC 2016

Figure 8-25. Overall Projected Population Change from 2017-2040 in the New Jersey Study Area by County



Source: USCB 2017r

Figure 8-26. Population Under Age 5 in the New Jersey Study Area by Census Block Group



Source: USCB 2017r

Figure 8-27. Population Over Age 65 in the New Jersey Study Area by Census Block Group

Table 8-9. Population Under Age 5 and Over Age 65 in the New Jersey Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
North Jersey	Bergen	937,920	49,660	5.3	153,527	16.4	1,030,400	NA	NA	NA	NA
	Essex	800,401	52,804	6.6	102,794	12.8	916,000	NA	NA	NA	NA
	Hudson	679,756	47,441	7.0	75,984	11.2	817,300	NA	NA	NA	NA
	Middlesex	837,288	49,144	5.9	115,701	13.8	1,023,100	NA	NA	NA	NA
	Monmouth	627,551	31,705	5.1	101,128	16.1	696,900	NA	NA	NA	NA
	Ocean	589,699	40,591	6.9	130,257	22.1	801,600	NA	NA	NA	NA
	Passaic	510,563	34,842	6.8	69,429	13.6	601,300	NA	NA	NA	NA
	Somerset	333,316	17,653	5.3	47,955	14.4	376,600	NA	NA	NA	NA
	Union	557,320	35,278	6.3	75,962	13.6	638,500	NA	NA	NA	NA
	Total North Jersey Region	***5,873,814***	***359,118***	***6.1***	***872,737***	***14.9***	***6,901,700***	***NA***	***NA***	***NA***	***NA***
Delaware Valley	Burlington	449,192	23,276	5.2	71,468	15.9	488,026	NA	NA	NA	NA
	Camden	510,996	31,687	6.2	74,496	14.6	525,101	NA	NA	NA	NA
	Gloucester	291,372	15,904	5.5	42,145	14.5	366,383	NA	NA	NA	NA
	Mercer	373,362	21,113	5.7	52,772	14.1	398,669	NA	NA	NA	NA
	Total Delaware Valley Region	***1,624,922***	***91,980***	***5.7***	***240,881***	***14.8***	***1,778,179***	***NA***	***NA***	***NA***	***NA***
South Jersey	Atlantic	272,926	15,767	5.8	44,540	16.3	318,200	NA	NA	NA	NA
	Cape May	94,549	4,483	4.7	23,124	24.5	79,500	NA	NA	NA	NA
	Cumberland	154,952	10,232	6.6	22,010	14.2	176,200	NA	NA	NA	NA
	Salem	63,776	3,531	5.5	11,000	17.2	62,900	NA	NA	NA	NA
	Total South Jersey Region	***586,203***	***34,013***	***5.8***	***100,674***	***17.2***	***636,800***	***NA***	***NA***	***NA***	***NA***
	Study Area Total	**8,084,939**	**485,111**	**6.0**	**1,214,292**	**15.0**	**9,316,679**	**NA**	**NA**	**NA**	NA
	New Jersey	**8,960,161**	**526,716**	**5.9**	**1,353,999**	**15.1**	**9,470,012**	**572,453**	**6.0**	**1,767,671**	**18.7**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: DVRPC 2016, NJTPA 2013, SJTPO 2016, USCB 2017b, USCB 2018b
Note: County-level projections were not available by age for this projection period.

According to 2017 estimates shown in Table 8-9, the elderly represented 14.9% of the U.S. population; 15.1% in New Jersey and 15.0% in the Study Area. Table 8-9 shows the breakdown by demographic region. The South Jersey Region had the highest percentage of elderly (17.2%). The counties of Cape May and Ocean (popular retirement destinations) had high percentages of elderly at 24.5% and 22.1%, respectively. The number and proportion of elderly to the overall population is projected to rise in the Nation and the State, fueled by aging baby boomers. The consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S. and 18.7% in the State. Projections with breakdown by age group were not available for the Study Area (USCB 2017b, USCB 2018b, NJTPA 2013, SJTPO 2016, DVRPC 2016).

8.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area are presented in Table 8-10.

As shown in Table 8-10, in 2017 homeownership in New Jersey was 64.1%, slightly higher than the Nation (63.8%) and the Study Area (62.7%). Renters comprised approximately 35.9% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was slightly higher (37.3%) (USCB 2017m).

Median home values were lower in the Study Area ($229,550) than the State ($321,100) but higher than the Nation ($193,500) (USCB 2017l). Figure 8-28 illustrates median home values in the Study Area. The figure illustrates that the northern part of the Study Area had higher home values as compared to the southern part. The North Jersey Region is close to the New York-Newark-Jersey City, NY-NJ-PA and Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSAs. Workers can easily commute via public transit to high-paying jobs in the New York City metropolitan area. South Jersey had lower median home values, except in the coastal areas, the location of popular beach resorts (USCB 2017r).

Home values in the State increased 1.5% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Zillow 2019). The market temperature of the State is characterized as very hot, which indicates market conditions favorable to sellers (Zillow 2019). In the 12-month period ending November 2019, metropolitan area market temperatures ranged from hot to very hot, and home values increased at the following rates (Zillow 2019):

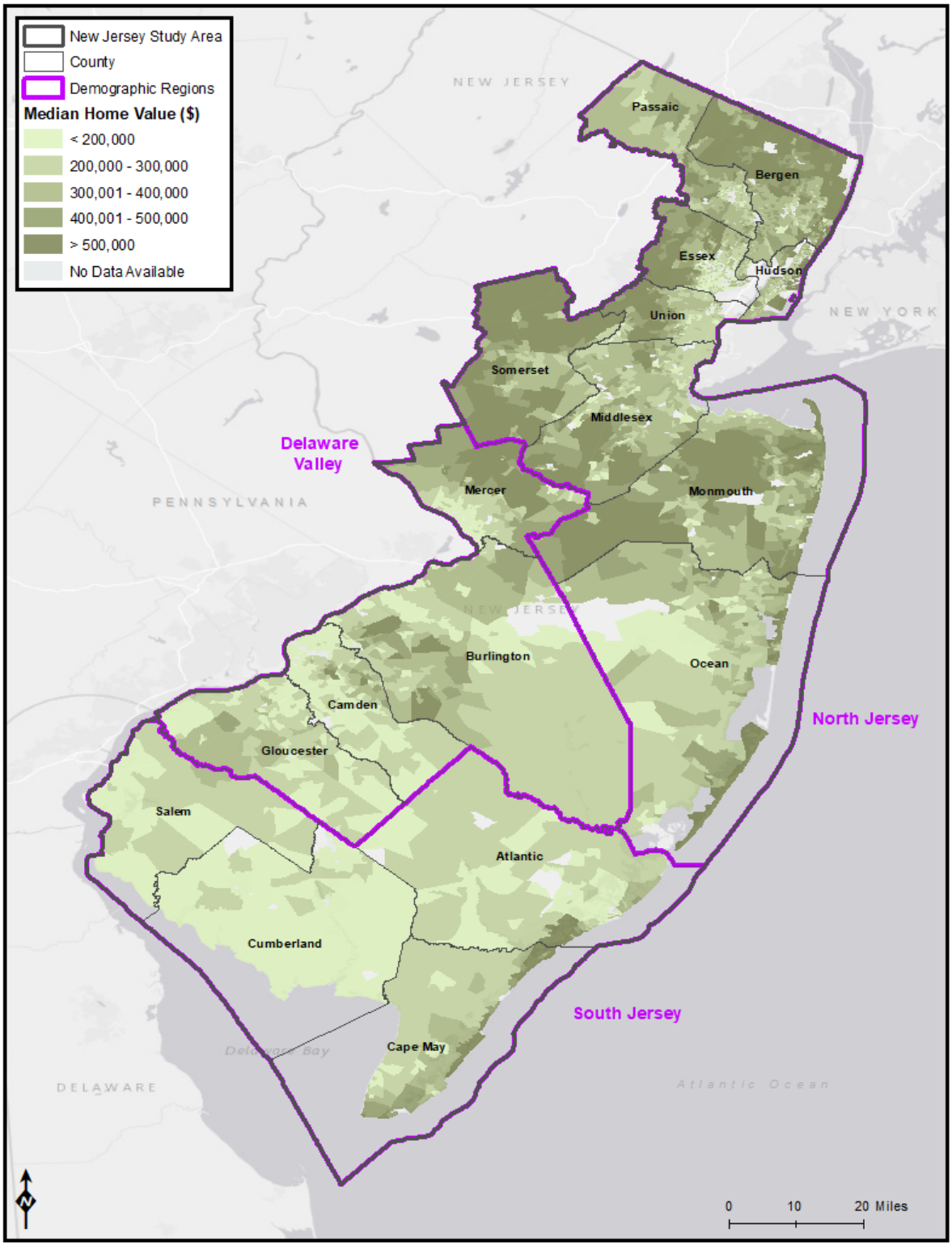
- Atlantic City-Hammonton, NJ – 5.2%; very hot
- New York-Newark-Jersey City, NY-NJ-PA – 0.9%; hot
- Philadelphia-Camden-Wilmington, PA-NJ-DE-MD – 3.2%; very hot
- Ocean City, NJ – 2.4%; hot
- Trenton, NJ – 2.1%; hot
- Vineland-Bridgeton, NJ – 2.8%; very hot.

Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including New Jersey.

Table 8-10 Housing Utilization and Vacancy Rates in the New Jersey Study Area

Region	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Gross Rent
North Jersey	Bergen	355,632	337,819	17,813	5.0	218,066	64.6	119,753	35.4	$451,200	$1,419
	Essex	315,186	280,327	34,859	11.1	124,852	44.5	155,475	55.5	$362,300	$1,107
	Hudson	277,742	252,352	25,390	9.1	79,116	31.4	173,236	68.6	$349,500	$1,286
	Middlesex	299,753	283,794	15,959	5.3	180,484	63.6	103,310	36.4	$329,000	$1,384
	Monmouth	260,524	232,482	28,042	10.8	171,560	73.8	60,922	26.2	$396,200	$1,315
	Ocean	281,171	223,135	58,036	20.6	178,570	80.0	44,565	20.0	$267,900	$1,368
	Passaic	176,843	162,440	14,403	8.1	86,901	53.5	75,539	46.5	$333,200	$1,238
	Somerset	125,762	115,970	9,792	7.8	88,188	76.0	27,782	24.0	$412,800	$1,499
	Union	201,442	187,916	13,526	6.7	110,762	58.9	77,154	41.1	$351,800	$1,219
	Total North Jersey Region	***2,294,055***	***2,076,235***	***217,820***	***9.5***	***1,238,499***	***59.7***	***837,736***	***40.3***	***NA***	***NA***
Delaware Valley	Burlington	178,178	164,404	13,774	7.7	125,557	76.4	38,847	23.6	$245,300	$1,263
	Camden	205,883	187,012	18,871	9.2	125,008	66.8	62,004	33.2	$193,500	$1,018
	Gloucester	112,516	104,810	7,706	6.8	83,431	79.6	21,379	20.4	$213,800	$1,134
	Mercer	144,385	129,546	14,839	10.3	83,188	64.2	46,358	35.8	$281,900	$1,191
	Total Delaware Valley Region	***640,962***	***585,772***	***55,190***	***8.6***	***417,184***	***71.2***	***168,588***	***28.8***	***NA***	***NA***
South Jersey	Atlantic	127,809	100,660	27,149	21.2	67,845	67.4	32,815	32.6	$219,000	$1,070
	Cape May	99,014	39,861	59,153	59.7	30,900	77.5	8,961	22.5	$295,500	$1,086
	Cumberland	56,332	50,596	5,736	10.2	32,245	63.7	18,351	36.3	$160,500	$1,003
	Salem	27,584	24,038	3,546	12.9	17,153	71.4	6,885	28.6	$185,800	$981
	Total South Jersey Region	***310,739***	***215,155***	***95,584***	***30.8***	***148,143***	***68.9***	***67,012***	***31.1***	***NA***	***NA***
	Study Area Total	**3,245,756**	**2,877,162**	**368,594**	**11.4**	**1,803,826**	**62.7**	**62.7%**	**37.3**	**$229,550**	**$1,163**
	New Jersey	**3,595,055**	**3,199,111**	**395,944**	**11.0**	**2,052,073**	**64.1**	**64.1%**	**35.9**	**$321,100**	**$1,249**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**63.8%**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017i, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 8-28. Median Home Value in the New Jersey Study Area by Census Block Group

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Figure 8-29 illustrates median gross rent in the Study Area. According to the National Low Income Housing Coalition, as of 2019, throughout New Jersey, fair market rent for a two-bedroom rental unit is $1,501. In these conditions, a minimum wage worker would have to work approximately 130 hours a week in order to afford a two-bedroom, fair market rate home. New Jersey has a shortage of approximately 200,619 rental homes affordable and available to extremely low-income households. Approximately 298,204 (26%) of renter households in New Jersey are considered extremely low income; approximately 214,706 (72%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (35%), single caregivers (35%), and disabled (19%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

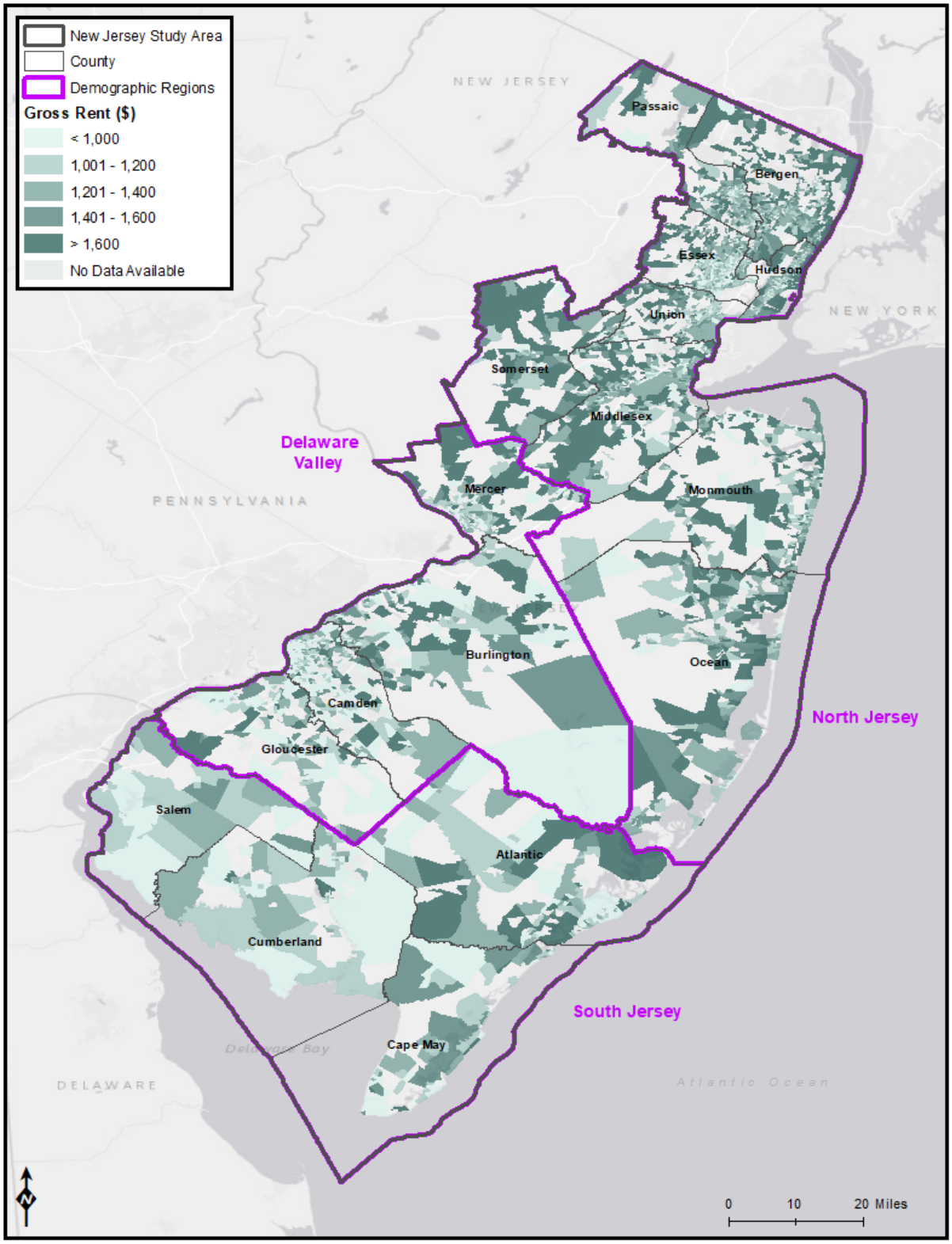
As shown in Table 8-10, home vacancy rates in New Jersey (11.0%) in 2017 were lower than the Nation (12.2%) and lower than the Study Area (11.4%). Figure 8-30 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (30.8%) in the less-densely populated South Jersey Region and the lowest in the Delaware Valley Region (8.6%) (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Cape May residents have been selling their homes to those seeking vacation houses (Stirling 2018).

8.4.4 Employment

8.4.4.1 Employment Types

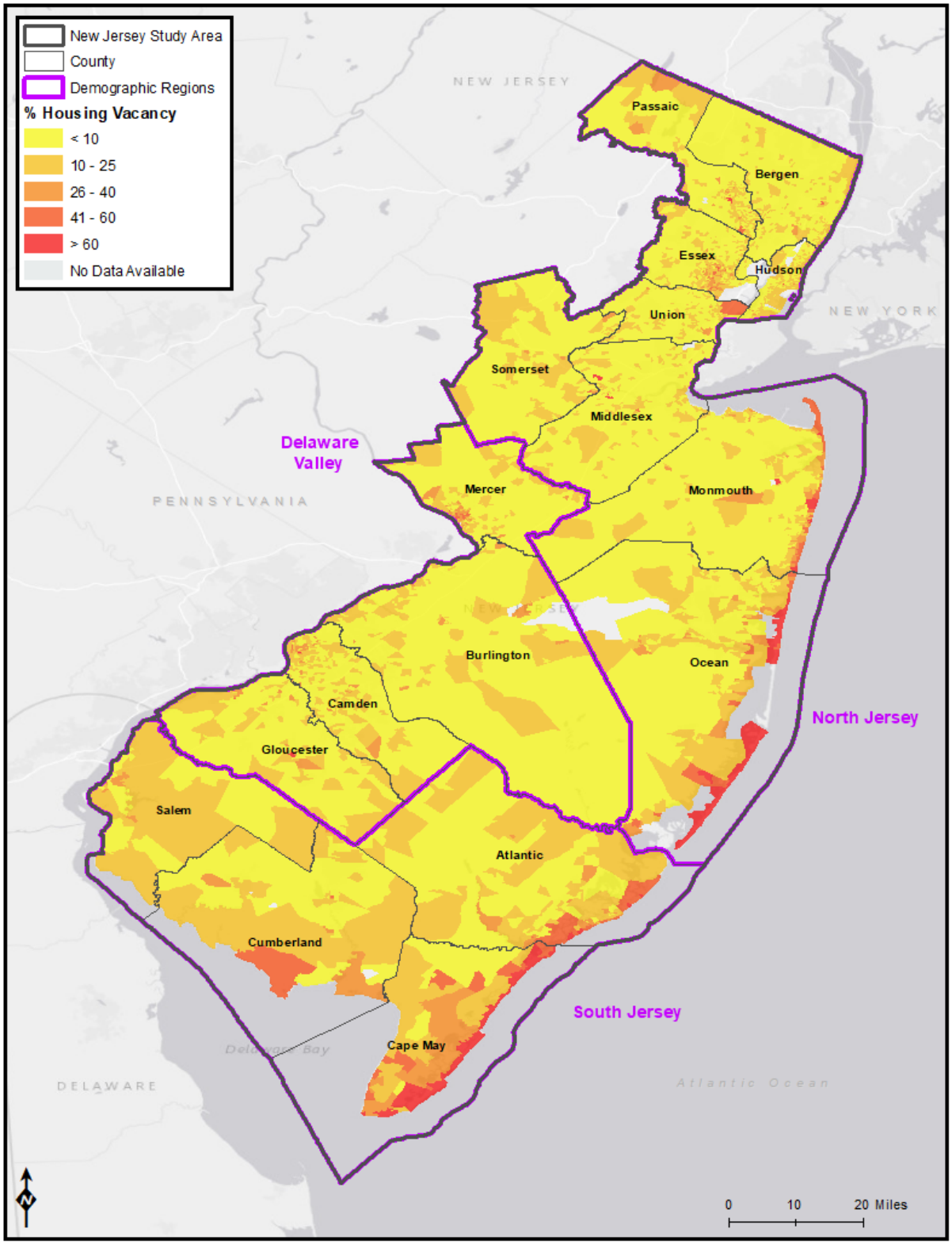
Employment data by industry sector are presented in Table 8-11. In 2017, the Study Area had a total employment of 3.9 million jobs, representing approximately 89.5% of the total jobs in New Jersey and 2.6% of the total jobs in the U.S. (USCB 2017p).

New Jersey’s 2018 annual gross domestic product was 622.0 billion, which represented 3.0% of the Nation’s gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 8-29. Median Gross Rent in the New Jersey Study Area by Census Block Group



Source: USCB 2017r

Figure 8-30. Housing Vacancy Rates in the New Jersey Study Area by Census Block Group

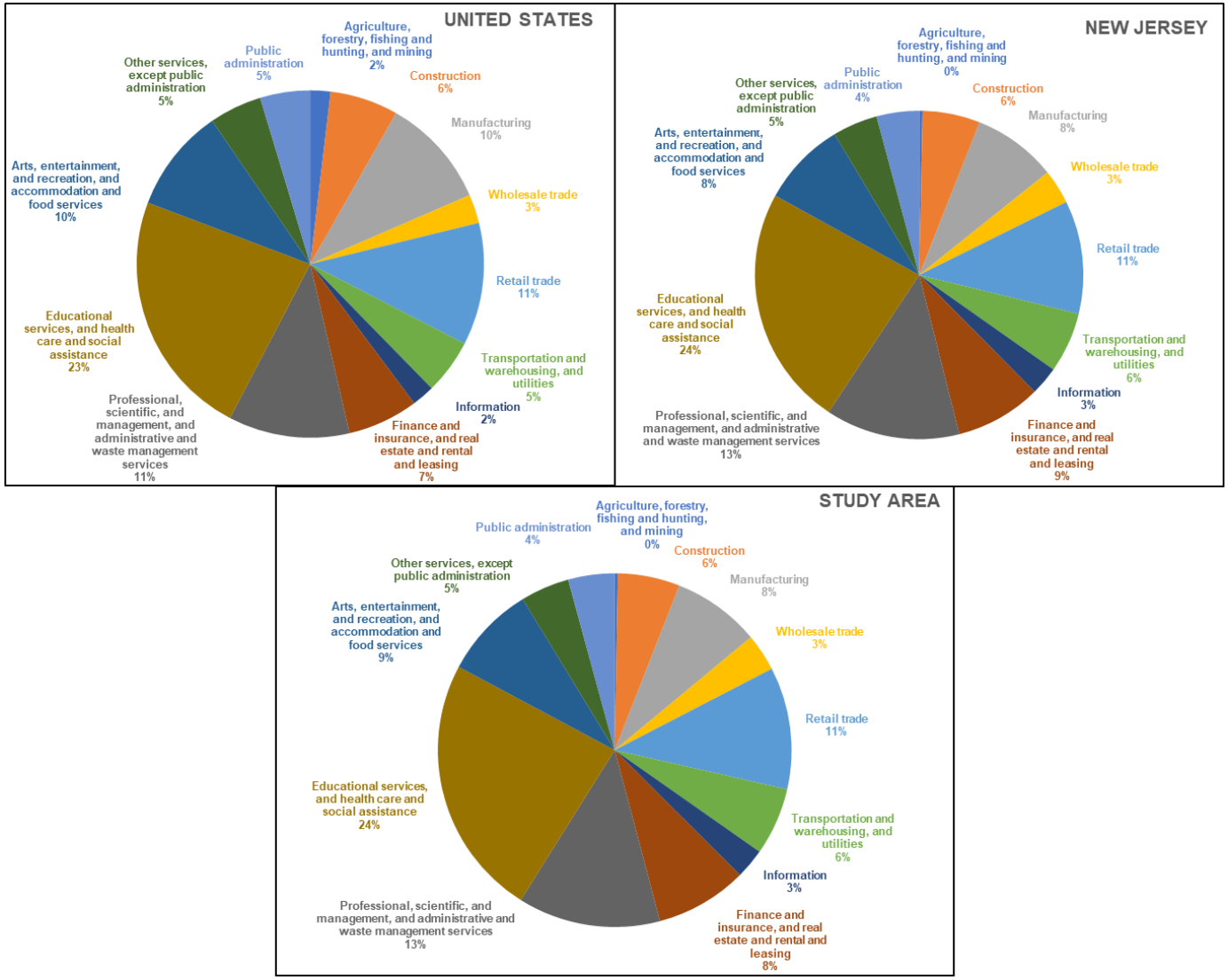
Table 8-11. Census Bureau Labor and Industry Statistics for the U.S., New Jersey, and the New Jersey Study Area (number of jobs)

Industry	United States	Percent (%)	New Jersey	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**4,388,024**		**3,929,092**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	13,755	0.3	10,960	0.3
Construction	9,564,541	6.4	249,596	5.7	223,202	5.7
Manufacturing	15,477,389	10.3	362,892	8.3	314,937	8.0
Wholesale trade	4,042,867	2.7	149,340	3.4	134,234	3.4
Retail trade	17,167,000	11.4	488,795	11.1	438,637	11.2
Transportation and warehousing, and utilities	7,681,579	5.1	261,195	6.0	242,859	6.2
Information	3,173,300	2.1	123,449	2.8	107,691	2.7
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	372,301	8.5	330,033	8.4
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	580,562	13.2	512,207	13.0
Educational services, and health care and social assistance	34,781,348	23.1	1,041,368	23.7	938,728	23.9
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	366,508	8.4	333,403	8.5
Other services, except public administration	7,371,226	4.9	194,728	4.4	175,234	4.5
Public administration	7,025,870	4.7	183,535	4.2	166,967	4.2

Source: USCB 2017p

Table 8-11 and Figure 8-31 show the number of jobs in each major industry sector for the U.S., the State, and the Study Area. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (23.9%); professional, scientific, and management, and administrative and waste management (13.0%); retail trade (11.2%); and arts, entertainment, and recreation, and accommodation and food services (8.5%). Generally, the dominant employment categories in the Study Area are similar to those of the State. The Study Area had a lesser percentage of manufacturing jobs (5.5%) as compared to the State (5.7%) and the Nation (10.3%) (USCB 2017p).

The U.S. Bureau of Labor Statistics lists New Jersey's major job sector industries as (1) trade, transportation, and utilities, (2) education and health services, (3) professional and business services, (4) leisure and hospitality, and (5) manufacturing (BLS 2020b). Trade, transportation, and utilities account for employing 21.2% of the workforce in the State (BLS 2020b). According to the New Jersey Business Action Center , the top industries in the State are life sciences, information technology, financial services, manufacturing, and trade, transportation, and utilities (NJDS 2020a).



Source: USCB 2017p

Figure 8-31. Number of Jobs by Industry Sector for the U.S., New Jersey, and the New Jersey Study Area

Figure 8-32 shows the location of jobs within the Study Area. The greater portion of jobs are located in the North Jersey Region near the New York-Newark-Jersey City, NY-NJ-PA MSA. Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the less populated South Jersey and Delaware Valley regions.

8.4.4.1.1 New Jersey's Ocean Economy

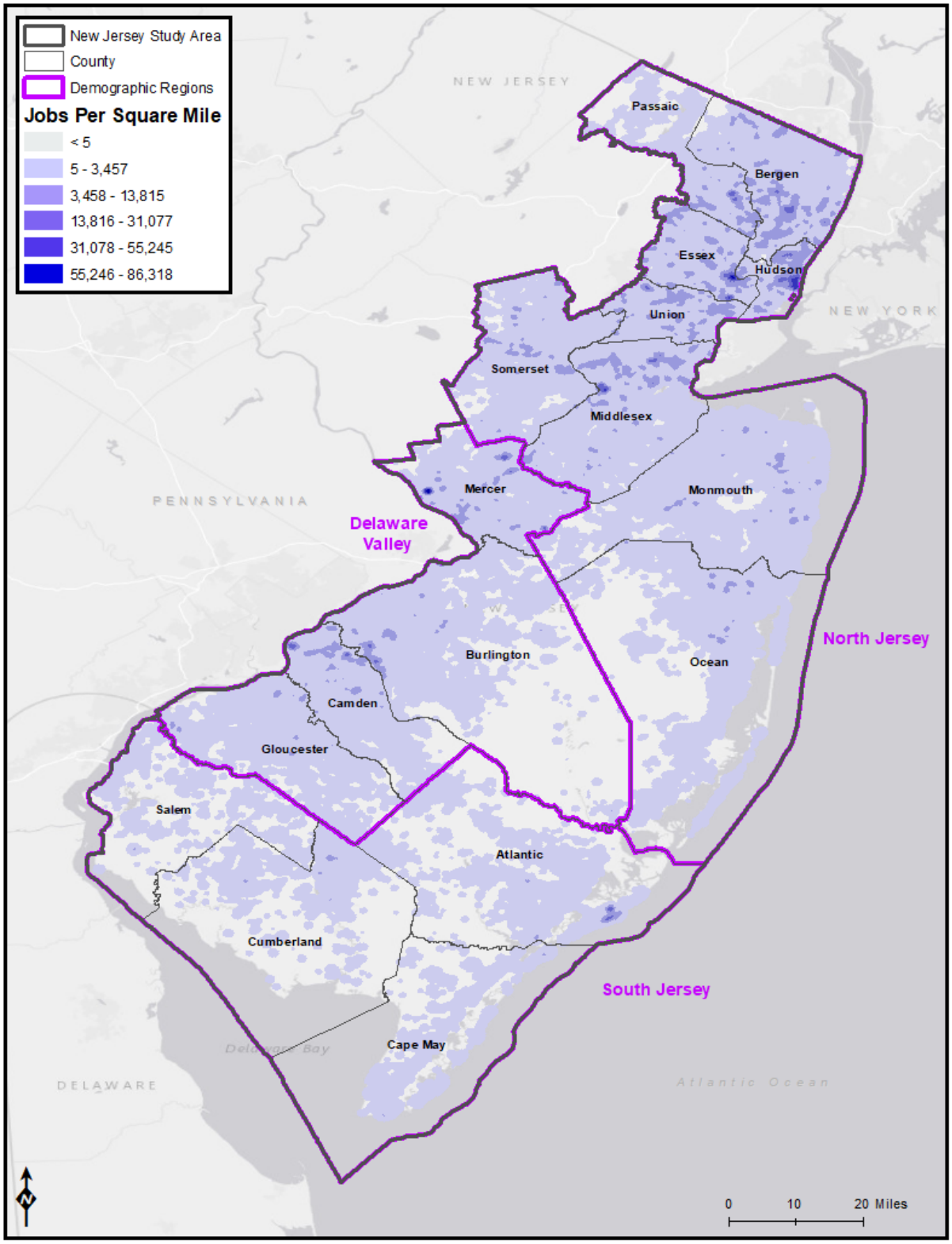
Overall, New Jersey's ocean economy ranked 5th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 8-12, New Jersey's ocean economy accounted for 145,494 maritime jobs in 2016, accounting for 3.7% of New Jersey's employment (NOAA 2016b, USCB 2017i). Within the State, tourism and recreation was the dominant sector, accounting for 65.9% (93,439) of maritime jobs. The tourism and recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 143,702 maritime jobs, representing 98.8% of total maritime jobs in the State. Figure 8-33 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. The counties in the South Jersey and North Jersey regions have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities. Hudson County had the greatest number of maritime jobs (22,343), representing 7.6% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). The highest percentage of maritime jobs to overall county jobs were in Cape May (32.7%), Atlantic (9.6%), and Ocean (9.1%) Counties (NOAA 2016b).

8.4.4.2 Income

As discussed in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 8-12, in 2017 New Jersey had higher median household income and per capita income than the U.S.

According to the USCB, the U.S. had median income of $57,652 and per capita income of $31,177 in 2017. During the same period, New Jersey had median income of $76,475 (32.6% higher than the Nation's median income) and per capita income of $39,069 (25.3% higher than the Nation's per capita). Median and per capita income in the Study Area were lower than the State at $65,771 and $36,205, respectively (USCB 2017k, USCB 2017n). Figure 8-34 and Figure 8-35 show median household and per capita income in the Study Area. The figures portray higher median household and per capita incomes in the northern part of the State, close to the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017r).



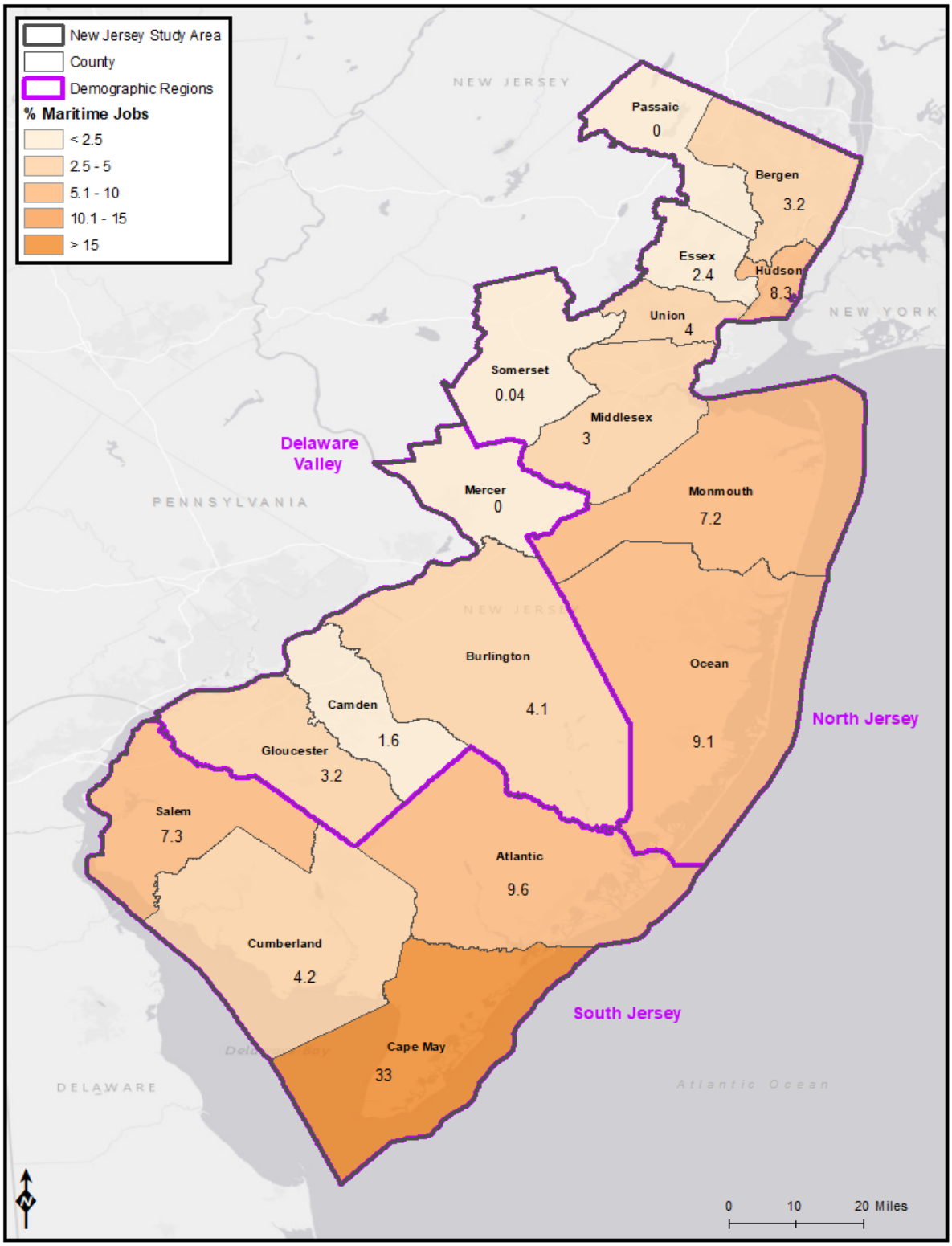
Source: USCB 2017r

Figure 8-32. Jobs Per Square Mile in the New Jersey Study Area by Census Block Group

Table 8-12. Employment Data in the New Jersey Study Area (from the Longitudinal Employer-Household Dynamics dataset)

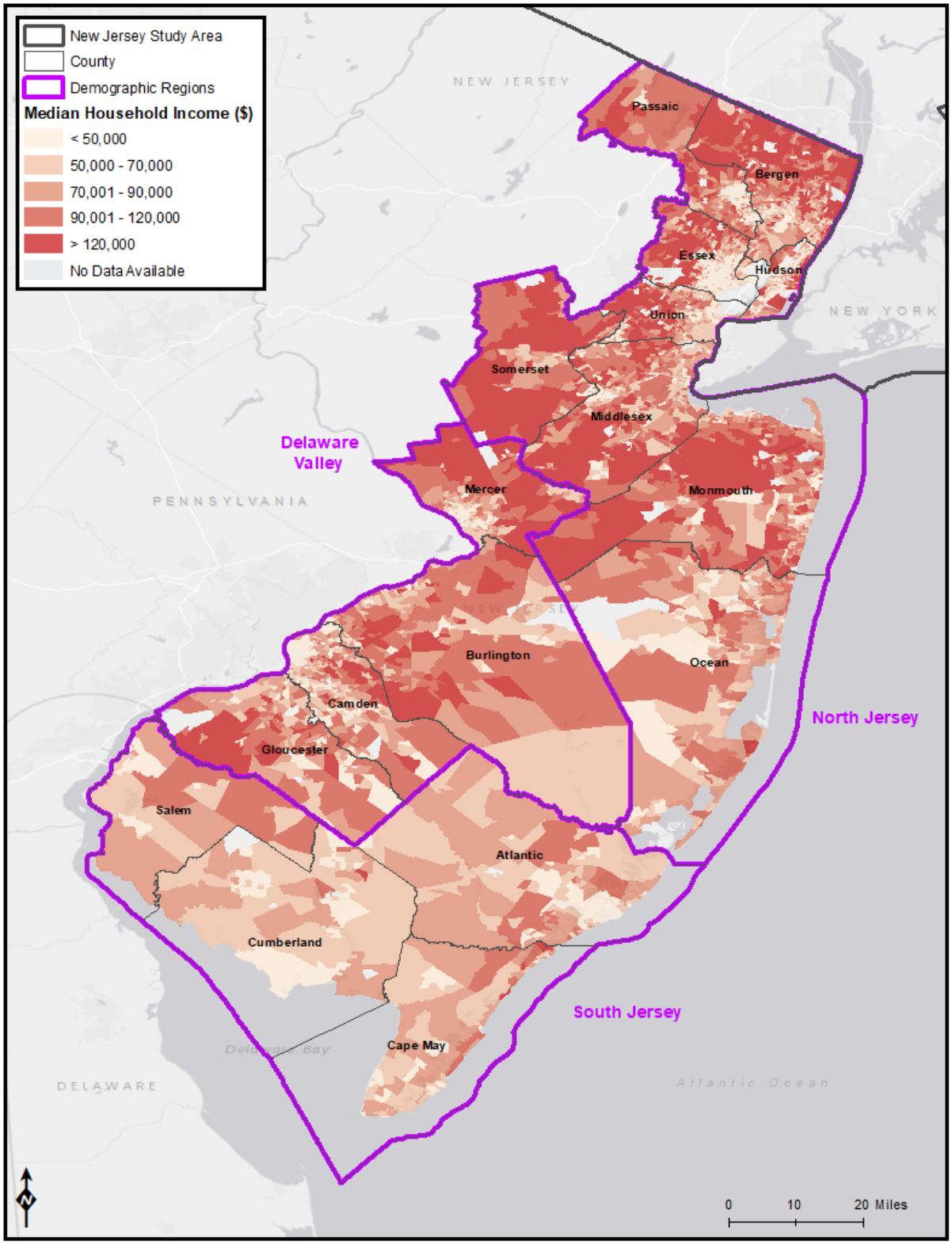
Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs[3] (%)	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
North Jersey	**Bergen**	500,032	499,802	473,672	26,130	5.2	454,642	14,611	3.0	$91,572	$46,601
	Essex	415,236	415,171	371,793	43,378	10.4	342,468	8,355	2.4	$57,365	$35,133
	Hudson	381,440	381,266	354,105	27,161	7.1	270,424	22,343	8.3	$62,681	$35,910
	Middlesex	436,702	436,566	408,838	27,728	6.4	439,658	13,264	3.0	$83,133	$36,558
	Monmouth	334,798	334,439	314,470	19,969	6.0	256,460	18,389	7.2	$91,807	$46,736
	Ocean	272,287	271,713	253,628	18,085	6.7	161,512	14,662	9.1	$65,771	$33,312
	Passaic	253,794	253,716	238,552	15,164	6.0	177,130	0	0.0	$63,339	$29,393
	Somerset	183,451	183,421	174,463	8,958	4.9	194,654	837	0.4	$106,046	$51,923
	Union	300,395	300,167	278,003	22,164	7.4	237,585	9,460	4.0	$73,376	$38,163
	Total North Jersey Region	***3,078,135***	***3,076,261***	***2,867,524***	***208,737***	***6.8***	***2,534,533***	***101,921***	***4.0***	***NA***	***NA***
Delaware Valley	**Burlington**	244,902	240,681	223,990	16,691	6.9	210,635	8,636	4.1	$82,839	$39,528
	Camden	269,677	269,394	248,241	21,153	7.9	218,164	3,587	1.6	$65,037	$32,931
	Gloucester	157,549	157,464	145,749	11,715	7.4	109,632	3,474	3.2	$81,489	$36,205
	Mercer	196,318	196,302	181,602	14,700	7.5	234,329	0	0.0	$77,027	$40,064
	Total Delaware Valley Region	***868,446***	***863,841***	***799,582***	***64,259***	***7.4***	***772,760***	***15,697***	***2.0***	***NA***	***NA***
South Jersey	**Atlantic**	143,718	143,367	127,737	15,630	10.9	118,521	11,432	9.6	$57,514	$29,941
	Cape May	46,913	46,049	42,170	3,879	8.4	32,773	10,701	32.7	$62,332	$36,256
	Cumberland	68,938	68,904	62,714	6,190	9.0	57,078	2,397	4.2	$50,000	$23,012
	Salem	31,918	31,912	29,365	2,547	8.0	21,249	1,554	7.3	$63,934	$31,681
	Total South Jersey Region	***291,487***	***290,232***	***261,986***	***28,246***	***9.7***	***229,621***	***26,084***	***11.4***	***NA***	***NA***
	Study Area Total	**4,238,068**	**4,230,334**	**3,929,092**	**301,242**	**7.1**	**3,536,914**	**143,702**	**4.1**	**$65,771**	**$36,205**
	New Jersey	**4,724,242**	**4,716,191**	**4,388,024**	**328,167**	**7.0**	**3,949,895**	**145,494**	**3.7**	**$76,475**	**$39,069**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



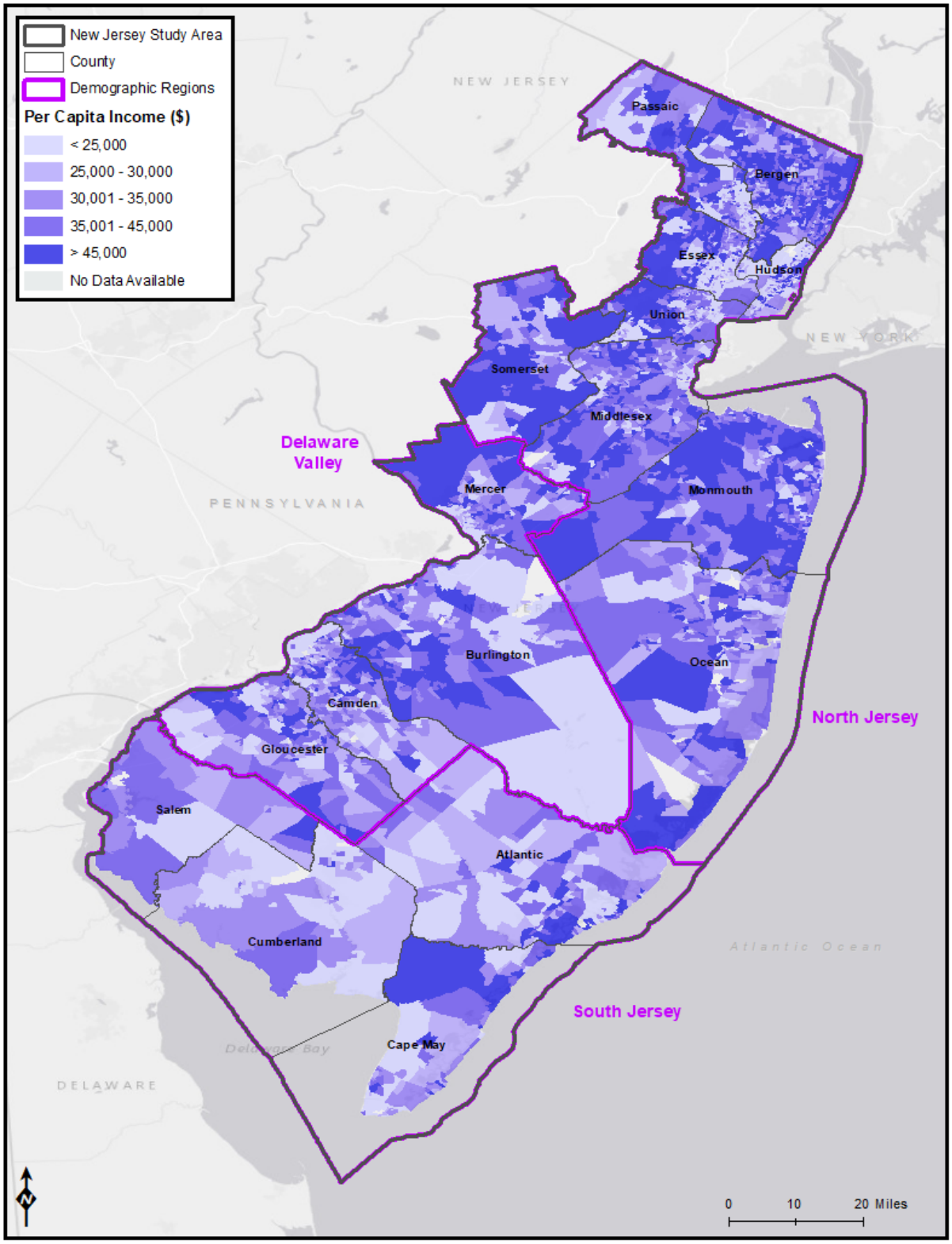
Source: NOAA 2017b

Figure 8-33. Maritime Jobs in the New Jersey Study Area by County



Source: USCB 2017r

Figure 8-34. Median Household Income in the New Jersey Study Area by Census Block Group



Source: USCB 2017r

Figure 8-35. Per Capita Income in the New Jersey Study Area by Census Block Group

8.4.4.3 Unemployment Rates

Figure 8-36 shows the 2017 unemployment rates in the counties in the Study Area by census block group. Table 8-12 presents unemployment rates for each county in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 7.1%, similar to the State (7.0%) but more than the Nation (6.6%) (USCB 2017h).

The unemployment rate was 7.4% in the Delaware Valley Region in 2017, with the highest rates occurring in Camden County (7.9%), a less densely populated county (USCB 2017h). This economic struggle of Camden and Gloucester Counties pre-dates the Great Recession (Stirling 2018).

The unemployment rate was 6.8% in the North Jersey Region in 2017, with counties in this region ranging from 4.9% (Somerset County) to 10.4% (Essex County) (USCB 2017h).

The unemployment rate was 9.7% in the South Jersey Region in 2017, which is the highest rate of the four demographic regions in the Study Area. Rates range from 10.9% (Atlantic County) to 8.0% in sparsely populated Cape May County (USCB 2017h). This area sustained losses from Hurricane Sandy and is still in recovery from the Great Recession. The decline of casinos in Atlantic City impacted employment in Atlantic County (McCarthy 2019, Jacobs 2017).

8.4.4.4 Educational Attainment

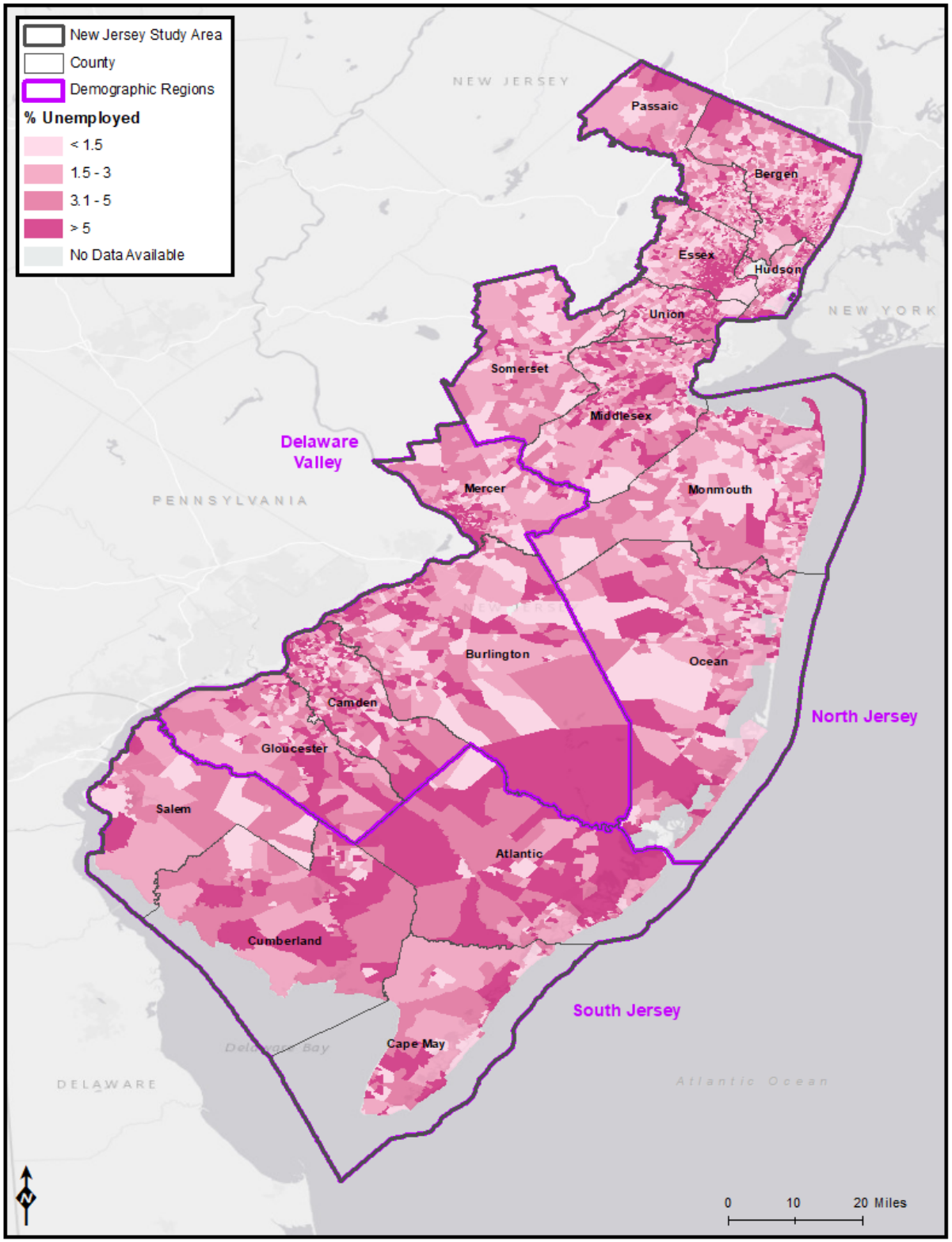
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 8-13 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State, and the Nation (USCB 2017t).

Figure 8-37 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In New Jersey, 27.4% of the working-age population earned only a high school diploma; 43.0% earned a college or advanced degree.
- In the Study Area, 28.4% of the working-age population earned only a high school diploma; 40.3% earned a college or advanced degree (USCB 2017q).

Figure 8-38 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).



Source: USCB 2017r

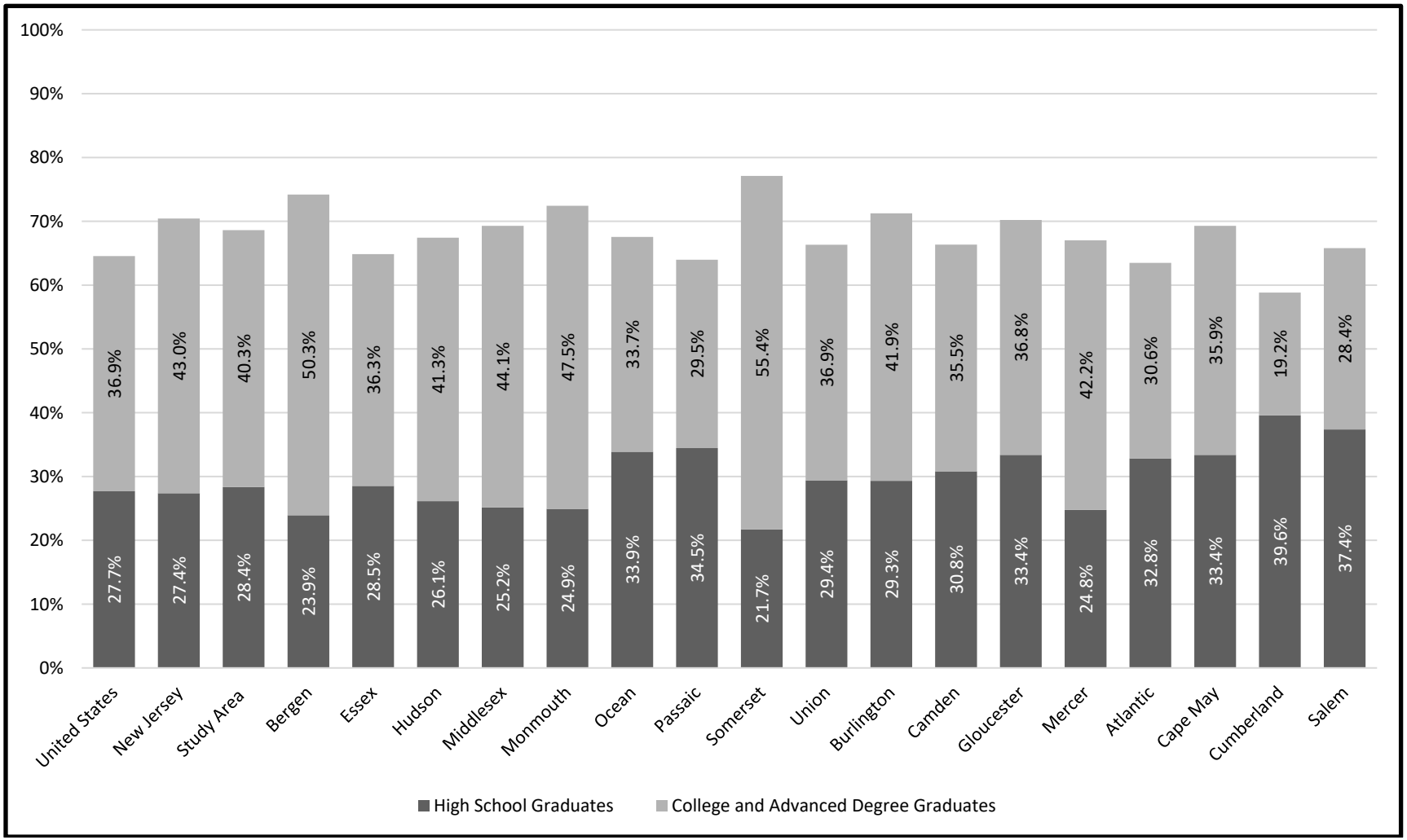
Figure 8-36. Unemployment Rates in the New Jersey Study Area by Census Block Group

Table 8-13. Educational Data for the New Jersey Study Area

Region	Geographic Unit	Number							Total	Percent						
		Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
North Jersey	**Bergen**	26,691	33,504	176,054	129,768	38,048	212,268	119,571	735,904	3.6	4.6	23.9	17.6	5.2	28.8	16.2
	Essex	38,696	49,627	173,765	125,759	30,651	118,786	71,957	609,241	6.4	8.1	28.5	20.6	5.0	19.5	11.8
	Hudson	44,534	40,349	141,412	91,243	21,961	130,764	70,614	540,877	8.2	7.5	26.1	16.9	4.1	24.2	13.1
	Middlesex	31,619	36,874	164,478	132,323	36,252	153,800	98,366	653,712	4.8	5.6	25.2	20.2	5.5	23.5	15.0
	Monmouth	12,704	24,490	122,096	97,771	31,102	125,517	76,020	489,700	2.6	5.0	24.9	20.0	6.4	25.6	15.5
	Ocean	12,511	28,645	152,630	105,045	31,010	82,227	38,473	450,541	2.8	6.4	33.9	23.3	6.9	18.3	8.5
	Passaic	31,430	32,141	133,476	75,997	17,904	66,340	30,103	387,391	8.1	8.3	34.5	19.6	4.6	17.1	7.8
	Somerset	6,079	10,349	55,866	42,438	14,152	72,438	55,850	257,172	2.4	4.0	21.7	16.5	5.5	28.2	21.7
	Union	29,413	30,062	125,267	83,917	22,219	84,084	50,914	425,876	6.9	7.1	29.4	19.7	5.2	19.7	12.0
	Total North Jersey Region	***233,677***	***286,041***	***1,245,044***	***884,261***	***243,299***	***1,046,224***	***611,868***	***4,550,414***	***5.1***	***6.3***	***27.4***	***19.4***	***5.3***	***23.0***	***13.4***
Delaware Valley	**Burlington**	6,770	18,453	103,538	76,262	27,444	79,649	40,856	352,972	1.9	5.2	29.3	21.6	7.8	22.6	11.6
	Camden	15,394	30,669	121,093	86,140	25,089	74,656	39,815	392,856	3.9	7.8	30.8	21.9	6.4	19.0	10.1
	Gloucester	4,570	12,599	75,213	49,949	17,907	44,381	20,597	225,216	2.0	5.6	33.4	22.2	8.0	19.7	9.1
	Mercer	14,392	20,627	72,540	61,622	14,056	59,944	49,772	292,953	4.9	7.0	24.8	21.0	4.8	20.5	17.0
	Total Delaware Valley Region	***41,126***	***82,348***	***372,384***	***273,973***	***84,496***	***258,630***	***151,040***	***1,263,997***	***3.3***	***6.5***	***29.5***	***21.7***	***6.7***	***20.5***	***11.9***
South Jersey	**Atlantic**	9,709	19,139	70,015	49,002	13,077	35,974	16,288	213,204	4.6	9.0	32.8	23.0	6.1	16.9	7.6
	Cape May	2,269	5,229	25,945	16,363	5,128	15,307	7,443	77,684	2.9	6.7	33.4	21.1	6.6	19.7	9.6
	Cumberland	9,890	15,698	46,784	23,050	6,877	11,284	4,549	118,132	8.4	13.3	39.6	19.5	5.8	9.6	3.9
	Salem	2,043	4,636	18,575	10,325	4,184	7,053	2,878	49,694	4.1	9.3	37.4	20.8	8.4	14.2	5.8
	Total South Jersey Region	***23,911***	***44,702***	***161,319***	***98,740***	***29,266***	***69,618***	***31,158***	***458,714***	***5.2***	***9.7***	***35.2***	***21.5***	***6.4***	***15.2***	***6.8***
	Study Area Total	**298,714**	**413,091**	**1,778,747**	**1,256,974**	**357,061**	**1,374,472**	**794,066**	**6,273,125**	**4.8**	**6.6**	**28.4**	**20.0**	**5.7**	**21.9**	**12.7**
	New Jersey	**298,109**	**415,540**	**1,923,882**	**1,364,419**	**418,148**	**1,636,942**	**969,808**	**7,026,848**	**4.2**	**5.9**	**27.4**	**19.4**	**6.0**	**23.3**	**13.8**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

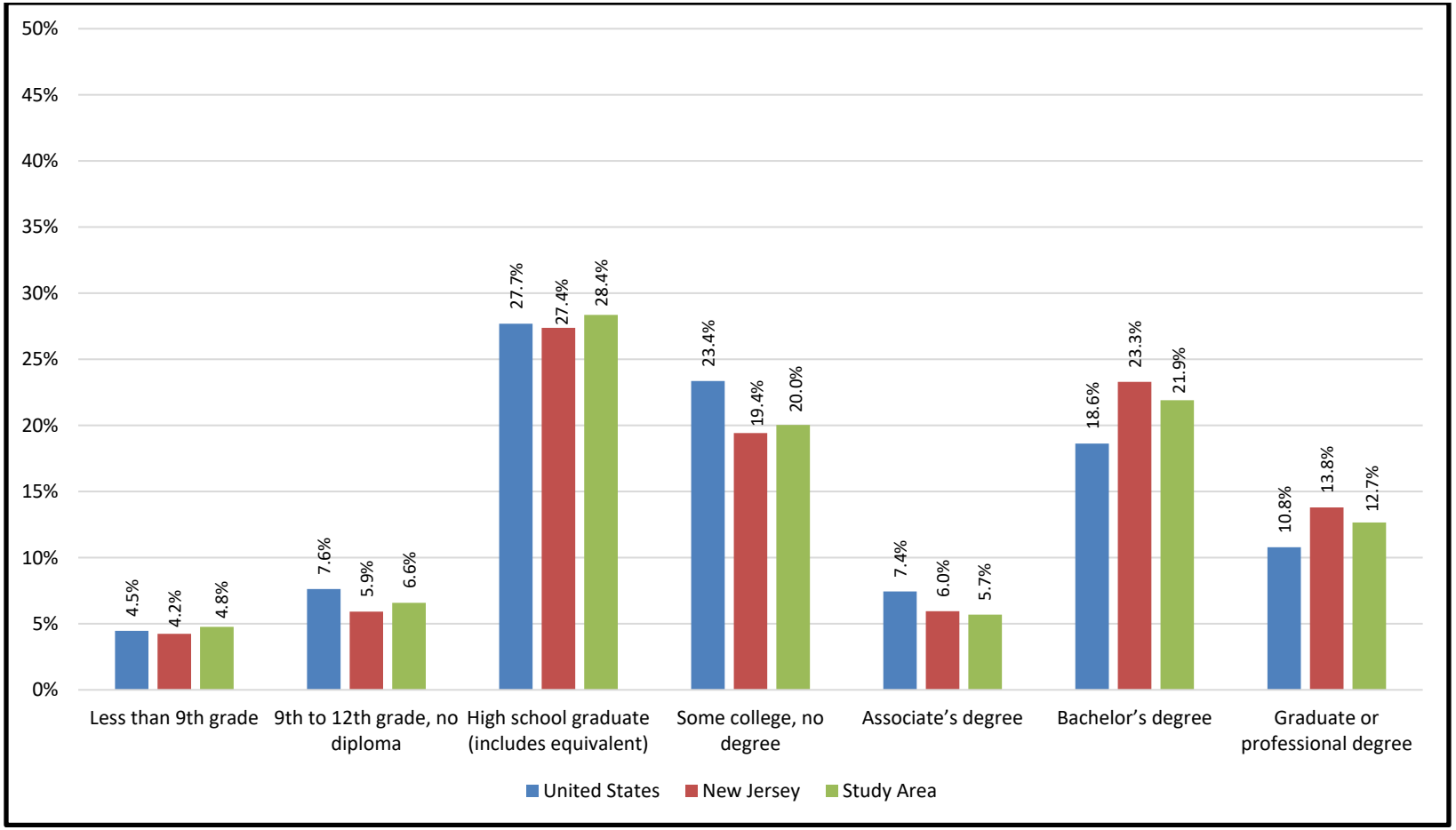
Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 8-37. High School, College, and Advanced Degree Graduate Rates in the New Jersey Study Area



Source: USCB 2017q

Figure 8-38. Educational Attainment in the New Jersey Study Area

For all counties, the percent of individuals with less than a 9th grade education ranges from 1.9% (Burlington County) to 8.4% (Cumberland County). Workers with no high school diploma ranges from 4.0% (Somerset County) to 13.3% (Cumberland County). Workers with a high school diploma as their last degree range from 21.7% (Somerset County) to 39.6% (Cumberland County). For workers with some college but no degree, the range is 16.5% (Somerset County) to 23.3% (Ocean County). Workers having achieved an associate's degree as their highest level of education ranges from 4.1% (Hudson County) to 8.4% (Salem County). Those with a bachelor's degree as their highest level of education ranges from 9.6% (Cumberland County) to 28.8% (Bergen County). Finally, workers who have achieved a graduate or professional degree ranges from 3.9% (Cumberland County) to 21.7% (Somerset County). Cumberland County, located in the South Jersey Region, appears to have more workers with lower levels of educational attainment. This is unsurprising given that this county has less urban development and was devastated by Hurricane Sandy. Bergen and Somerset Counties appear to have more workers with overall higher levels of educational attainment which is unsurprising given the more urban nature of these counties, and location close to transit and higher paying employment opportunities.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

8.4.5 Vulnerable Populations

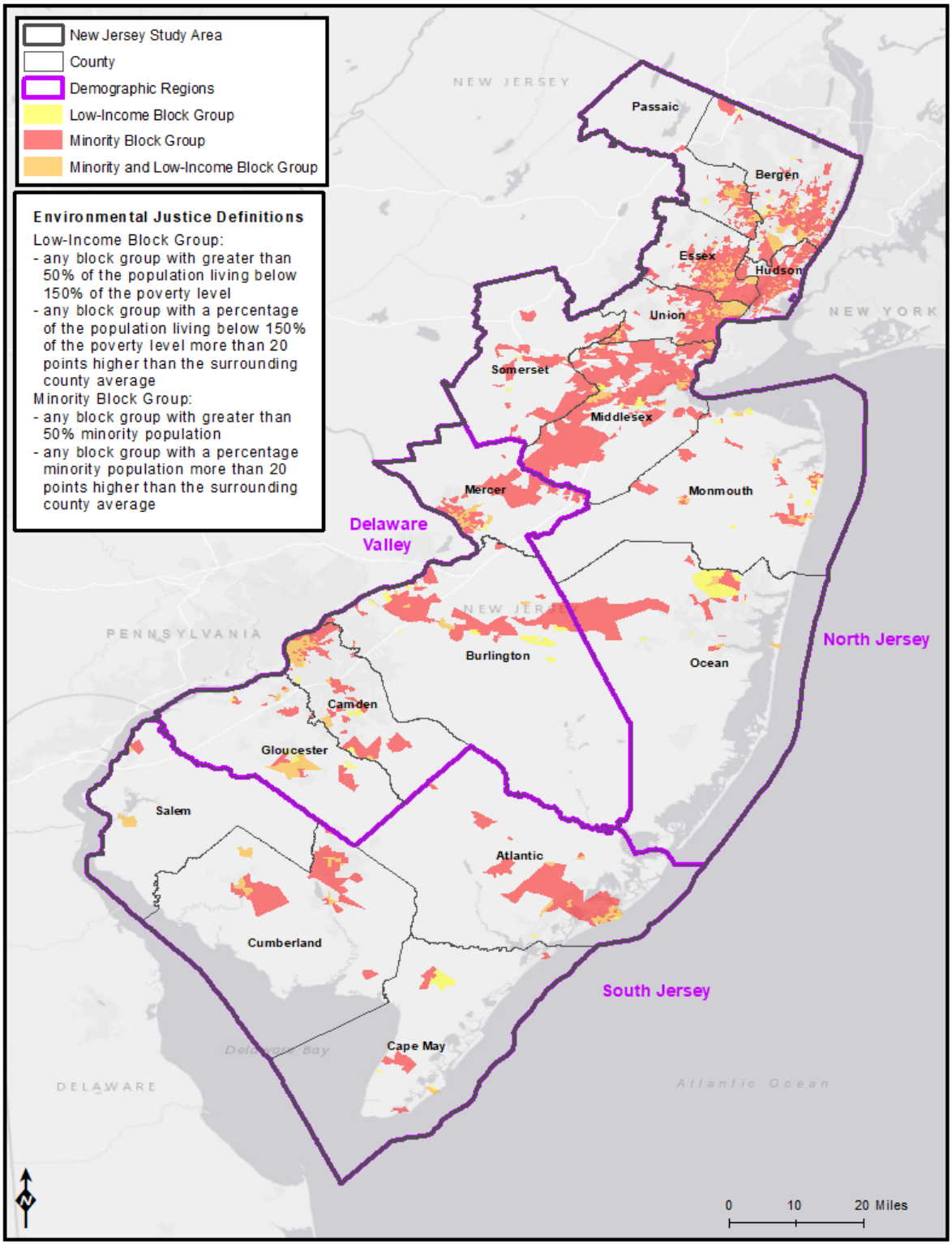
Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are listed below.

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities and subsistence populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

8.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities). Figure 8-39 shows the location of census block groups within the Study Area that contain minority and low-income populations that constitute potential environmental justice populations under EO 12898.



Source: USCB 2017r

Figure 8-39. Minority and Low-Income Population in the New Jersey Study Area by Census Block Group

8.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 8-14 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 8,084,939 people living in the Study Area, approximately 3,742,936 (46.3%) are minority. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 5,754 block groups in the Study Area, approximately 41.1% (2,363 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contains high percentages of census block groups with minority populations. As shown in Table 8-14, the North Jersey Region has the highest percentage of census block groups with minority populations at 49.5%. The South Jersey and Delaware Valley regions have 39.2% and 37.2% of census block groups with minority populations, respectively. Counties with the highest percentages, all of which are significantly higher than percent minority population in the Nation (38.5%), are Hudson (77.3%), Essex (64.5%), Union (58.3%), Passaic (55.2%), and Middlesex (54.5%), all located in the North Jersey Region. Figure 8-39 illustrates the locations of these regions and counties (USCB 2017f).

Within the Study Area the largest minority group is Black or African-American (13.7%) followed by Hispanic or Latino (12.3%) (USCB 2017f).

8.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 8-14 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 7,923,868 people for whom poverty status is determined living in the Study Area, approximately 1,444,728 (18.2%) have incomes less than 150% of the poverty level. This is higher than then State (17.3%) but less than the Nation (23.7%). These sensitive populations are subject to environmental justice consideration. Of the 5,754 census block groups in the Study Area, approximately 11.8% (678 block groups) are considered low-income populations (USCB 2017o).

Each of the demographic regions contain census block groups with high percentages of low-income populations. As shown in Table 8-14, the South Jersey Region contains the highest percentage at 13.3%. The North Jersey Region contains the lowest percentage at 11.3% (USCB 2017o).

As illustrated in Table 8-14 and Figure 8-39, many counties contain census block groups with high percentages of low-income populations. The highest percentages are located in Passaic County (21.4%) and Essex County (18.5%) of the North Jersey Region, and Mercer County (18.2%) of the Delaware Valley Region (USCB 2017f).

Table 8-14. Low-Income and Minority Populations in the New Jersey Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
North Jersey	Bergen	937,920	542,226	395,694	42.2	791	61	7.7	269	34.0	927,026	114,736	12.4
	Essex	800,401	249,087	551,314	68.9	671	124	18.5	433	64.5	781,279	202,347	25.9
	Hudson	679,756	195,557	484,199	71.2	445	41	9.2	344	77.3	672,241	176,058	26.2
	Middlesex	837,288	371,039	466,249	55.7	523	50	9.6	285	54.5	807,450	114,513	14.2
	Monmouth	627,551	473,037	154,514	24.6	469	44	9.4	70	14.9	621,400	77,212	12.4
	Ocean	589,699	500,671	89,028	15.1	378	29	7.7	21	5.6	582,096	107,156	18.4
	Passaic	510,563	214,683	295,880	58.0	364	78	21.4	201	55.2	502,606	134,526	26.8
	Somerset	333,316	192,408	140,908	42.3	181	7	3.9	60	33.1	329,859	26,863	8.1
	Union	557,320	226,675	330,645	59.3	417	46	11.0	243	58.3	550,581	102,946	18.7
	Total North Jersey Region	***5,873,814***	***2,965,383***	***2,908,431***	***49.5***	***4,239***	***480***	***11.3***	***1,926***	***45.4***	***5,774,538***	***1,056,357***	***18.3***
Delaware Valley	Burlington	449,192	306,647	142,545	31.7	279	19	6.8	52	18.6	436,937	47,594	10.9
	Camden	510,996	293,604	217,392	42.5	382	63	16.5	128	33.5	504,013	102,553	20.3
	Gloucester	291,372	230,567	60,805	20.9	191	16	8.4	18	9.4	287,292	36,162	12.6
	Mercer	373,362	189,649	183,713	49.2	242	44	18.2	112	46.3	356,513	65,922	18.5
	Total Delaware Valley Region	***1,624,922***	***1,020,467***	***604,455***	***37.2***	***1,094***	***142***	***13.0***	***310***	***28.3***	***1,584,755***	***252,231***	***15.9***
South Jersey	Atlantic	272,926	153,899	119,027	43.6	183	29	15.8	66	36.1	267,153	62,930	23.6
	Cape May	94,549	80,953	13,596	14.4	90	5	5.6	9	10.0	92,226	16,607	18.0
	Cumberland	154,952	73,427	81,525	52.6	99	16	16.2	44	44.4	142,679	43,176	30.3
	Salem	63,776	47,874	15,902	24.9	49	6	12.2	8	16.3	62,517	13,427	21.5
	Total South Jersey Region	***586,203***	***356,153***	***230,050***	***39.2***	***421***	***56***	***13.3***	***127***	***30.2***	***564,575***	***136,140***	***24.1***
	Study Area Total	**8,084,939**	**4,342,003**	**3,742,936**	**46.3**	**5,754**	**678**	**11.8**	**2,363**	**41.1**	**7,923,868**	**1,444,728**	**18.2**
	New Jersey	**8,960,161**	**5,023,606**	**3,936,555**	**43.9**						**8,783,989**	**1,522,422**	**17.3**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

8.4.5.2 Socially Vulnerable Populations

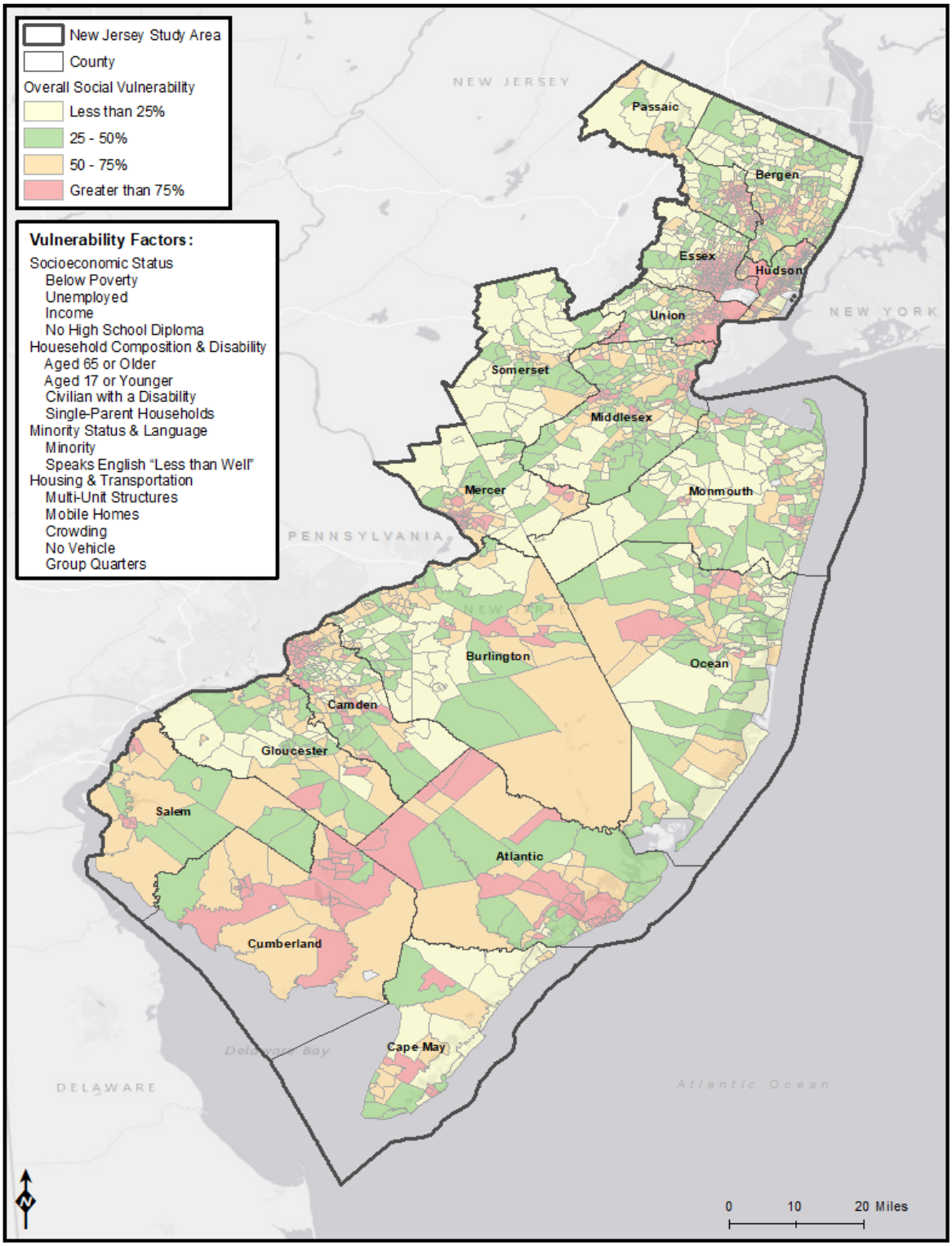
As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this chapter, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in "Fishing Communities" (Chapter 8.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 8-40 for the Study Area. As shown in Figure 8-40, the North and South Jersey Regions have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees. Additionally, many vulnerable block groups are located in and near the New York-Newark-Jersey City MSA (CDC 2016).

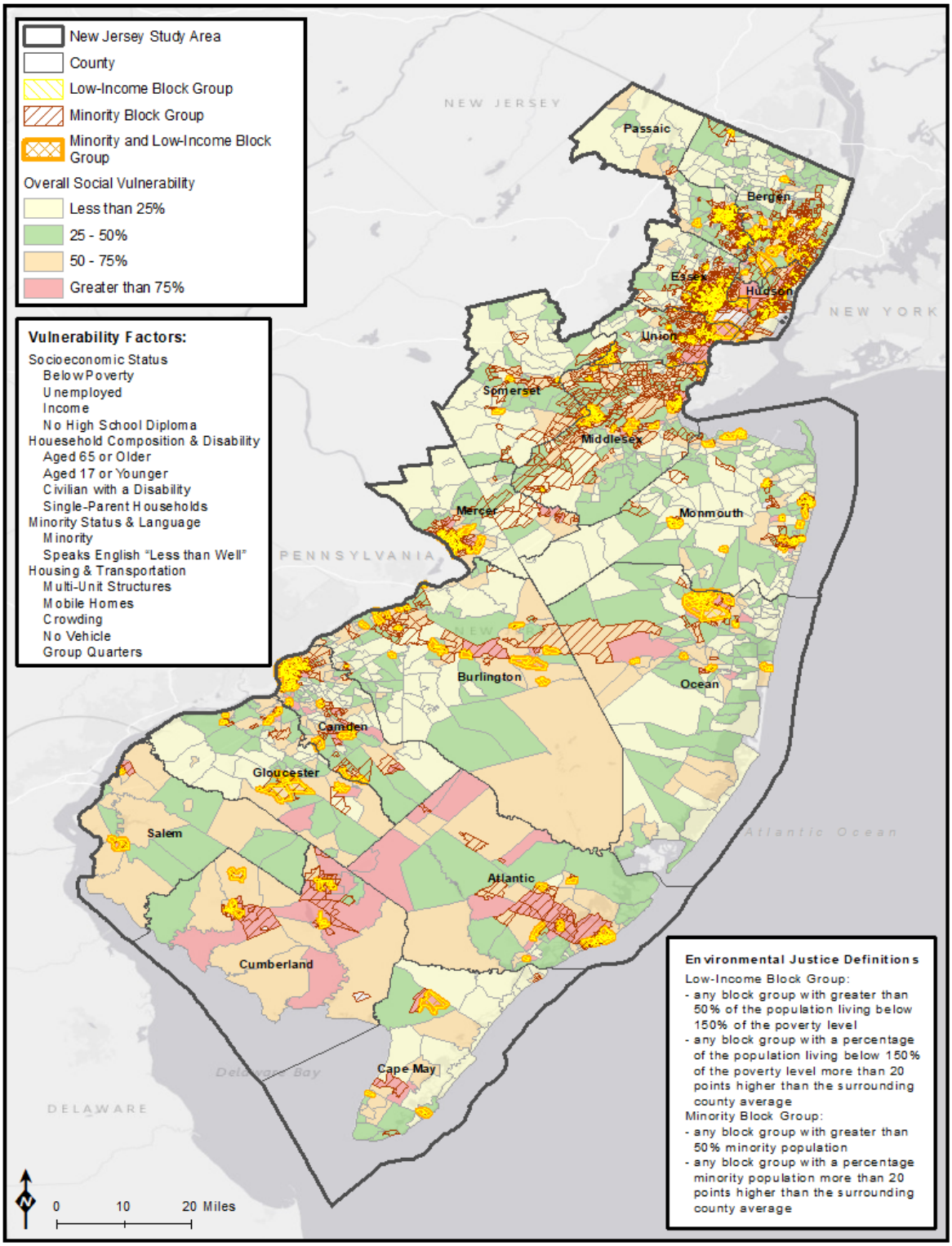
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 8-41 combines the CDC SoVI index (as shown in Figure 8-40) with minority and low-income populations (as shown in Figure 8-39) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC SoVI vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in the New York-Newark-Jersey City MSA.

Figure 8-42 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 8-42 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 8.2.2.2 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure.



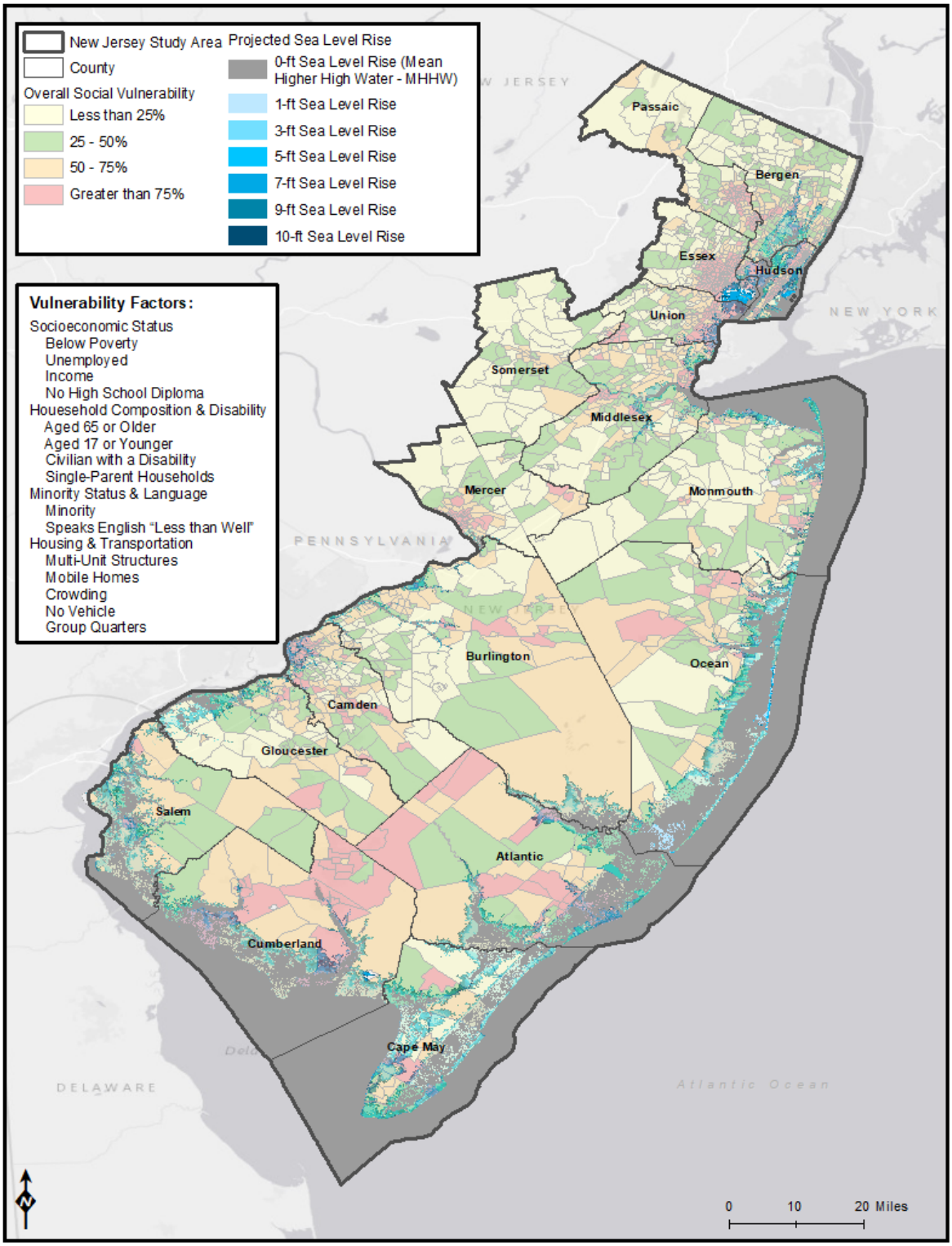
Source: CDC 2016

Figure 8-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the New Jersey Study Area by Census Tract



Source: CDC 2016, USCB 2017r

Figure 8-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the New Jersey Study Area



Source: CDC 2016, NOAA 2018a

Figure 8-42. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the New Jersey Study Area by Census Tract

As discussed in Chapter 8.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that the location of socially vulnerable populations is considered when evaluating potential future OCS-related project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area (CDC 2016).

8.4.5.3 Resource-Dependent Populations

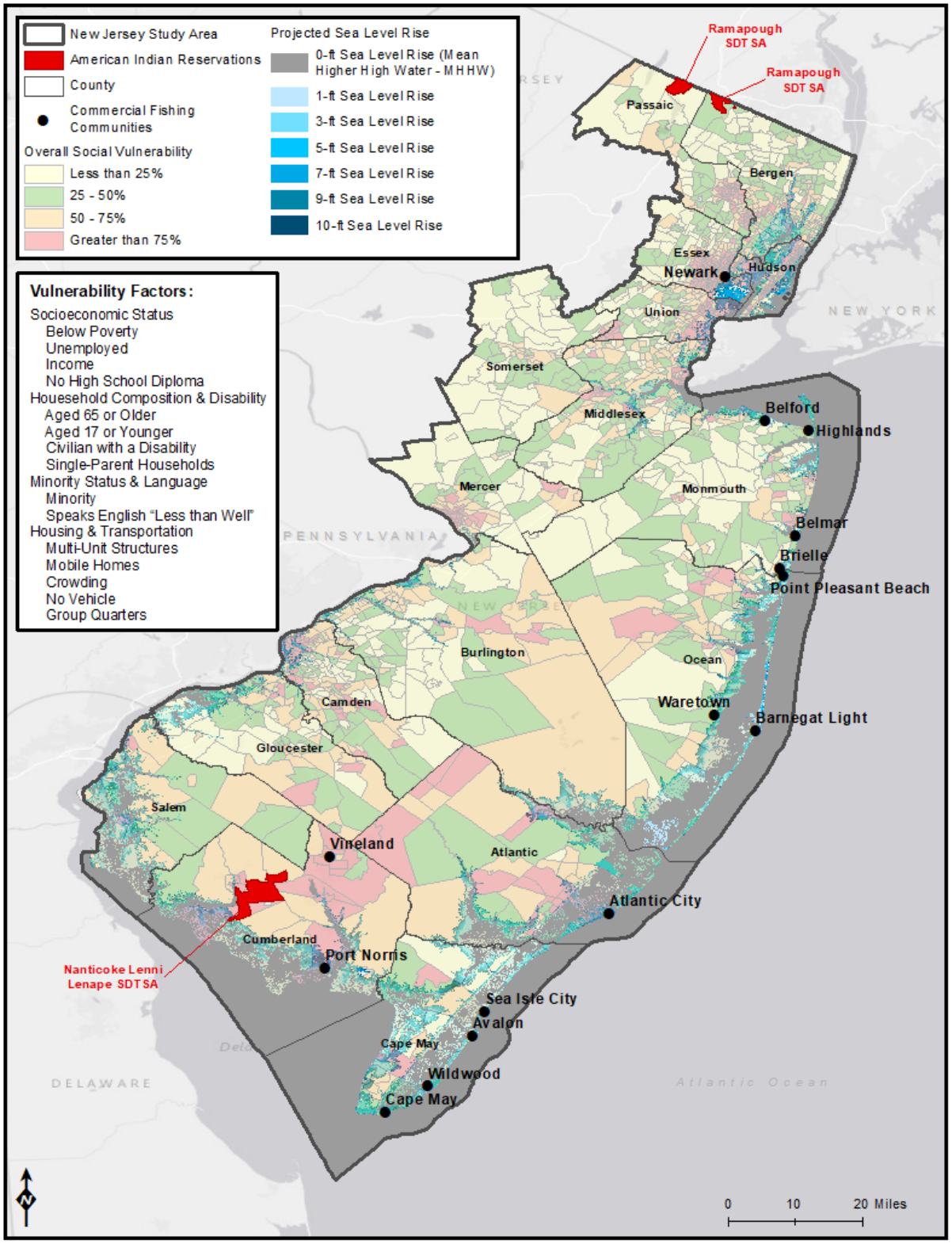
Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.

8.4.5.3.1 Fishing Communities

There are 15 fishing communities in the Study Area, all of which are located in the North and South Jersey demographic regions, as illustrated in Figure 8-43. Some of these communities, such as the Newark community, are associated with larger urban areas. Most are located along the coast, though Vineland is located inland and is known for freshwater bass fishing (City of Vineland 2020).

The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Atlantic City, Atlantic County
- Avalon, Cape May County
- Barnegat Light, Ocean County
- Belford, Monmouth County
- Belmar, Monmouth County
- Brielle, Monmouth County
- Cape May, Cape May County
- Highlands, Monmouth County
- Newark, Essex County
- Point Pleasant Beach, Ocean County
- Port Norris, Cumberland County
- Sea Isle City, Cape May County
- Vineland, Cumberland County
- Waretown, Ocean County
- Wildwood, Cape May County



Source: NOAA 2018a, NOAA Fisheries 2019k

Figure 8-43. Potential Vulnerable Communities in the New Jersey Study Area by Census Tract

As can be seen in Figure 8-43, all 15 of these fishing communities, with the exception of Vineland, are located within areas vulnerable to sea level rise, and therefore, also vulnerable to associated storm surge impacts. As discussed in Chapter 8.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that the location of fishing communities be considered early in the OCS-related project site-selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

8.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and American Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, American Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 8-43). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups, and who also depend on subsistence resources, may have distinct cultural or economic relationships with coastal lands that

require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

8.4.5.4 Tribes

New Jersey has five federally recognized tribes that have historical ties to the State, but there are no federally recognized tribes residing in the State. There are also three State-recognized tribes in Passaic, Burlington, and Cumberland Counties and three other tribal groups who reside in the Study Area. New Jersey recognizes Inter-Tribal People, which refers to American Indian people who reside in New Jersey but are members of federally and/or State-recognized tribes in other States (NJDS 2020b, NCSL 2019, HUD 2019b). Table 8-15 lists the federally and State-recognized tribes in New Jersey as well as the historically relevant tribes and tribes who have historical ties to, and thus may maintain interests in modern activities impacting the Study Area. Federally recognized tribal lands are shown in Figure 8-43.

Table 8-15. Federally and State-Recognized Tribes with Historical Ties to New Jersey

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes within the Study Area			
Powhatan Renape Tribe	State	Yes	Tribal members in New Jersey currently reside in the Rankokus Reservation that was ceded from the Rancocas State Park in 1982, located in Burlington County.
Ramapough Lenape Indian Nation	State	Yes	Tribal members in New Jersey currently reside in Passaic and Bergen Counties.
Nanticoke Lenni-Lenape Tribe	State	Yes	Tribal members in New Jersey currently reside in Cumberland County.
Federally Recognized Tribes Outside the Study Area			
Absentee-Shawnee Tribe of Indians of Oklahoma	Federal	Yes	Tribal members currently reside outside New Jersey (primarily in Oklahoma) but have historical ties to the Study Area.
Delaware Nation, Oklahoma	Federal	Yes	Tribal members currently reside outside New Jersey (primarily in Oklahoma) but have historical ties to the Study Area.
Delaware Tribe of Indians	Federal	Yes	Tribal members currently reside outside New Jersey (primarily in Oklahoma) but have historical ties to the Study Area.
Shawnee Tribe	Federal	Yes	Tribal members currently reside outside New Jersey (primarily in Oklahoma) but have historical ties to the Study Area.
Stockbridge Munsee Community, Wisconsin	Federal	Yes	Tribal members currently reside outside New Jersey (primarily in Wisconsin) but have historical ties to the Study Area (Burlington County).
Special Interest Groups and Organizations			
New Jersey Sand Hill Band of Lenape and Cherokee Indians	Neither	Yes	Tribal members in New Jersey currently reside in Monmouth County.
Taino Jatibonucu Tribe of Puerto Rico	Neither	Yes	Tribal members in New Jersey currently reside in Cumberland County.

Table 8-15. Federally and State-Recognized Tribes with Historical Ties to New Jersey

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
The United Cherokee Nation – New Jersey Clan	Neither	No	Tribal members currently reside in New Jersey. Established 2005.

Sources: NCSL 2019, HUD 2019b, NJDS 2020b

The Powhatan Renape Tribe is a branch of the Algonquin speaking Indians, and are members of the Powhatan Confederacy, based in Virginia. In 1982, the State of New Jersey ceded the Rancocas State Park to the Powhatan Renape, creating the Rankokas Reservation of the Powhatan Renape Nation in Burlington County (Ohlstein 2015). Today most of the decedents are in Oklahoma and Canada.

Ramapough Lenape Indian Nation have lived in the Ramapough Mountains (Bergen and Passaic Counties) for thousands of years; however, there is little documentation in New York or New Jersey that refers to the Nation. They were recognized by the State of New Jersey in 1980 and by the State of New York in 1982 (Ramapough Lenape Nation 2013).

Nanticoke Lenni-Lenape Tribe had Lenape ancestors that inhabited New Jersey, Delaware, New York, and eastern Pennsylvania when the European settlers came, and Nanticoke ancestors that lived in southeast Delaware. When the Nanticoke tribes began migrating from Maryland to Delaware, they united with the Lenni-Lenape Indians who remained in New Jersey. Most populations were later pushed out of their native land in Delaware, but some preserve their culture and tribal government in Delaware (Kent and Susses Counties). The Nanticoke Lenni-Lenape tribe established a tribally governed 501(c)3 nonprofit community benefit agency, "The Nanticoke Lenni-Lenape Indians of New Jersey, for educational, social, and cultural purposes, and aid the tribe members residing in the Delaware Valley (Nanticoke Lenni-Lenape Tribal Nation 2007a). Their main headquarters is in Bridgeton (Cumberland County) and have tribal grounds in Fairfield Township (Cumberland County) where many tribal families currently live (NL Tribe 2020).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. The communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 8-43. The overall social vulnerability for Bergen is primarily less than 25% to 50% while Burlington County is mixed and ranges primarily from less than 25% to 75%. Overall social vulnerability for Cumberland County primarily ranges from 50% to greater than 75% while Passaic County is primarily less than 25%, with only a few areas that range from 25 to 50% (CDC 2016). Also shown in Figure 8-43 is NOAA sea level rise data, indicating that Bergen, Burlington, and Cumberland Counties, in which tribal populations are present, are subject to some level of potential sea level rise vulnerability including inundation risk

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

8.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 8-16 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 32.4% of the population do not speak English at home. The North Jersey Region has the highest percentage (37.2%) of this population within the Study Area. Spanish is the language spoken by the majority (1,294,612 people or 17.0%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 649,706 people (8.5%) of the Study Area population (USCB 2017e).

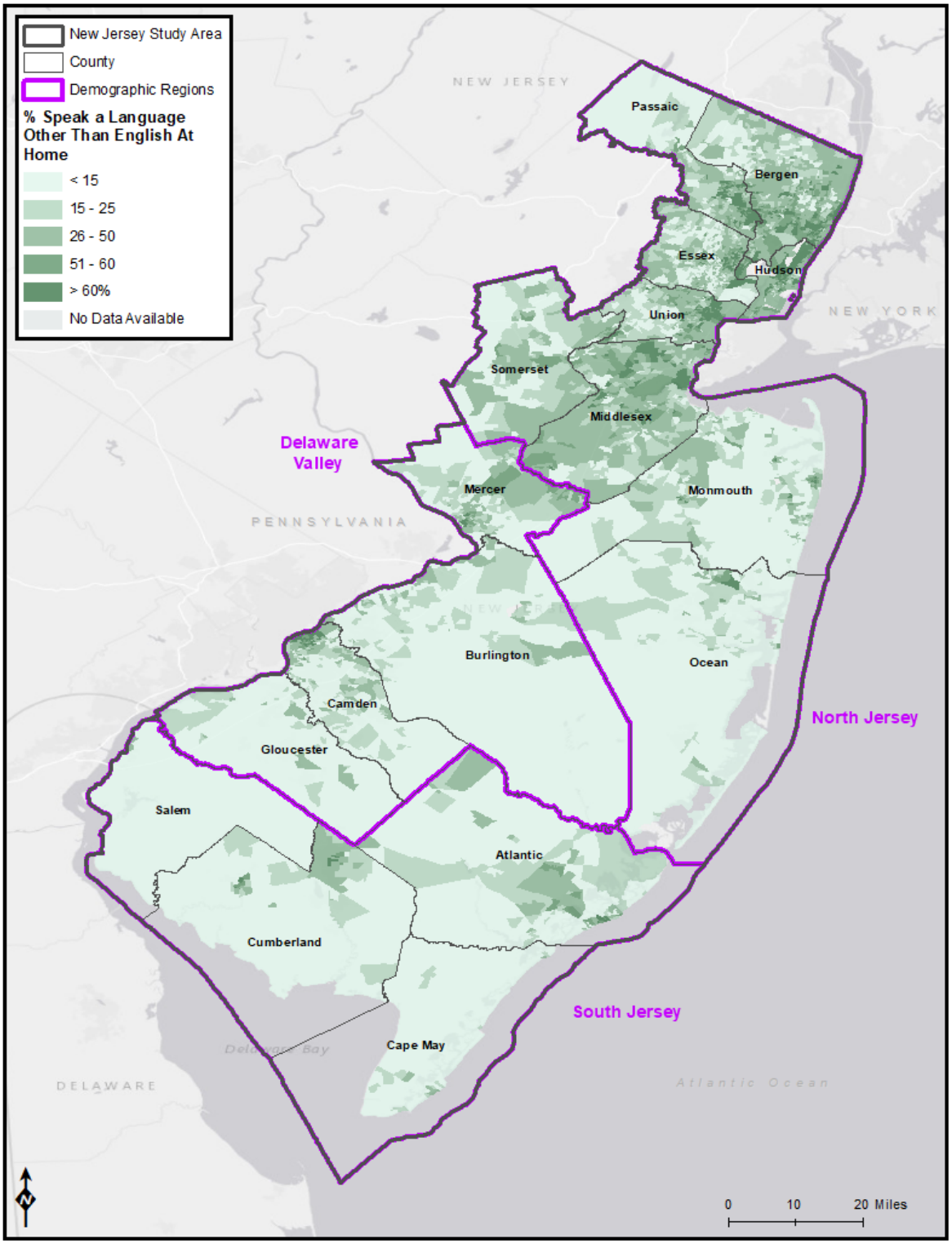
Figure 8-44 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations (as compared to the overall county population) were Hudson (59.2%) Passaic (48.2%), Union (43.6%), and Middlesex (43.1%) (USCB 2017e). As shown in Figures 8-39 and 8-41, Hudson and Union Counties have large areas ranked as over 75% vulnerable and impacted by rising sea levels (CDC 2016, NOAA 2018a).

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Table 8-16. People who Speak a Language Other than English at Home in the New Jersey Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
North Jersey	Bergen	888,260	354,332	39.9	132,141	98,840	102,152	21,199
	Essex	747,597	258,407	34.6	142,776	74,168	20,821	20,642
	Hudson	632,315	374,366	59.2	242,261	65,797	45,522	20,786
	Middlesex	788,144	339,555	43.1	127,825	121,494	72,989	17,247
	Monmouth	595,846	104,266	17.5	43,747	37,602	17,424	5,493
	Ocean	549,108	69,478	12.7	34,296	23,905	6,360	4,917
	Passaic	475,721	229,257	48.2	166,691	37,259	11,731	13,576
	Somerset	315,663	95,924	30.4	35,096	29,860	26,293	4,675
	Union	522,042	227,453	43.6	146,805	57,954	14,085	8,609
	Total North Jersey Region	***5,514,696***	***2,053,038***	***37.2***	***1,071,638***	***546,879***	***317,377***	***117,144***
Delaware Valley	Burlington	425,916	55,317	13.0	19,911	21,204	10,435	3,767
	Camden	479,309	98,089	20.5	58,895	18,455	16,585	4,154
	Gloucester	275,468	24,122	8.8	10,315	7,215	4,508	2,084
	Mercer	352,249	104,689	29.7	49,842	30,427	19,678	4,742
	Total Delaware Valley Region	***1,532,942***	***282,217***	***18.4***	***138,963***	***77,301***	***51,206***	***14,747***
South Jersey	Atlantic	257,159	70,075	27.2	39,601	18,679	9,998	1,797
	Cape May	90,066	8,414	9.3	4,994	2,682	625	113
	Cumberland	144,720	40,469	28.0	35,554	3,195	1,100	620
	Salem	60,245	5,249	8.7	3,862	970	278	139
	Total South Jersey Region	***552,190***	***124,207***	***22.5***	***84,011***	***25,526***	***12,001***	***2,669***
	Study Area Total	**7,599,828**	**2,459,462**	**32.4**	**1,294,612**	**649,706**	**380,584**	**134,560**
	New Jersey	**8,433,445**	**2,611,986**	**31.0**	**1,360,981**	**701,070**	**408,855**	**141,080**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017r, USCB 2017e

Figure 8-44. Percent of People Who Speak a Language Other than English at Home in the New Jersey Study Area by Census Block Group

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

8.4.6 Summary – Demographics and Socioeconomics

New Jersey's population is increasing, but at a rate slower than the Nation. The State's population grew 1.9% since the 2010 Census, having added approximately 171,627 people. During the same period, the population of the U.S. grew 4%. Much of the slowdown in the State's population growth is a result of domestic out-migration, as more people are moving out of the State than in. Reasons for migration losses include working age residents seeking employment opportunities elsewhere, and large senior populations of retirement age moving to the southern and western parts of the U.S. Other Northeastern States, such as New York and Connecticut, are experiencing high domestic outmigration for the same reasons (Frey 2019, realprocity.com 2019). The State's losses from domestic outmigration were partially offset by gains from natural increase and international migration resulting in an overall population gain of approximately 19,977 in 2018 according to USCB estimates (USCB 2019b).

The Study Area represented 90.2% (8.1 million residents) of the overall State population of 8.9 million. Three demographic regions – North Jersey, South Jersey, and Delaware Valley – comprise the Study Area. Overall, the population of the Study Area grew 2.2%, faster than the State (1.9%) but less than the Nation (4.0%) (USCB 2017a, USCB 2017d). Some Study Area counties are affected by growth inhibiting obstacles such as high property taxes. Parts of the State are still in recovery from Hurricane Sandy and the Great Recession (NJ.com 2019). Between 2010 and 2017, 11 out of 17 counties gained population; 6 counties lost population (USCB 2017a, USCB 2017d).

Between 2010 and 2017, the North Jersey and Delaware Valley Regions grew 3.0% and 0.5%, respectively. The South Jersey Region had a population loss of 1.4%, reflecting a trend toward urbanization (USCB 2017a, USCB 2017d). In general, urban towns and cities, especially those with walkable downtowns, access to public transit, and in commuting distance to the New York-Newark-Jersey City, NY-NJ-PA MSA New York, experienced growth (Stirling 2018).

Most counties in the Study Area's North Jersey Region grew between 2010 and 2017. Hudson County, in close proximity to New York City and public transit, led the region with 7.2% growth. Populous Bergen County, connected to New York City via the George Washington Bridge, grew 3.6%. Counties in the Delaware Valley Region had slower growth than North Jersey counties, in spite of proximity to Philadelphia and the State capital in Trenton. All South Jersey counties in the Study Area experienced population loss. These areas were impacted by Hurricane Sandy and have long commutes to city centers. The decline of once popular casino hub Atlantic City, once the only city to have legalized gambling outside of Las Vegas, impacted population loss in Atlantic County (McCarthy 2019, Jacobs 2017).

The population density of the Study Area was 1,446 persons per square mile in 2017, greater than the State (1,208 persons per square mile) and the Nation (91 persons per square mile), signifying that the coastal counties are more densely populated than the State and the Nation. There are six metropolitan areas in the Study Area. There are geographic high-density concentrations in major urban areas, surrounded by contiguous low-density areas comprising the "less than 901 to 1,200 persons per square mile" category. Population densities in the Study Area ranged from 192 persons per square mile in Salem County (located in the South Jersey Region) to 14,716 persons per square mile in Hudson County (located in the populous North Jersey Region, part of the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017d, USCB 2017c).

Population in the Study Area is projected to grow 15.2% (9.3 million residents) by 2040, more than the State (5.7%) but less than the Nation (16.4%). Growth will not be uniform across the Study Area.

Projected growth by study region is North Jersey (17.5%), Delaware Valley (9.4%), and South Jersey (8.6%). No regions are expected to decline in population. Ocean County, which attracts retirees and orthodox Jewish community with large families, is projected to grow 35.9%. Strong growth in projected in Middlesex, Hudson, and Gloucester Counties. Of the 17 counties in the Study Area, 15 geographic units are projected to increase population, while 2 units (Cape May and Salem Counties) are projected to decrease population (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017d).

The State and the Study Area are aging. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in New Jersey and 6.0% in the Study Area. The Delaware Valley Region had the smallest percentage (5.7%) of young children in 2017; the North Jersey Region had the highest percentage (6.1%). While the population of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline to 5.7% in the Nation but grow to 6.0% in the State by 2040. Projections with breakdown by age group were not available for the Study Area (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017b, USCB 2018b).

According to 2017 estimates, the elderly represented 14.9% of the U.S. population; 15.1% in New Jersey, and 15.0% in the Study Area. The South Jersey Region had the highest percentage of elderly (17.2%). The counties of Cape May and Ocean (popular retirement destinations) had high percentages of elderly at 24.5% and 22.1%, respectively. The number and proportion of elderly to the overall population is projected to rise in the Nation and the State, fueled by aging baby boomers. The consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., and 18.7% in the State. Projections with breakdown by age group were not available for the Study Area (NJTPA 2013, SJTPO 2016, DVRPC 2016, USCB 2017b, USCB 2018b).

Homeownership in New Jersey was 64.1%, slightly higher than the Nation (63.8%) and the Study Area (62.7%). Renters comprised approximately 35.9% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was slightly higher (37.3%) (USCB 2017m).

Median home values were lower in the Study Area ($229,550) than the State ($321,100) but higher than the Nation ($193,500). The northern part of the Study Area had higher median home values as compared to the southern part. The North Jersey Region is close to the New York-Newark-Jersey City, NY-NJ-PA and Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSAs (USCB 2017l). Workers can easily commute via public transit to high-paying jobs in the New York City metropolitan area. South Jersey had lower median home values, except in the coastal areas, the location of popular beach resorts (USCB 2017r).

Housing affordability for low- and moderate-income workers is a problem in New Jersey. A large proportion of the State (26%) is considered extremely low income, and of these households, 72% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

Home values increased in the State (1.5%) as well as in the metropolitan areas within the Study Area. The market temperature of the metropolitan areas was characterized by Zillow as ranging from "hot to very hot" (Zillow 2019). Home vacancy rates in New Jersey (11.0%) in 2017 were lower than the Nation (12.2%) and lower than the Study Area (11.4%). The highest vacancy rates (30.8%) were in the less densely populated South Jersey Region, and the lowest in the Delaware Valley Region (8.6%) (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. Cape May residents have been selling their homes to those seeking vacation houses (Stirling 2018).

The Study Area had a total employment of 3.9 million jobs in 2017, representing approximately 89.5% of the total jobs in New Jersey and 2.6% of the total jobs in the U.S. The dominant employment categories in the Study Area are educational services, and health care and social assistance (23.9%); professional, scientific, and management, and administrative and waste management (13.0%); retail trade (11.2%); and arts, entertainment, and recreation, and accommodation and food services (8.5%). The Study Area had a lesser percentage of manufacturing jobs (5.5%) as compared to the State (5.7%) and the Nation (10.3%) (USCB 2017p). The greater portion of jobs are located in the North Jersey Region near the high-density New York-Newark-Jersey City, NY-NJ-PA MSA.

New Jersey's ocean economy ranked 5th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy, and accounted for 145,494 maritime jobs in 2016 (approximately 3.7% of New Jersey's employment) (NOAA 2016b, USCB 2017i). Tourism and recreation, which includes eating and drinking establishments, hotels, marinas, boat dealers and charters, was the dominant sector, accounting for 65.9% (93,439) of maritime jobs. The Study Area had 143,702 maritime jobs, representing 98.8% of total maritime jobs in the State. The counties in the South Jersey and North Jersey Regions have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities. Hudson County had the greatest number of maritime jobs (22,343), representing 7.6% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). The highest percentage of maritime jobs to overall county jobs were in Cape May (32.7%) (NOAA 2016b).

In 2017, New Jersey had median income of $76,475 (32.6% higher than the Nation's median income) and per capita income of $39,069 (25.3% higher than the Nation's per capita income). Median and per capita income in the Study Area were lower than the State at $65,771 and $36,205, respectively (USCB 2017k, USCB 2017n). Median household income and per capita income are higher in the northern part of the State, close to the New York-Newark-Jersey City, NY-NJ-PA MSA (USCB 2017r).

The average unemployment rate in the Study Area was 7.1%, similar to the State (7.0%) but more than the Nation (6.6%), reflecting the availability of jobs in high-density urban areas. The South Jersey Region has the highest rate of unemployment (9.7%). Counties in this region sustained losses from Hurricane Sandy and are still in the recovery from the Great Recession. The decline of casino employment in Atlantic City impacted employment in Atlantic County. The North Jersey Region has the lowest (6.8%). Within the Study Area, unemployment rates ranged from 4.9% in Somerset County (North Jersey Region) to 10.9% in Atlantic County (South Jersey Region) in 2017 (USCB 2017h).

In the Study Area, 28.4% of the working-age population hold only a high school diploma; 40.3% hold a college or advanced degree. In the Study Area, 28.4% of the working-age population hold only a high school diploma; 40.3% hold a college or advanced degree. These rates are higher than the national rates (27.7% of the working-age population hold only a high school diploma and 36.9% hold a college and/or advanced degree (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 8,084,939 people living in the Study Area, approximately 3,742,936 (46.3%) are minority. Of the 5,754 block groups in the Study Area, approximately 41.1% (2,363 block groups) are considered minority populations.

Each of the demographic regions contain census block groups with minority populations. The North Jersey Region has the highest percentage of census block groups with minority populations (45.4%.); the Delaware Valley Region had the lowest (30.2%). Counties with the highest percentages are Hudson (77.3%), Union (58.3%), Passaic (55.2%), and Middlesex (54.5%), all located in the North Jersey Region. Within the Study Area the largest minority group is Black or African-American (13.7%) followed by Hispanic or Latino (12.3%) (USCB 2017f)

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 7,923,868 people for whom poverty status is determined living in the Study Area, approximately 1,444,728 (18.2%) have incomes less than 150% of the poverty level. Of the 5,754 census block groups in the Study Area, approximately 11.8% (678 block groups) are considered low-income populations. Each of the demographic regions contain census block groups with high percentages of low-income populations. The South Jersey Region contains the highest percentage (13.3%); the North Jersey Region contains the lowest (11.3%) (USCB 2017o).

Resource-dependent populations include 15 fishing communities and subsistence populations in the Study Area ((NOAA Fisheries 2019g). New Jersey has no federally recognized and three State-recognized tribes within the Study Area, as well as several American Indian organizations.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. The North and South Jersey Regions have the highest vulnerability ranking within the Study Area. Additionally, many vulnerable block groups are located in and near the New York-Newark-Jersey City, NY-NJ-PA MSA. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in the North Jersey Region. Many communities along the coast in the New York City and Long Island Regions are at risk for sea level rise and other coastal hazards (CDC 2016, USCB 2017f, USCB 2017o). No federally recognized tribes currently reside in New Jersey; however five federally recognized tribes have historical interests within the state. There are three State-recognized tribes and three tribal groups who do reside in and have historical ties to New Jersey.

Populations that speak a language other than English are present within the Study Area. In the Study Area, 32.4% of the population do not speak English at home. Spanish is the language spoken by the majority (1,294,612 people or 17.0%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 649,706 people (8.5%) within the Study Area population (USCB 2017e). Counties with the highest percentages of these populations were Hudson (59.2%) Passaic (48.2%), Union (43.6%), and Middlesex (43.1%) (USCB 2017e).

Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact community emergency response planning and implementation factors such as sea level rise, or storm surge (USCB 2001).

8.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

8.5.1 Regional Observations

New Jersey is bounded on the northeast by Raritan Bay, which is fed by the Raritan River, and on the south by the Delaware Bay, which is fed by the Delaware River. New Jersey has several miles of Atlantic coastline framed by a series of barrier islands in the area between these two bays. A variety of wetlands are found along the New Jersey shoreline. New Jersey has geographic characteristics that make it more susceptible to storm surge, primarily due to relatively low nearshore elevations. These shoreline areas are also susceptible to impacts associated with rising sea level.

The NJDEP manages land use as a critical function of the overall environmental protection strategy for the State. The NJDEP Division of Land Use Regulation regulates land use activities through a permit process in accordance with several statutes focused on freshwater, wetland, and tidelands protection; flood hazard control; coastal area and waterfront development; water pollution; and water protection and planning. Though NJDEP manages land use, local municipalities have the power to plan and zone for development under the Municipal Land Use Law (N.J.S.A. 40:55D-1) (New Jersey Future 2020).

Because New Jersey's farmland is in such high demand by developers and other non-agricultural interests, New Jersey's Department of Agriculture has a Strategic Plan containing a goal of preserving 20,000 acres of farmland per year. The Department's programs encourages county adoption of comprehensive farmland preservation plans, coordinating farmland preservation efforts with economic development strategies at county and municipal levels; proactive strategies that link the land, products, processing and workforce with marketing opportunities; and long-term land value appreciation (NJDA 2020).

Despite rigorous land use controls, New Jersey also offers a variety of incentives for development and, like many States, has Opportunity Zones targeted for development.

New Jersey's population is still increasing, but at a very slow rate. Much of the slowdown in the State's population growth is a result of domestic out-migration, an accelerating trend in the State, as more people are moving out of the State than in. New Jersey, as well as the neighboring States of Connecticut and New York, is experiencing high senior migration losses as a result of national migration pattern toward the southern and western parts of the U.S. These retirees are seeking a higher quality of life for a lower cost and more temperate weather. Other reasons for migration losses include poor employment outlook (Frey 2019, realprocity.com 2019).

Many of the major cities in New Jersey are clustered in the northern part of the Study Area closest to New York City. Population density is correspondingly higher in this part of the State as compared with other portions of the Study Area. The southern part of the Study Area has experienced minor population loss to the urban areas in recent years.

Parts of the State, particularly in the South Jersey Region, are still in recovery from the Great Recession which began in 2007 and Hurricane Sandy (2012) (Stirling 2018).

Housing affordability for low- and moderate-income workers is a problem in New Jersey. A large proportion of the State (26%) is considered extremely low income, and of these households, 72% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

8.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information of the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- NJDEP guidance on land use management and planning should be considered early in future project analysis to determine project compatibility with existing land use plans.
- Potential future projects that would impact prime farmlands may receive resistance if they are not compatible with New Jersey Department of Agriculture's Strategic Plan, which targets the preservation of farmland.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.

- As the State is still recovering from Hurricane Sandy and the Great Recession, projects that bring new jobs or economic benefits to local communities would likely be encouraged as long as they are designed in accordance with local environmental and land use planning statutes and objectives and take into account mitigation planning associated with sea level rise and corresponding storm surge issues.
- Cultural resource surveys may be required once site-specific information is known.
- New Jersey's geographic boundaries are largely defined by waterways; half of the Delaware Bay ports are located within New Jersey and the Port of New York and New Jersey is one of the world's major ports. Thus, maritime resources are an important component of New Jersey's multimodal transportation system. This may result in the New Jersey Study Area being well equipped to support new maritime projects.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 9

PENNSYLVANIA

9 Pennsylvania

9.1 Introduction

This chapter presents the coastal land use baseline analysis for the Commonwealth of Pennsylvania to support development of future BOEM environmental impact assessments related to prospective development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Pennsylvania is located near the North Atlantic Planning Area. A total of three counties are located within the Pennsylvania Study Area (Study Area) along the Pennsylvania coastline. Counties range in population size from 563,384 in Delaware County to 1,569,657 in Philadelphia County. There is only one city in the Study Area with a population over 250,000; it is Philadelphia with a population of 1,587,761. The next most populous city in the Study Area is Levittown with a population of 52,433 (ESRI 2019a). Pennsylvania cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Pennsylvania is unique to other northern Atlantic States because it does not have a coastline with the Atlantic Ocean; rather, the coastal status is determined by proximity to the Delaware River shoreline. The Pennsylvania coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes three counties located within the Commonwealth of Pennsylvania. The Study Area is shown in Figure 9-1 and Figure 9-2 and includes Bucks, Delaware, and Philadelphia Counties.

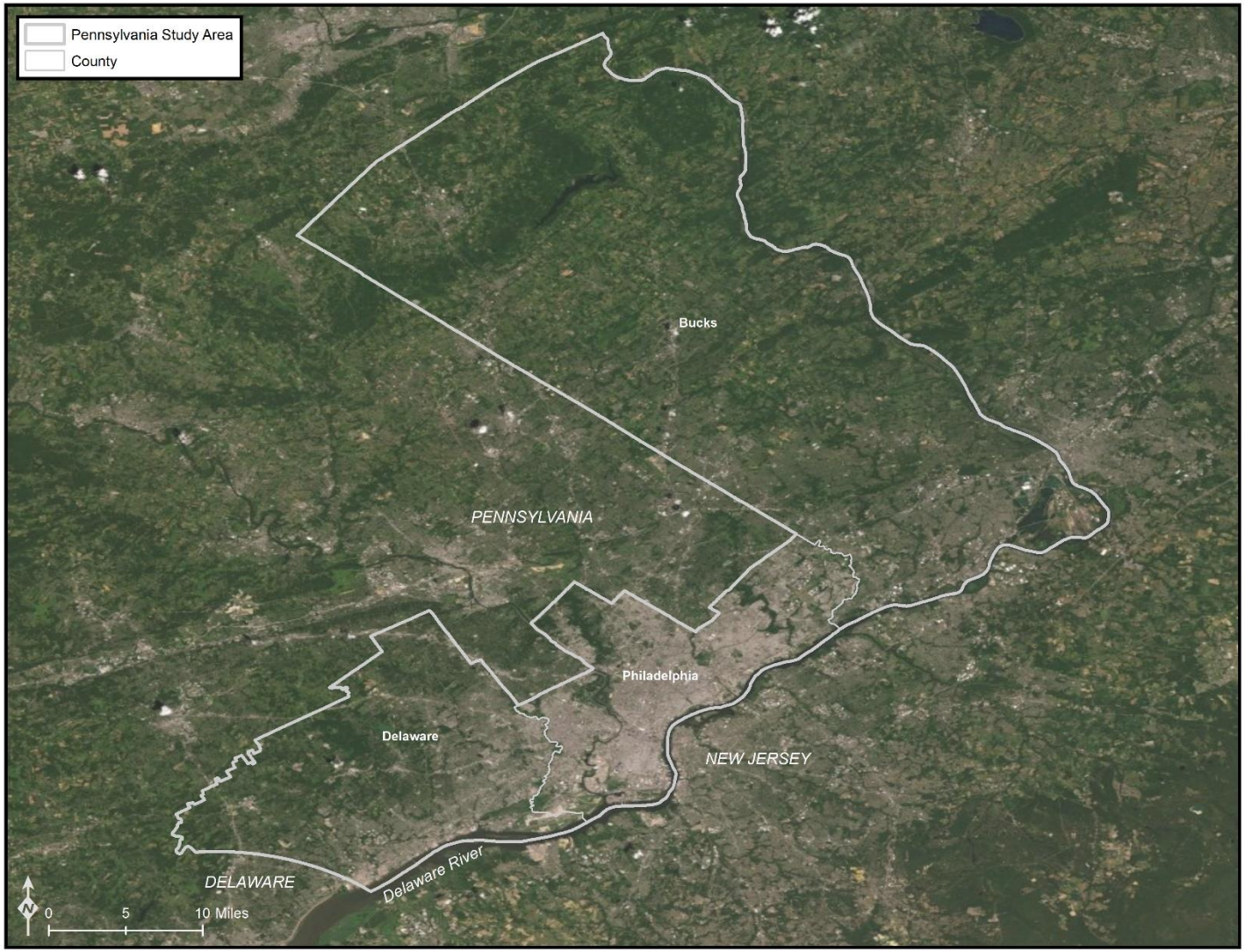
8.6.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table are rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Pennsylvania are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as

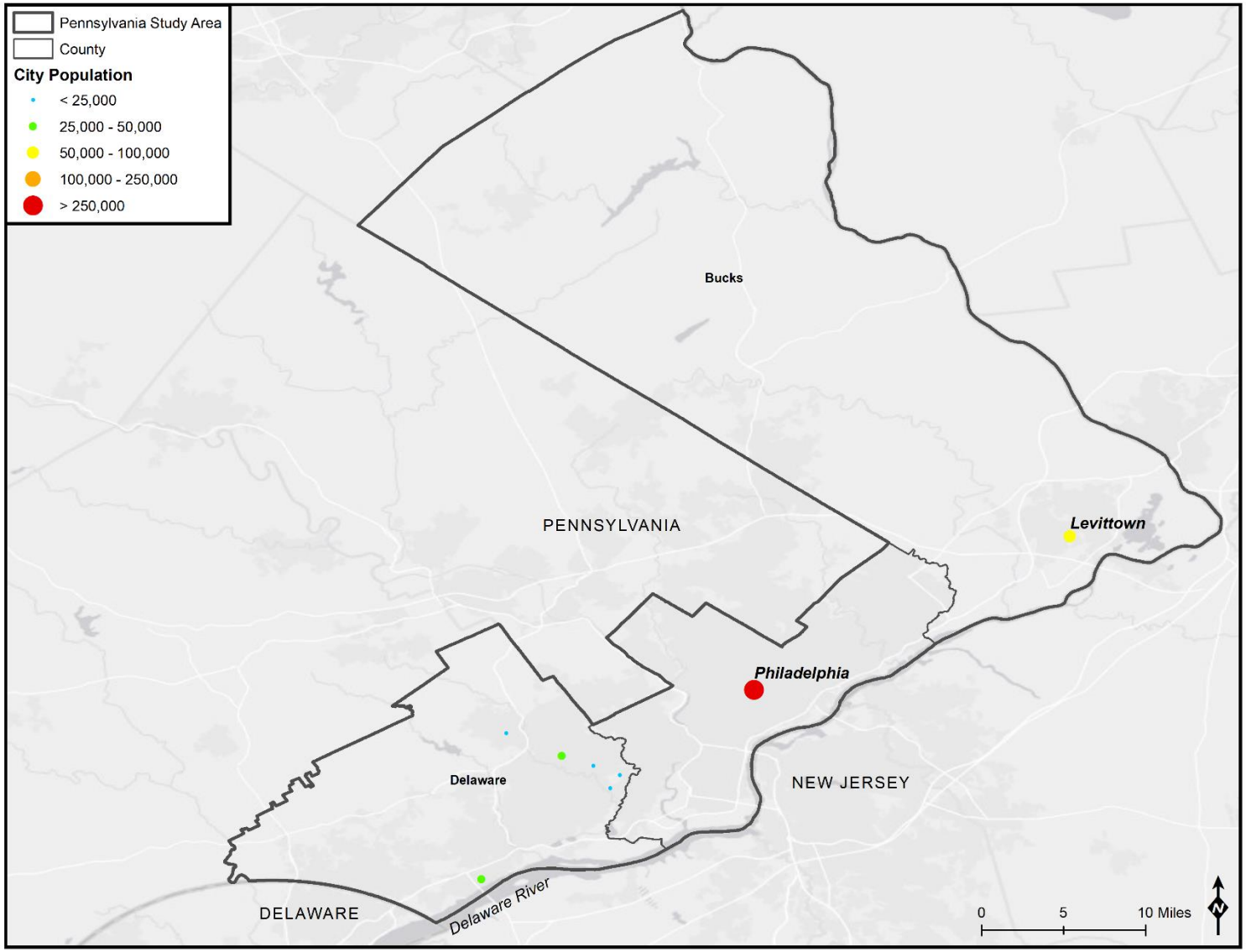
- Pennsylvania Geospatial Data Clearinghouse (Pennsylvania Spatial Data Access)
- Pennsylvania Department of Conservation and Natural Resources
- City of Philadelphia
- Pennsylvania Fish and Boat Commission
- The Pennsylvania State University
- Pennsylvania Department of Transportation
- The Center for Rural Pennsylvania

The metadata database for Pennsylvania specific State, county, and local data sources is included in Appendix A.



Source: ESRI 2019a

Figure 9-1. Commonwealth of Pennsylvania Study Area



Source: ESRI 2019a

Figure 9-2. Cities in the Pennsylvania Study Area

9.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the Study Area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

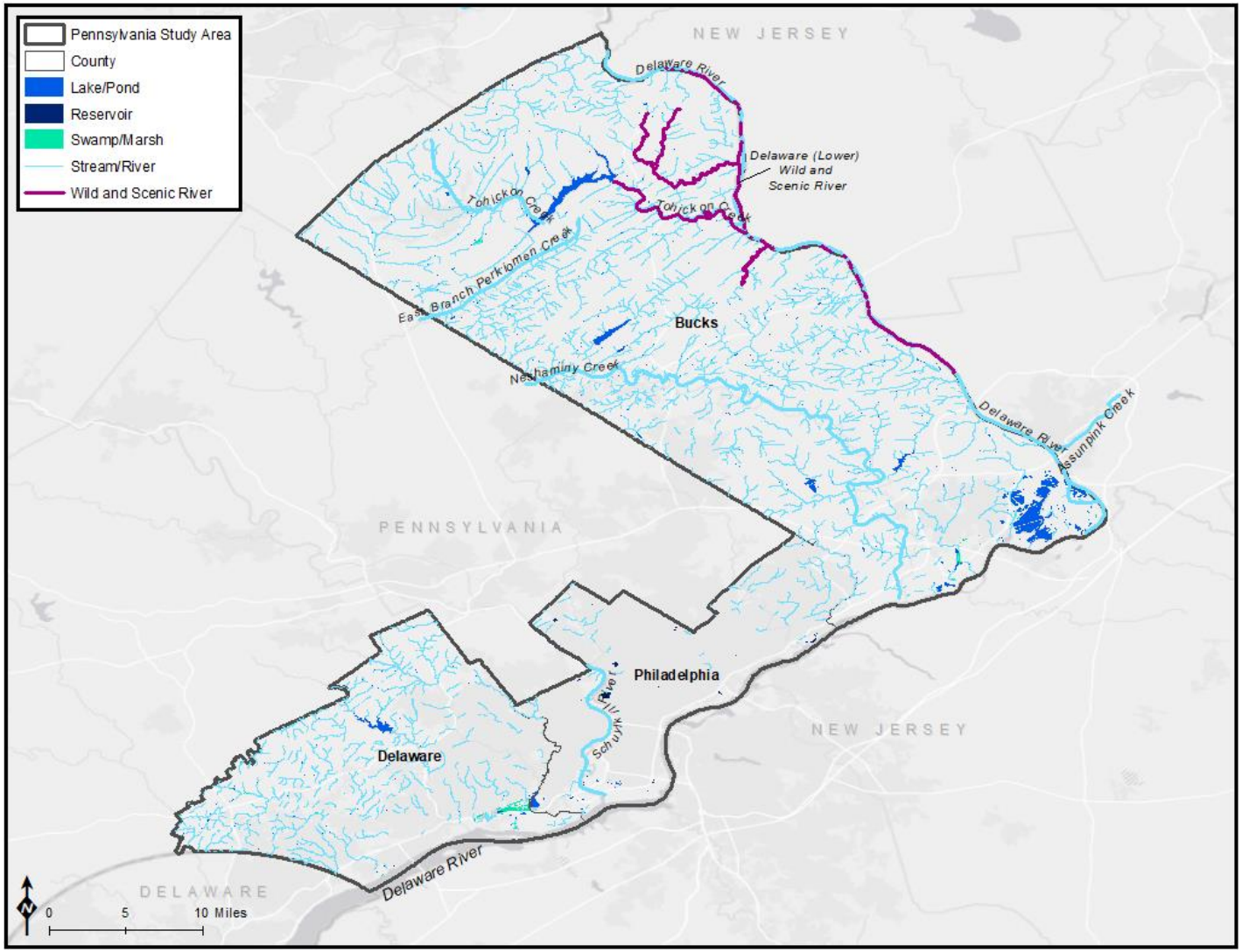
9.2.1 Water Resources

Pennsylvania's water resources include rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

9.2.1.1 Rivers

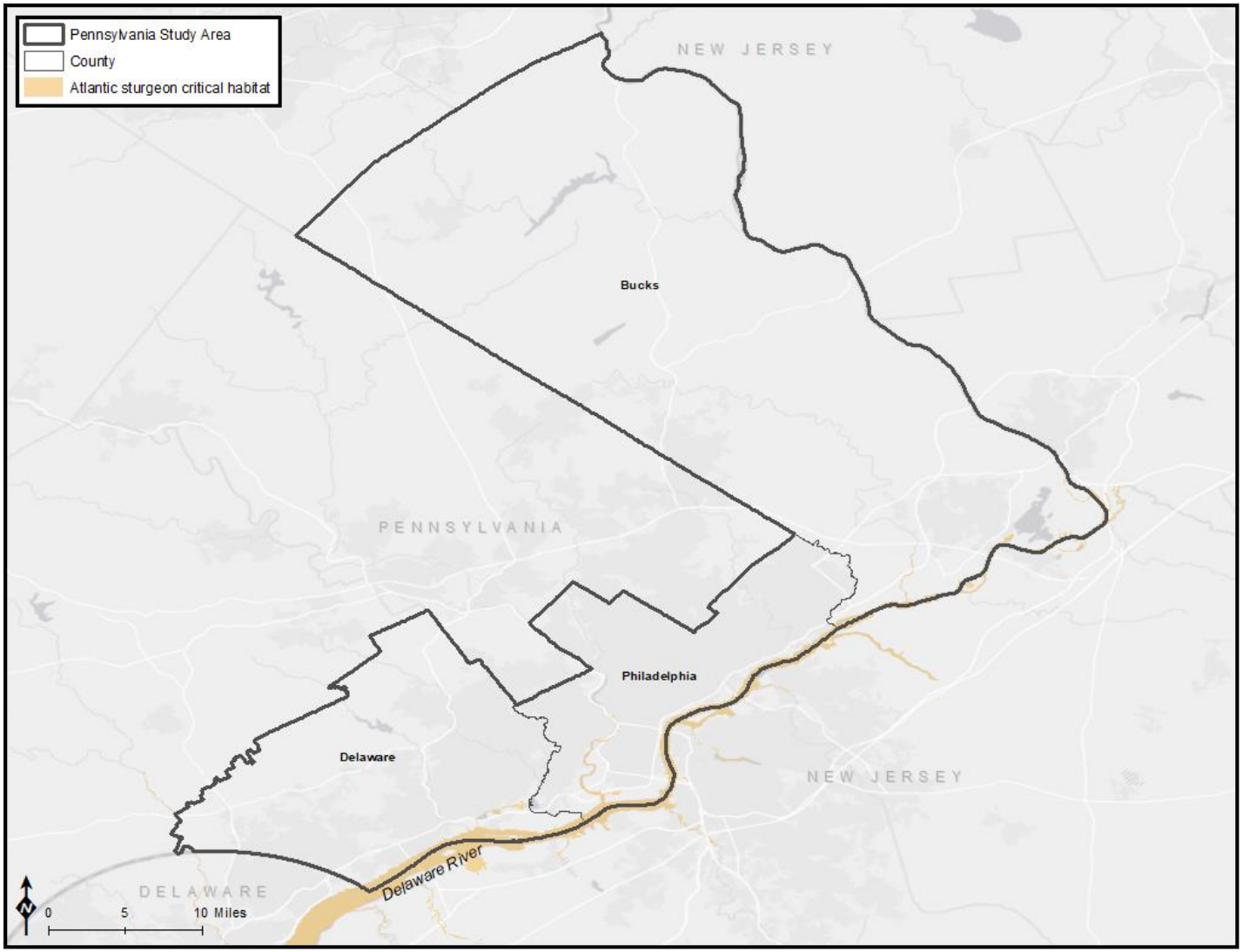
The Study Area is located within the Delaware River Basin with major contributions from both the Delaware River and one of its major tributaries, the Schuylkill River. The Study Area incorporates both the river nature of the Delaware in its southeasterly flow from the mountains and the estuary nature of the tidally influenced Delaware flowing southwesterly from Trenton, New Jersey. Along this tidal stretch, the Delaware River is joined by the Schuylkill River south of Philadelphia before leaving the Study Area to become Delaware Bay and flow into the Atlantic Ocean. Figure 9-3 shows the major surface water bodies within the Study Area. Major rivers in the Study Area include Tohickon Creek, Neshaminy Creek, Schuylkill River, and Delaware River. As shown in Figure 9-4, the Delaware River also provides critical habitat for the shortnose sturgeon and the Atlantic sturgeon in the Study Area (USFWS 2019i, USFWS 2019j, USGS 2019e).

Arising from Springfield Township in Bucks County, Tohickon Creek travels almost 30 miles east southeast to the Delaware River. Dammed by the USACE in 1958, Tohickon Creek formed Nockamixon Lake, the largest lake in Bucks County. The Pennsylvania Department of Environmental Protection and the Department of Conservation and Natural Resources coordinate regular releases from the dam to provide recreational uses and influx of cold waters into the last 11 miles of the Tohickon. Although petitioned for designation as an exceptional value waterway in 1995, as part of the review of the exceptional value petition, an evaluation of the existing and designated uses of the stream were conducted. Designated uses are based on regulations designed to protect certain types of water bodies. Existing uses are the actual, observed, and measured conditions of the water body. A draft stream evaluation report released in late 2019 recommended downgrading this lower mainstream portion of the waterway from a more restrictive cold water fishes designated use to a less restrictive warm water fishes use based on the survey observations of the waterway, largely because of the presence of the Nockamixon Dam. The survey identified no cold water aquatic community and found conditions more suitable to a warm water aquatic community. Such a change would not meet the requirements of the exceptional value designation. This recommendation is under further review (PADEP 2019, Bagenstose 2019).



Source: USGS 2019e

Figure 9-3. Hydrography in the Pennsylvania Study Area



Sources: USFWS 2019i, USFWS 2019j

Figure 9-4. Critical Habitat within the Pennsylvania Study Area

Flowing from the North Branch and West Branch of Neshaminy Creek, the Neshaminy flows southeast through Bucks County towards the Delaware River. The Neshaminy is joined by Little Neshaminy Creek, which rises near Montgomeryville, Pennsylvania flowing east through Bradford recreation area and dam before joining with the Neshaminy about 24 miles above its confluence with the Delaware near river mile 115. The North Branch of the Neshaminy is dammed forming Lake Galena, a 356-acre reservoir, 3 miles from Doylestown. Drinking water is withdrawn from North Branch Neshaminy about 2 miles downstream of Lake Galena. Historically, excessive nutrients and suspended sediments in Lake Galena led to toxic blue-algal blooms and reduced water quality. Implementation of agricultural and stormwater best management practices along with restoration of protective riparian habitats have improved water quality in this continuing endeavor (Bucks County Conservation District and Link 2010).

Rising from the Appalachian Mountains in Schuylkill County, the eastern branch of Schuylkill River merges with the western branch from Minersville, Pennsylvania to form the Schuylkill River in Pottsville, Pennsylvania. From Pottsville, the Schuylkill River flows 135 miles southeast to Philadelphia and the Delaware River, being joined by Tulpehocken Creek near Reading and Manatawny Creek at Pottstown. The Schuylkill is then joined by French Creek and Perkiomen Creek before Norristown and then by Wissahickon Creek before flowing into the Upper Estuary of the Delaware River northeast of the Philadelphia Airport.

The major river in the Study Area is the Delaware River. Flowing from the Catskill Mountains of New York through Pennsylvania, New Jersey, and Delaware to enter the Atlantic at Delaware Bay, the Delaware River is the longest un-dammed river in the U.S. east of the Mississippi. More than 2,000 tributaries feed into the Delaware, including the Schuylkill. The Delaware River provides water for over 15 million people (USGS 2020, DRBC 2020a). Management of this important, multistate resource is through the Delaware River Basin Commission. Composed of the four State governors and a Federal representative, the Delaware River Basin Commission manages releases from reservoirs with consideration of water supply, water quality, and ecosystem sustainability while managing flooding risk and damage. Recognizing that Buck County includes drainage areas for parts of the Delaware, the Delaware River Basin Commission designated part of the Buck County as drainage area to special protection waters. Regulations under this program require a more stringent Delaware River Basin Commission approval for any new or expanded industrial and municipal wastewater treatment plants with an estimated daily average discharge rate of at least 10,000 gallons over a 30-day consecutive period, instead of the 50,000-gallon threshold used over the rest of the basin (DRBC 2019b, DRBC 2019d, DRBC 2020a).

Pennsylvanians receive their water supply from a mixture of groundwater sources and surface water, including the Ohio, Susquehanna, and Delaware River Basins. The Study Area is in the Delaware River Basin. While Philadelphia receives water from the Schuylkill and Delaware Rivers, and while surface water supplies much of north and central Buck County water, water needs in the coastal plain are also met with groundwater (USGS 1997). Suppliers to Delaware County include Aqua PA and Chester Water Authority. While the Chester Water Authority uses the Susquehanna River, Aqua PA uses eight surface water and 28 groundwater sources. Philadelphia County relies on the Baxter intake on the Delaware River along with the Belmont and the Queens intakes on the Schuylkill River. Bucks County water sources are a mixture of surface and groundwater sources.

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Pennsylvania has approximately 83,260 miles of river, only 409.3 miles are designated wild and scenic rivers. Several segments of the Delaware River along the New Jersey border, are designated as wild and scenic river in the Study Area (USFWS 2019a).

As shown in Figure 9-4, the Pennsylvania Study Area includes designated critical habitat for the New York Bight distinct population segment of the Atlantic sturgeon. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Pennsylvania, the designated critical habitat of the Atlantic sturgeon is in the Delaware River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

9.2.1.2 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 Floodplain Management and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 9-5, floodplains comprise about 10% of the counties in the Study Area, accounting for 9, 10, and 13% of the total acreage in Bucks, Delaware, and Philadelphia counties, respectively. Table 9-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

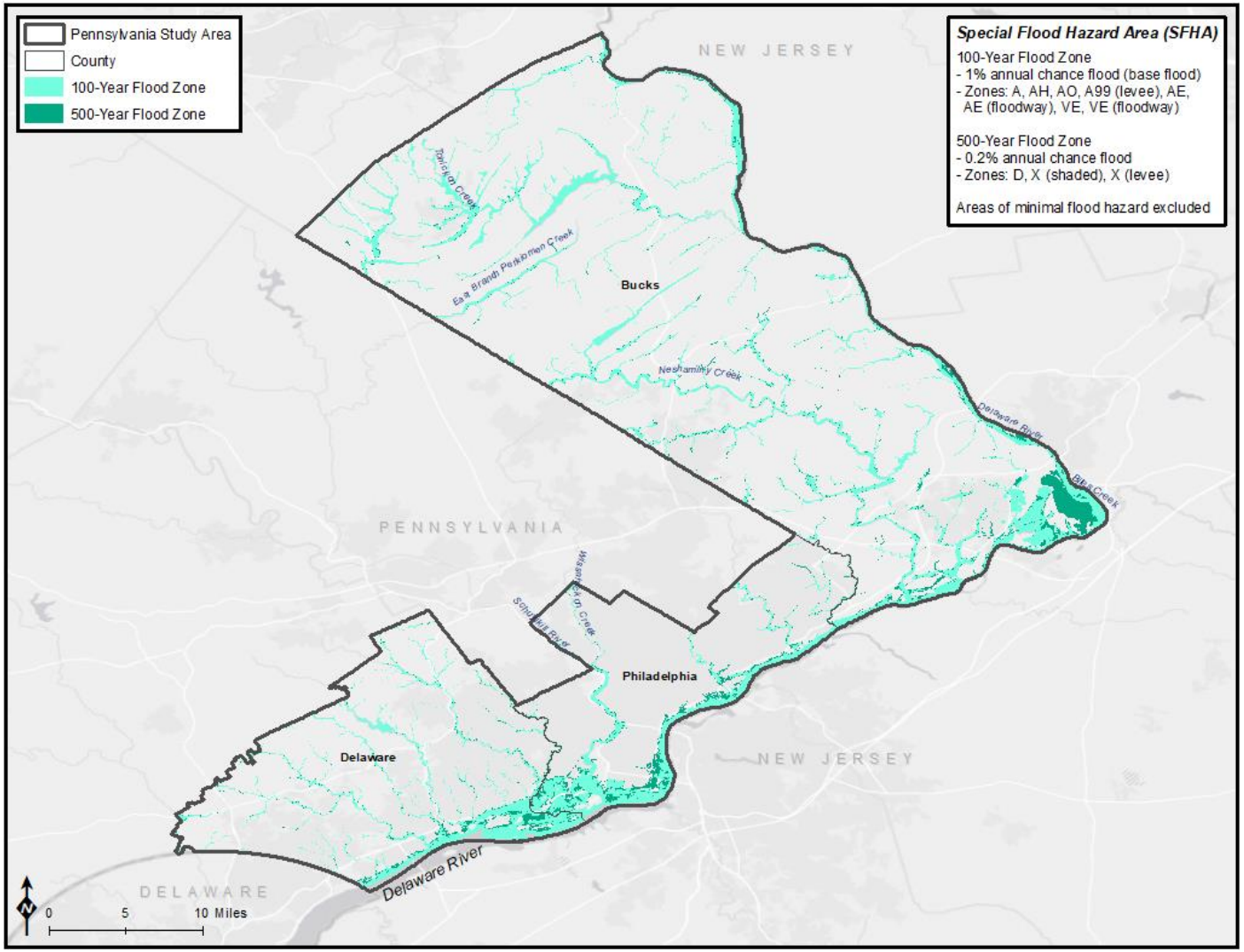
Table 9-1. Floodplains in the Pennsylvania Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 Year) (acres)	Floodplains (500 year) (%)
Bucks	37,373	9.7	7,029	1.8
Delaware	11,712	10.0	2,226	1.9
Philadelphia	11,752	13.7	3,500	4.1
Study Area Total	60,837	10.3	12,755	2.2

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

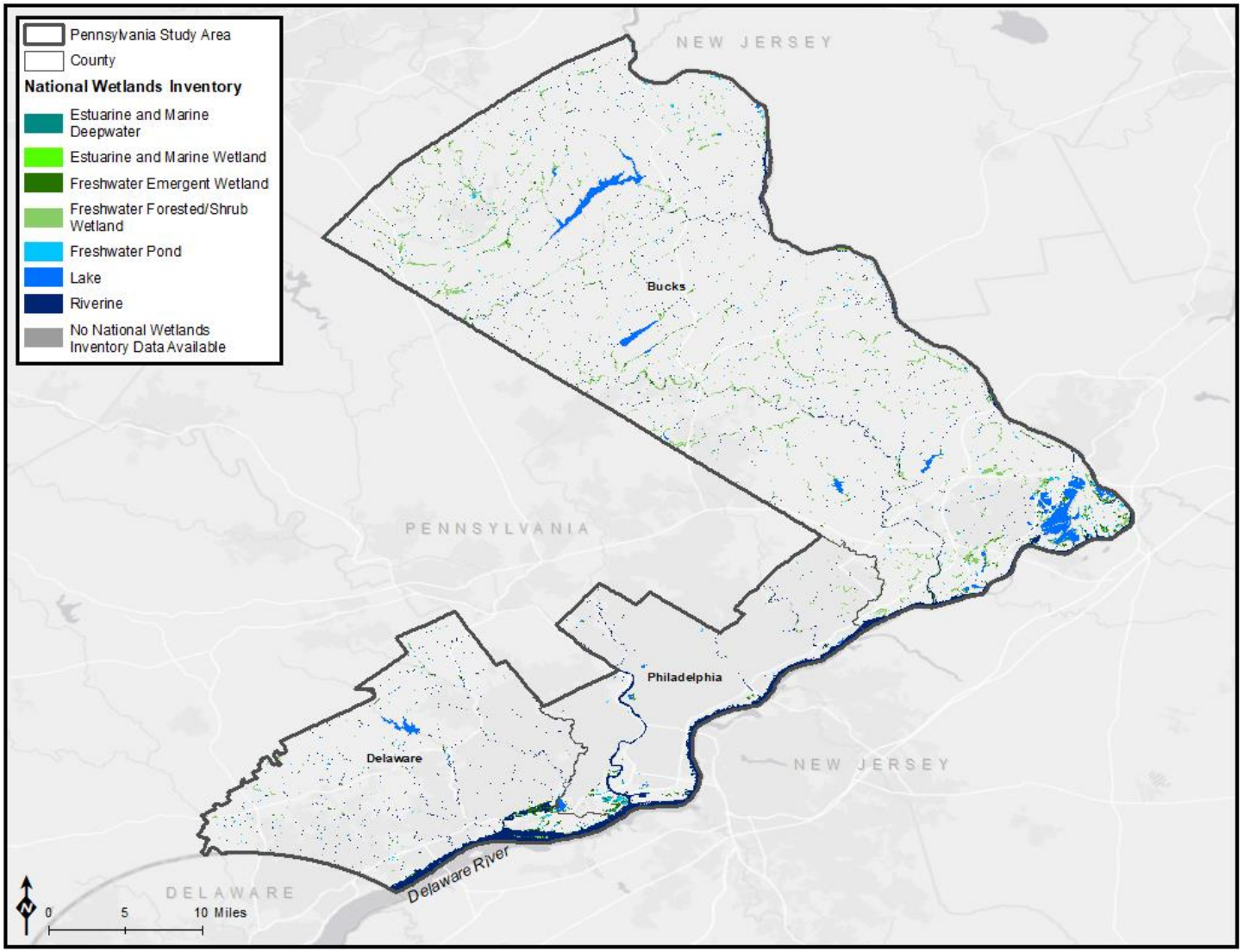
9.2.1.3 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 9-6, wetlands are a large part of the land area in many of the Study Area counties.



Source: FEMA 2019b

Figure 9-5. Floodplains of the Pennsylvania Study Area



Source: USFWS 2018a

Figure 9-6. Wetlands in the Pennsylvania Study Area

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 9-2 details the wetland acreage in the Study Area along with other water resources (FGDC 2013, USFWS 2019c).

Table 9-2. Wetlands in Pennsylvania Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Fresh water Pond	Riverine
Bucks	23,845	0	1,492	8,231	0	5,253	1,536	7,333
Delaware	7,220	0	626	584	2	404	366	5,237
Philadelphia	6,508	0	410	342	0	292	312	5,153
Study Area Total	37,573	0	2,529	9,157	2	5,949	2,214	17,723

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

Providing a rich mix of fresh and salt water, Pennsylvania estuaries include a wealth of wetlands. In the Study Area, the Delaware River Estuary, recognized as the tidal Delaware River up to Delaware River mile 133 at Trenton, is a recognized resource. Providing health, recreational, and economic benefits, these estuaries provide an abundance of diverse habitats that help mitigate erosion and the effects of flooding and pollution. Efforts to protect this valuable habitat include collaborative programs of debris and nitrogen reduction as well as habitat restoration (DRBC 2019b, DRBC 2019d, DRBC 2020a, DRBC 2020b). As such, this is an important natural and cultural resource within the Study Area.

9.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods, because higher seas raise the launch pad for storm surge (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in Pennsylvania areas along the Delaware River reflects the national trend for increasing population growth in the coastal areas. The socioeconomic impacts of this relationship are discussed in Chapter 9.4. Additionally, land subsidence increases the rate of relative sea level rise in areas with certain geological characteristics (Eggleston and Pope 2013).

9.2.2.1 Sea Level Rise

Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019).

According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.12 inches/year (NOAA 2019b).

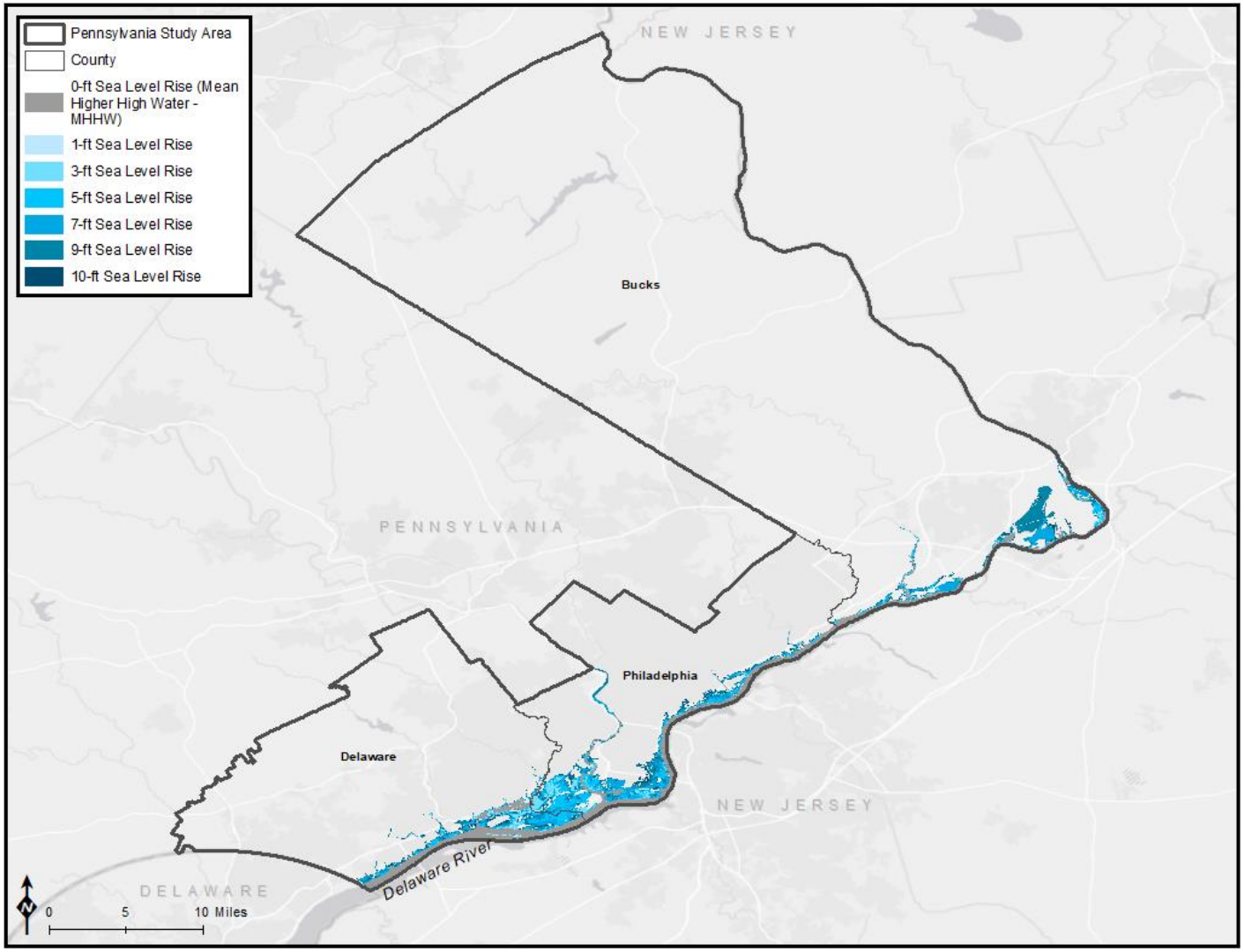
Figure 9-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in Pennsylvania along the Delaware River and its tributaries, especially in the City of Philadelphia, FDR Park, the Philadelphia International Airport, and farther north along the Delaware River at the oxbow feature defined by Van Sciver Lake, which holds the U.S. Steel Industrial Park (NOAA 2018a). These sea level rise data depict the potential inundation of the coastal areas as a result of 0-10 foot rise in sea level above current mean higher high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels.

Projections for future sea level rise in Pennsylvania based on NOAA research (with 1992 as the baseline) predict intermediate levels of sea level rise at roughly 1.6 feet by 2050 (0.33 inches/year), and 4.5 feet by 2100 (0.5 inches/year), which is almost four times the current global rate (Strauss et al. 2016). Greater than average sea level rise along Pennsylvania's Delaware River shoreline is due to the sinking, or subsidence, of the Delaware Valley (USEPA 2016a). Given additional forces such as subsidence and global climate effects, 4 to 9 feet should be considered a reasonable range in which extreme floods are likely this century along the whole Pennsylvania shoreline. Within the Commonwealth of Pennsylvania, nearly nine square miles of land lie less than 4 feet above the high tide line, much of this is within the Study Area in the City of Philadelphia. More than 5,000 people reside in more than 2,000 homes with $686 million in property value in this area. The Philadelphia International Airport is also within this area. When considering land area under 9 feet above the high tide line, which encompasses 29 square miles of land, totals reach $3.4 billion, over 27,000 people, and over 12,000 homes (Strauss et al. 2016).

9.2.2.2 Storm Surge

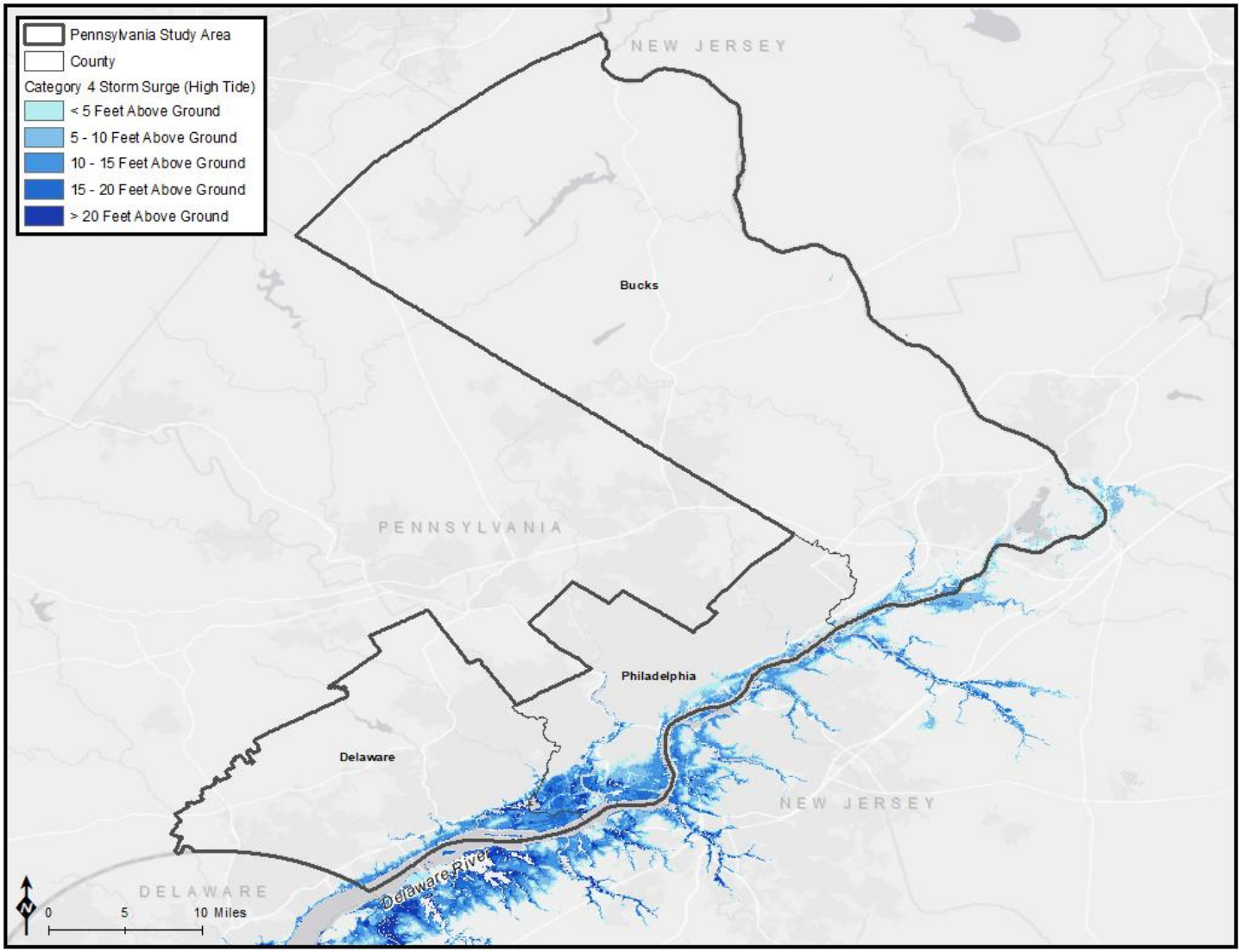
Storm surges from coastal storms increase the impacts of sea level rise. The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b).

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Figure 9-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Pennsylvania shoreline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario. Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the Pennsylvania shoreline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts. Storm surge is projected to impact areas in Pennsylvania similar to those affected by sea level rise but will produce impacts farther inland. A 2014 National Climate Assessment report identified Philadelphia's airport as particularly vulnerable to storm surges. One runway is just 8.3 feet above sea level (Cohen 2019). With sea level rise of 4 feet by the end of the century, a Category 1 hurricane would put a majority of the airport underwater (Sasko 2019).



Source: NOAA 2018a

Figure 9-7. Projected Sea Level Rise throughout the Pennsylvania Study Area



Source: NOAA 2020a

Figure 9-8. Projected Storm Surge throughout the Pennsylvania Study Area for a Category 4 Hurricane

The Delaware River Basin Commission maintains records of major storms and their impacts. Historically, the most significant floods occurred in 1955 as the result of two back-to-back rain events resulting from remnants of Hurricanes Connie and Diane in August 1955 caused record flooding in the Delaware River Basin. However, data available for that event is primarily as peak flow, rather than flood height. In general, past flooding in Pennsylvania comes from heavy rain events and snowmelt from upstream, rather than from storm surge (DRBC 2018).

9.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. Sea level rise is projected to impact areas in Pennsylvania along the Delaware River and its tributaries, especially in Philadelphia, FDR Park, the Philadelphia International Airport, and farther north at the oxbow feature defined by Van Sciver Lake, which holds the U.S. Steel Industrial Park (NOAA 2018a). Projections for future sea level rise in Pennsylvania based on NOAA research (with 1992 as the baseline) predict intermediate levels of sea level rise at roughly 1.6 feet by 2050 (0.33 inches/year), and 4.5 feet by 2100 (0.5 inches/year), which is almost four times the current global rate (Strauss et al. 2016). Given additional forces such as subsidence and global climate effects, 4 to 9 feet should be viewed as a reasonable range where extreme floods are likely this century along the whole Pennsylvania coast. Historically, flooding in Pennsylvania comes from heavy rain events and snowmelt from upstream, rather than from storm surge (DRBC 2018). Because of its northerly position, it is unlikely that a Category 4 or 5 hurricane would strike the Pennsylvania shoreline directly; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts. In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

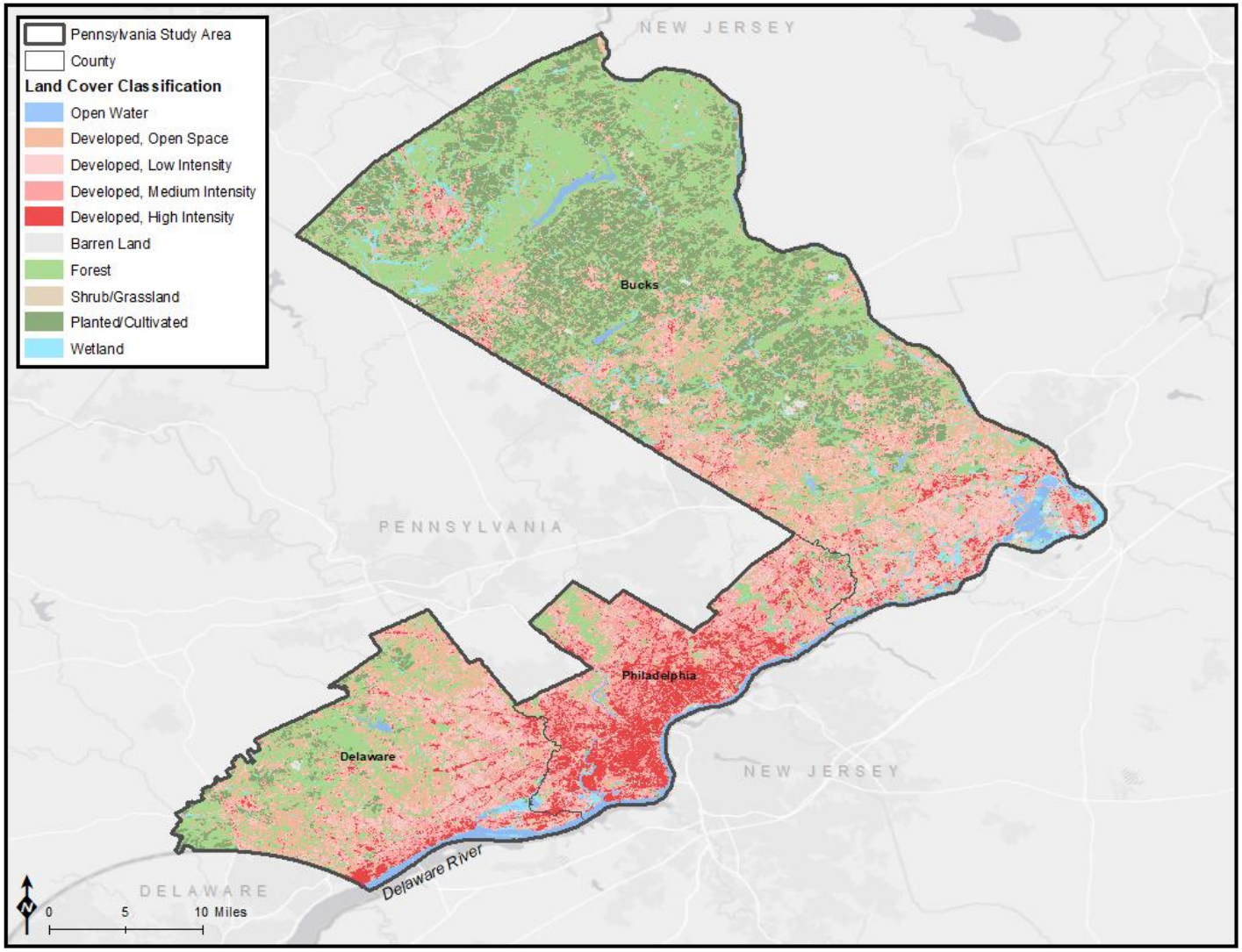
9.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

9.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a).

Table 9-3 presents the NLCD data for the three counties within the Study Area by acreage. With the exception of open water land cover (e.g., rivers, lakes, ponds, ocean), Table 9-4 presents the same NLCD data by percentage and overall land cover for each county (NLCD 2016a). Open water land cover was excluded from Table 9-4 because this land cover would not be considered for future industrial development. The following section discusses the key findings of this analysis.



Source: NLCD 2016a

Figure 9-9. National Land Cover in Pennsylvania Study Area

Table 9-3. Acres of Land Cover by NLCD Classifications in Pennsylvania Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Bucks	397,987	68,657	43,812	18,566	6,299	137,333	1,777	129,874	4,632	99,384	14,603	10,384
Delaware	121,986	34,209	22,138	13,968	6,475	76,790	223	31,753	669	6,660	1,706	4,185
Philadelphia	91,327	10,662	12,297	29,306	24,726	76,991	199	6,780	629	778	1,287	4,664
Study Area Total	611,301	113,528	78,246	61,840	37,499	592,067	2,200	168,406	5,930	106,821	17,596	19,233

Source: NLCD 2016a

Table 9-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Pennsylvania Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Types
Bucks	17.7	11.3	4.8	1.6	35.4	0.5	33.5	1.2	25.6	3.8	Developed/Forest/ Agricultural
Delaware	29.0	18.8	11.9	5.5	65.2	0.2	27.0	0.6	5.7	1.4	Developed/ Forest
Philadelphia	12.3	14.2	33.8	28.5	88.8	0.2	7.8	0.7	0.9	1.5	Developed
Study Area Total	19.2	13.2	10.4	6.3	49.2	0.4	28.4	1.0	18.0	3.0	Developed/Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

As shown in Table 9-4, the predominant land cover types in Pennsylvania are developed (49.2%) and forested lands (28.4%). Philadelphia County has the highest percentage of developed urban land in the Study Area. Of the 88.8% of Philadelphia County that is developed, only 26.5% is open space or low intensity development while 62.3% is of medium or high urban development. Delaware County has the second highest percentage of total developed land. Of the 65.2% of Delaware County that is developed, 47.8% is open space and low intensity development which could have good potential for future growth. Delaware County also has 27% forest land cover. Bucks County is mix of developed (35.4%), forest (33.5%), and agricultural (25.6%) cover.

Most of the forest cover in the Study Area is in Bucks County. Most of the high intensity urban development acreage is in Philadelphia County because of the City of Philadelphia. Philadelphia County is the smallest county in the Study Area and the urban sprawl extends into Delaware and Bucks Counties.

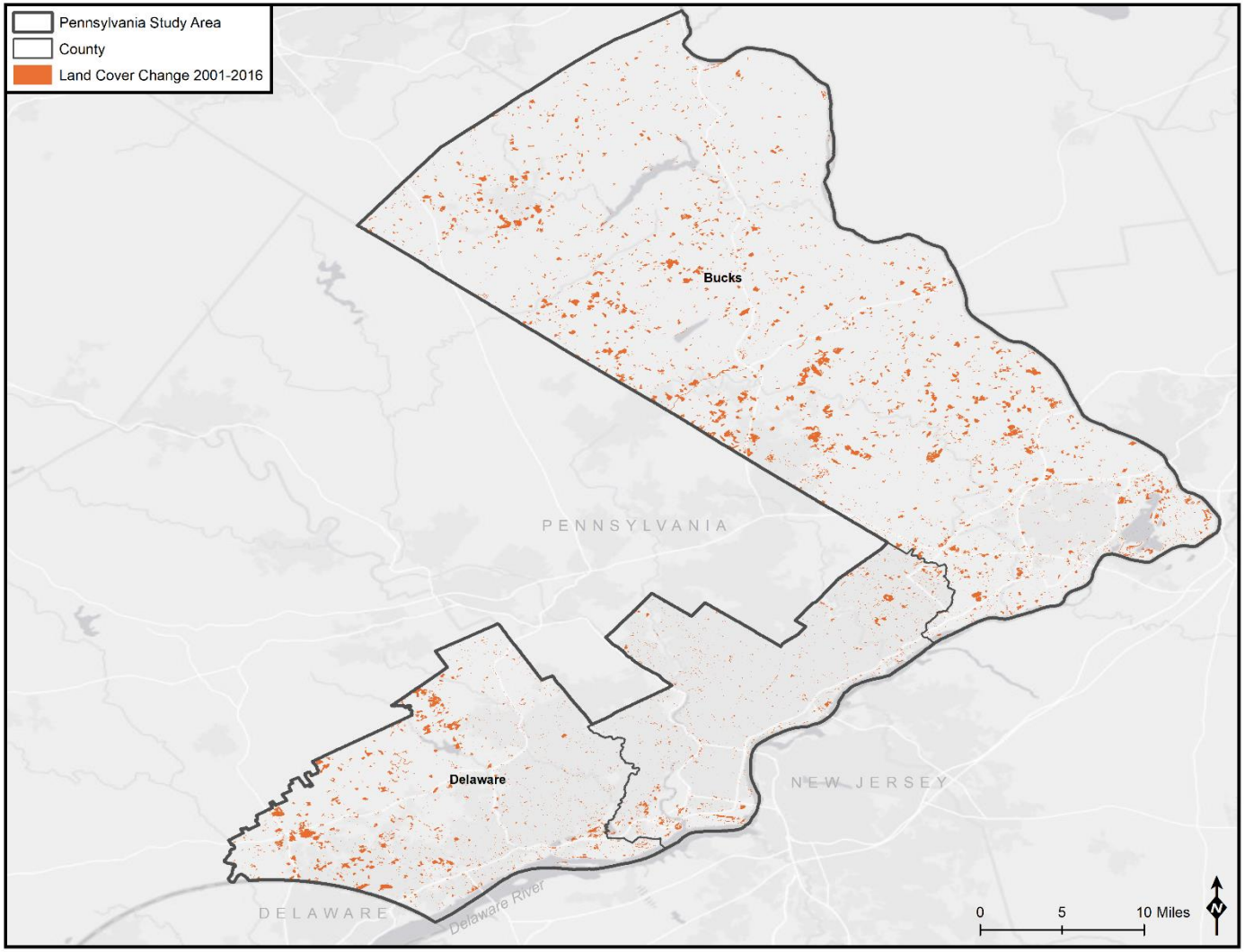
The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In the Study Area, 3.9% of the land cover changed at least once. Table 9-5 and Figure 9-10 how the land cover change within the Study Area from 2001 to 2016. Delaware County experienced the most significant land cover change at 4.4% followed closely by Bucks County at 4.0%. These were largely changes from or to any one of the urban land cover types. It is assumed these changes are associated with local urban growth. In Bucks County the change was also from or to either Hay or Cultivated Crops. This could be a result of various fields being made fallow for a few years before going back into cultivation. Philadelphia County experienced the least land cover change at 2.4%.

Table 9-5. Land Cover Change for the Pennsylvania Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Bucks	397,987	15,997	4.0
Delaware	121,986	5,327	4.4
Philadelphia	91,327	2,236	2.4
Study Area Total	**611,301**	**23,559**	**3.9**

Source: NLCD 2001-2016

It is likely that future industrial development activities will be concentrated in the Bucks and Delaware Counties because Philadelphia County may be too highly developed to support future development. Bucks and Delaware Counties have more open space and low intensity urban development, which has good potential for future growth. These counties have a large percentage of area that has been previously disturbed by other activities, which will help to minimize potential environmental impacts. These counties also have existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.



Source: NLCD 2001-2016

Figure 9-10. Land Cover Change for the Pennsylvania Study Area

9.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, including housing utilization, zoning, industrial incentives and vacancy rates, land cover change, and a focus on recreation will shape how new OCS-related activity will influence life in coastal communities. The following sections describe existing and future land use, zoning, housing utilization and vacancy rates, recreation resources, and industrial incentives within the Study Area.

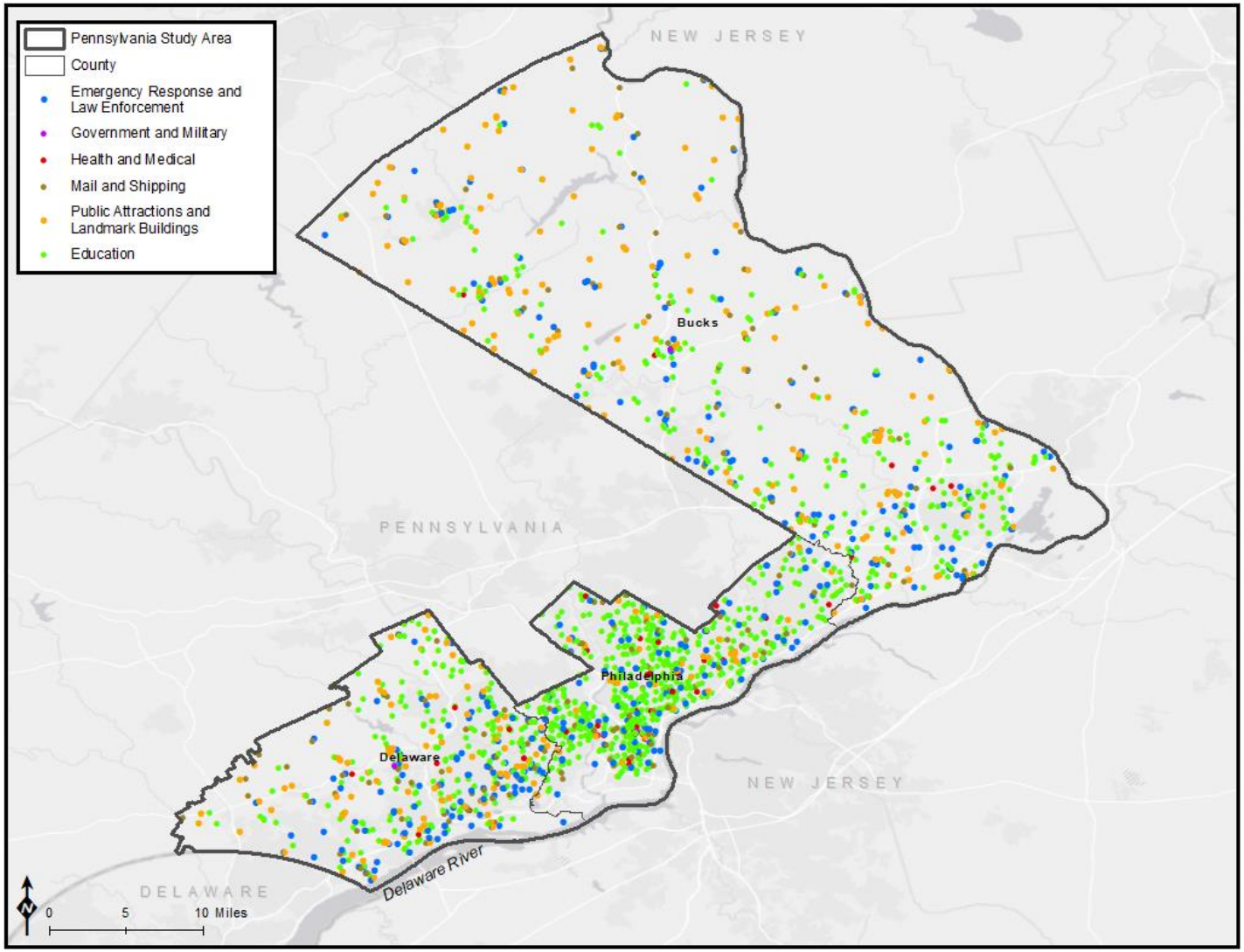
9.3.2.1 Existing and Future Land Use

The land cover data (Chapter 9.3.1) provide an initial assessment of potential land uses within a project area; however, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Therefore, in this section, land cover data are enhanced by the application of more detailed ground-based information. Figure 9-11 presents existing land uses at the broad scale of the Study Area (USGS 2017). Figure 9-12 shows impervious areas across the Study Area (NLCD 2016b). These figures show the relationship between land cover analysis, which identified developed areas in Chapter 9.3.1, and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

The existing land use maps for the Study Area indicate that (1) existing land uses are primarily located in developed areas, (2) educational resources are most abundant in Philadelphia County, and (3) impervious surfaces are associated with areas of developed land use (Figure 9-9) and educational resources.

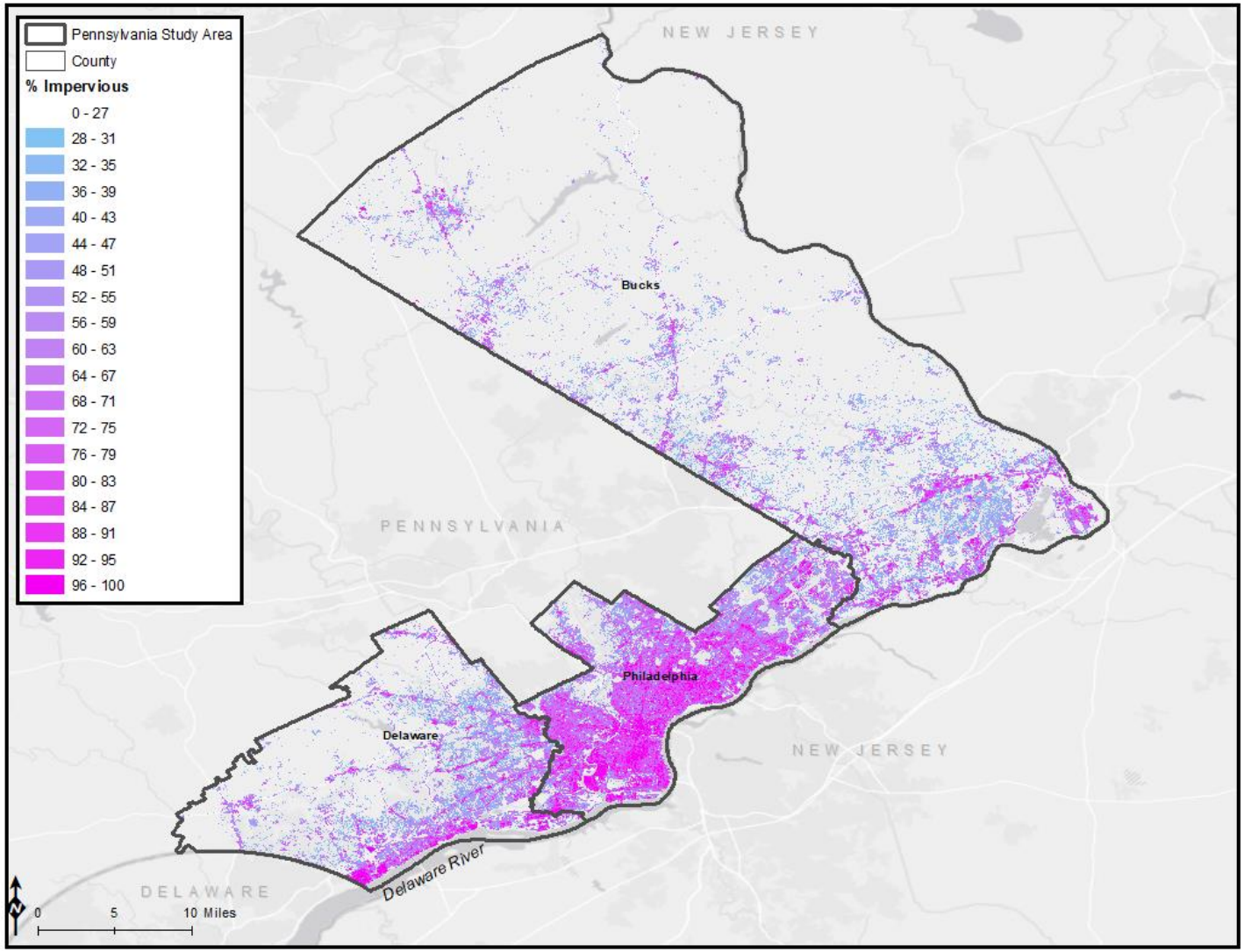
For future land use planning in Pennsylvania, the Municipalities Planning Code was enacted in 1969 to provide a uniform framework for planning and establishing land use laws for all of Pennsylvania's municipalities and counties, except for Philadelphia and Pittsburgh. There are 10 Planning Series in the Municipalities Planning Code: (1) Local Land Use Controls in Pennsylvania, (2) The Planning Commission, (3) The Comprehensive Plan, (4) Zoning, (5) Technical Information on Floodplain Management, (6) The Zone Hearing Board, (7) Special Exceptions, Conditional Uses and Variances, (8) Subdivision and Land Development, (9) The Zoning Officer, and (10) Reducing Land Use Barriers to Affordable Housing (PADCED 2017a, PADCED 2019a). However, the four primary planning tools are the Planning Commission, Comprehensive Plan, Subdivision and Land Development Ordinance, and Zoning Ordinance (PennState 2001). The publications are periodically revised or updated to reflect changes in Pennsylvania planning laws.

The Municipalities Planning Code gives local governments, including counties, the authority to plan and regulate land use (PADCED 2017a). Local government units have exclusive authority to plan and regulate land use with considerable leeway (PALTA 2019), but the comprehensive plans and zoning ordinances must be consistent with, and not exceed, the requirements contained in various State statutes referenced in the Municipalities Planning Code (PALULL 2019). And although local governments are required to adopt a comprehensive plan, they are not required to plan or zone. Further, unlike many other States, county land use regulations do not supersede local regulations. Thus, if a local government does not exercise a delegated land use power, neither the county government nor State agency can enforce their land use power over the local government (PALTA 2019). County land use regulations can only be used in municipalities without their own regulations. Therefore, State and county planning authorities either support municipalities by helping with their own planning or they may persuade municipalities to work together cooperatively (PennState 2001).



Source: USGS 2017

Figure 9-11. Select Existing Land Uses within the Pennsylvania Study Area



Source: NLCD 2016b

Figure 9-12. Impervious Surfaces within the Pennsylvania Study Area

Each county within Study Area has their own Comprehensive Plan. Further, as per the Municipalities Planning Code, each of the 54 municipalities in Bucks County and 49 municipalities in Delaware County have a combination of Comprehensive Plans, Zoning Ordinances, and/or Subdivision and Land Development Ordinances. Although Philadelphia is exempt from the mandate of the Municipal Planning Code to produce Comprehensive Plans, each of the 18 districts in Philadelphia County, which is the City of Philadelphia, has a District Plan. These planning documents discuss topics such as population, economy, housing, transportation, utilities, open space and recreation, environmental resources, historic preservation, and overall land use. Such planning documents are developed to help the towns, cities, and counties lay out goals for future growth and development. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase future changes in land use. Appendix B includes links to relevant planning documents.

Pennsylvania is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. There are 734 Qualified Opportunity Zones designated in the State. An interactive map of opportunity zones in Pennsylvania are located online at http://dced.maps.arcgis.com/home/webmap/viewer.html?webmap=b0bd4d703ddc498fb0a993a00d77ed4c.

Future planning in conjunction with onshore components associated with future OCS-related activities or projects will need to consider the comprehensive plan (or equivalent) of the municipality, district, or county within which the new project would be located. Statewide statutes or comprehensive plans that may be applicable to the proposed activities should also be considered. It is likely that municipalities and regulating State agencies will be more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist planners in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

9.3.2.2 Zoning

As described in Chapter 9.3.2.1, the Municipalities Planning Code includes zoning. All of Pennsylvania's municipalities and counties, except for Philadelphia and Pittsburgh are required to adhere to this code and therefore should have established respective zoning ordinances. As the Study Area covers multiple municipalities, within multiple counties, there are a variety of zoning ordinances specific and unique to each respective unit. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with

the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

9.3.2.3 Industrial Incentives

Pennsylvania has several business opportunities that allow businesses and corporations to recoup tax money or incentives to operate in Pennsylvania. The State currently has several programs and incentives for businesses that include investing in disused industrial areas, building high performance buildings and infrastructure, investing in local work forces, and creating jobs (PADCED 2019b). These programs and tax incentives are discussed below.

The High Performance Building Program offers additional financing through grant or loan funds to cover associated costs related to the renovation or construction of buildings that exceed green building standards within Pennsylvania (PADCED 2018a).

The Industrial Sites Reuse Program encourages the remediation of impacted industrial sites in order to create useful space. The Program offers grants and loans for applicants that commit to the remediation of contaminated industrial sites (PADCED 2017b).

The Keystone Special Development Zone (KSDZ) Program offers tax credit incentives for redevelopment of former industrial and commercial sites. This incentive is available to for-profit businesses and companies that locate and operate in these designated geographic zones, which are in need of revitalization.(PADCED 2018b).

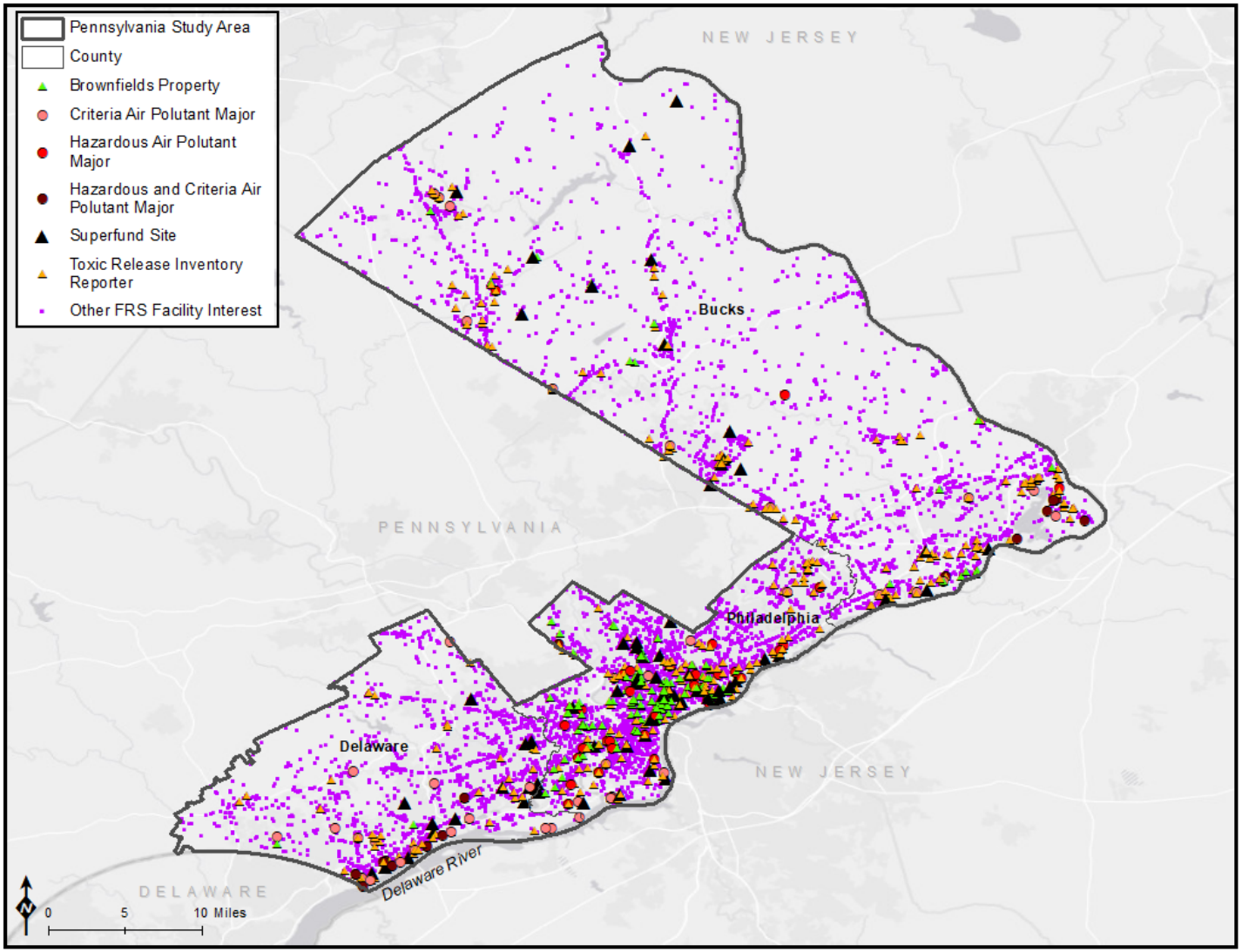
The Job Creation Tax Credit provides eligible businesses a tax credit for businesses that create at least 25 new jobs or expand their existing workforce over a period of 3 years (PADCED 2018c).

The Pennsylvania Economic Development Financing Authority provides low-interest financing through tax exempt and taxable debt such as bonds and notes. Incentives and tax exemptions from the program include low interest rates, comprehensive funding, and financing options (PADCED 2017c).

In summary, Pennsylvania has several financial incentives through programs and tax credits that allow small and large companies to enter Pennsylvania's business landscape. These programs and tax credits focus on attracting businesses to the State and incentivizing companies with tax credits on State income taxes to invest in the State and local economies with a competitive business environment (PADCED 2019c).

9.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 9-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include the following:



Source: USEPA 2018a

Figure 9-13. USEPA Facility Register Service Record for the Pennsylvania Study Area

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 9-13, industry is concentrated in the major urban centers of Philadelphia and along the Delaware River. Chapter 9.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

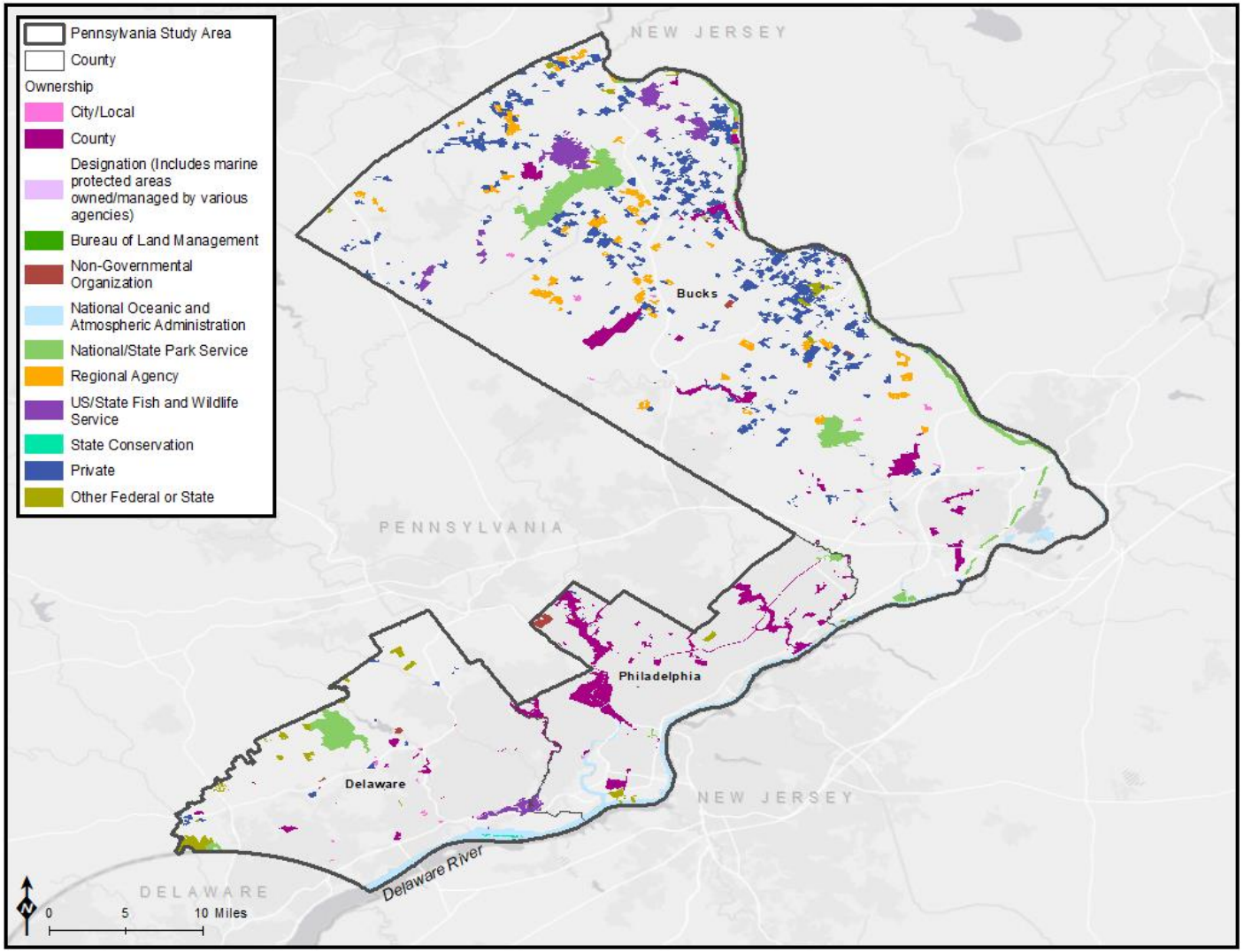
9.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 9-14 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

Protected lands in the Study Area include those owned and/or managed by the Federal, State, or local government, non-government agencies, or private entities. These protected lands include State Parks, State Game Lands, county and local parks, a NWR, and historical landmarks and sites. Parks identified as protected areas that are also recreational resources are discussed further in Chapter 9.3.2.7

In Bucks County, notable protected areas include State Game Lands 56 (1,787 acres) and 157 (2,011 acres) (PGC 2019); Nockamixon State Park, a 5,286-acre park that includes 1,450-acre Lake Nockamixon; Delaware Canal State Park, a 60-mile long towpath along the Delaware River that includes a 90-acre pond and 11 river islands; Tyler State Park (1,711 acres); and Neshaminy State Park (339 acres) (PADCNR 2019a). There are also several other county parks (Bucks County 2019) and local parks (Visit Bucks County 2019) that are considered protected areas in Bucks County.

In Philadelphia County, notable protected areas include Benjamin Rush State Park (275 acres) (PADCNR 2019a); Fairmount Park (2,000 acres); Wissahickon Valley Park, a 1,800-acre park with 57 miles of trails; Pennypack Park (1,600 acres); Valley Forge National Historical Park (3,600 acres); and FDR Park, a 348-acre park along the Delaware River (Visit Philadelphia 2019a).



Source: USGS 2019f

Figure 9-14. Protected Areas within the Pennsylvania Study Area

In Delaware County, notable protected areas include Ridley Creek State Park, a 2,600-acre park (PADCNR 2019a); John Heinz NWR, a 1,000-acre refuge that spans Delaware and Philadelphia Counties (USFWS 2016b); First State National Historical Park, which lies primarily in the State of Delaware but extends into Pennsylvania; and the Brandywine Battlefield Park, which is a National Historic Site (Brandywine Battlefield 2019). There are also several county parks considered protected areas (DELCOPA 2019) in Delaware County.

Evaluation of future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

9.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Pennsylvania, resided in the area long before the era of European exploration. They arrived in the region as nomadic bands of hunters and gatherers. Multiple tribes lived throughout the area and were present when Europeans first arrived in the area but were displaced by colonial expansion. Some tribes in the Study Area included the Delaware (Lenape and Munsee tribes) and the Iroquois (Oneida and Seneca tribes) (Nelson 2020h, Native Languages of the Americas 2015a).

Colonial conquest, wars in Germany, political conflict in England, and the Reformation and economic issues in Europe led to the migration of various peoples to America and specifically to the area that came to be known as the Commonwealth of Pennsylvania. While English, French, Spanish, and Dutch explorers have various claims to early visits to the area, the first permanent settlement in what became Pennsylvania was in 1643 when Swedish Governor Johann Printz established his capital for New Sweden at Tinicum Island (Delaware County). In 1655, conflict between the explorers led to the seizure of New Sweden by the Dutch. The Dutch colony was then seized by the English in 1664 and, other than a brief reoccupation by the Dutch from 1673-1674, remained under the control of the Duke of York until 1681 (PHMC 2020a).

In 1681, William Penn requested this land from King Charles I to establish a place where the Society of Friends, or Quakers, could practice their religion free from persecution. The King, with the support of the Duke of York, granted all the land in Pennsylvania to William Penn. Penn and his heirs determined they would also buy the claims of American Indians living in the area. In doing so, they established trade with the local tribes and extended rights and privileges to them under English law. Through these efforts, Penn established relatively noncontentious relations with the tribes. However, between the purchases of land, the French and Indian War (several battles of which were fought in Pennsylvania), and conflicts with colonists, the tribes that lived in the area migrated out of Pennsylvania over time (PHMC 2020b, Thompson and Miller 2020).

Pennsylvania is important in the history of the United States. Pennsylvania's capital, Philadelphia, was the site of the first and second Continental Congresses which were held in 1774 and 1775, respectively. Several battles of the American Revolutionary War were fought in Pennsylvania, including the Battle of Brandywine, which was largest engagement of the Revolutionary War. This battle was fought in Delaware County on September 11, 1777, and today, the Brandywine Battlefield Historic Site is a national Historic Landmark. Philadelphia is the birthplace of the Declaration of Independence and the American Revolution and was the first capital of the United States until 1777, and again from 1790 until

1800. The United States Constitutional Convention was held in Philadelphia in 1787 and, that same year, Pennsylvania was the second of the new American states to ratify the new Constitution. Tourists are drawn to Pennsylvania to explore this history and many major landmarks (such as Independence Hall and the Liberty Bell) and battlefield sites (History 2018a). Popular recreational sites in the Study area are further discussed in Chapter 9.3.2.7, Recreation.

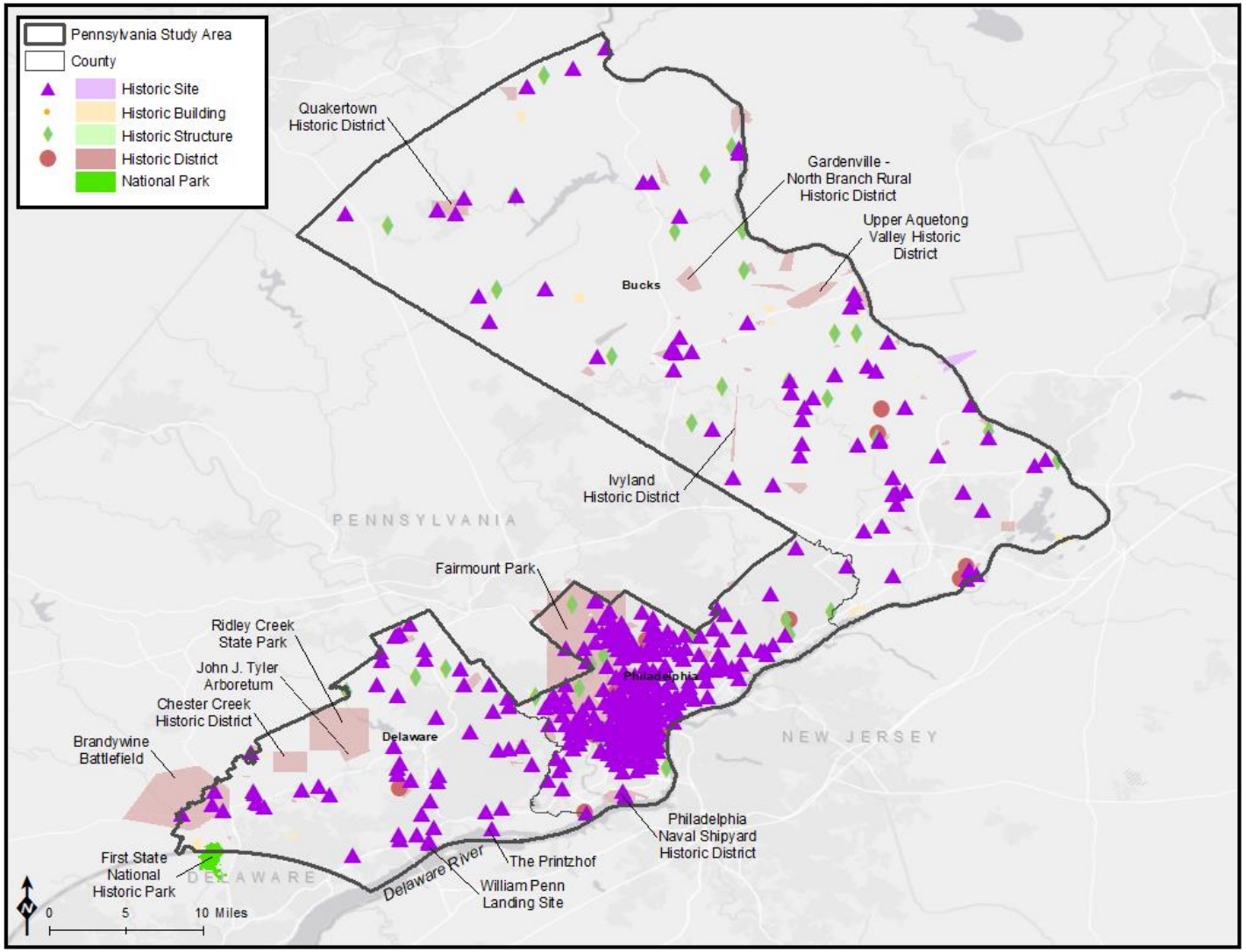
With the Pennsylvania Emancipation Act of 1781, Pennsylvania gradually abolished slavery. In 1769, Pennsylvania's southern border became the dividing line (i.e., the Mason and Dixon Line) between free states (north of the line) and slave states (south of the line). Being a boarder state resulted in several major battles of the American Civil War (1861-1865) being fought within the State of Pennsylvania, including the Battle at Gettysburg. Although Gettysburg is not within the Study Area, this battle was considered one of the most decisive Union victories and a major turning point of the war (Thompson and Miller 2020).

The period between the American Revolutionary War and the Civil War was a period of growth for Pennsylvania and the state became a center for trade, commerce, and industrial development. Beginning in 1820, several major mining companies were founded to develop Pennsylvania's extensive deposits of hard and soft coal. The world's first successful oil well was drilled in Titusville in 1859. Throughout the 1800s, Pennsylvania was a leading producer of textiles, ships, lumber, tobacco, iron and steel. Pennsylvania's population grew accordingly. In fact, Pennsylvania remained the second most populous state in the country until the early 1900s (Thompson and Miller 2020).

Pennsylvania's importance in American wars continued in World Wars I and II with the State's industries serving as major suppliers of iron, steel, arms, and machinery. National and global economic changes and competition from foreign markets post-World War II led to a shift in Pennsylvania's economy and contributed to a decline in the State's manufacturing businesses between the mid-1960s and the mid-1980s. Pennsylvania is now identified as part of the "rust belt," an area formerly dominated by industrial businesses that were affected by this shift. Pennsylvania's economy now has a stronger emphasis in high-technology industries and on the service sector (Thompson and Miller 2020).

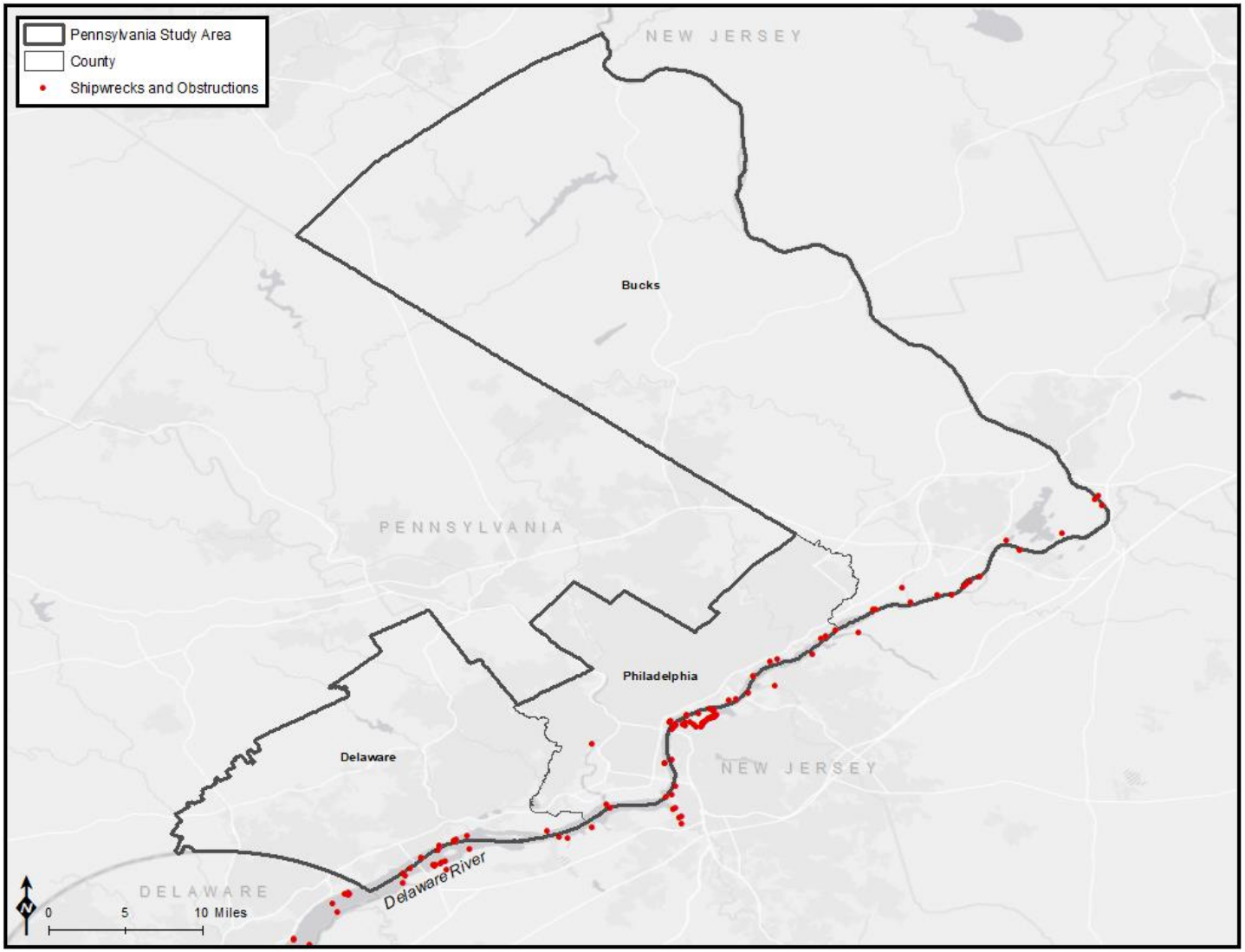
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with American Indian, early colonial settlements, the American Revolution, the War of 1812, the American Civil War, the Industrial revolution, and World Wars I and II. Because of the duration of the human presence in the Pennsylvania, there is an abundance of historic sites. Figure 9-15 and Figure 9-16 present a summary of many of these cultural sites within the Study Area, including maritime sites and shipwrecks along the Delaware River.

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states were noted to have historically significant maritime settings, with over 1,100 of those resources considered to have a historically significant view toward the open sea. Pennsylvania was excluded from this study because it has no open coast, but data collected from surrounding states (New York and New Jersey) may be applicable because, within a defined visual areas of potential effect, concern for cultural and historic sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.



Sources: NPS 2014, USFS 2019a

Figure 9-15. Cultural and Historic Sites within the Pennsylvania Study Area



Source: NOAA 2016a

Figure 9-16. Shipwrecks and Obstructions within the Pennsylvania Study Area

In summary, many cultural sites in the Study Area are shown in Figure 9-15 and Figure 9-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources, and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Pennsylvania's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and the immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

9.3.2.7 Recreation

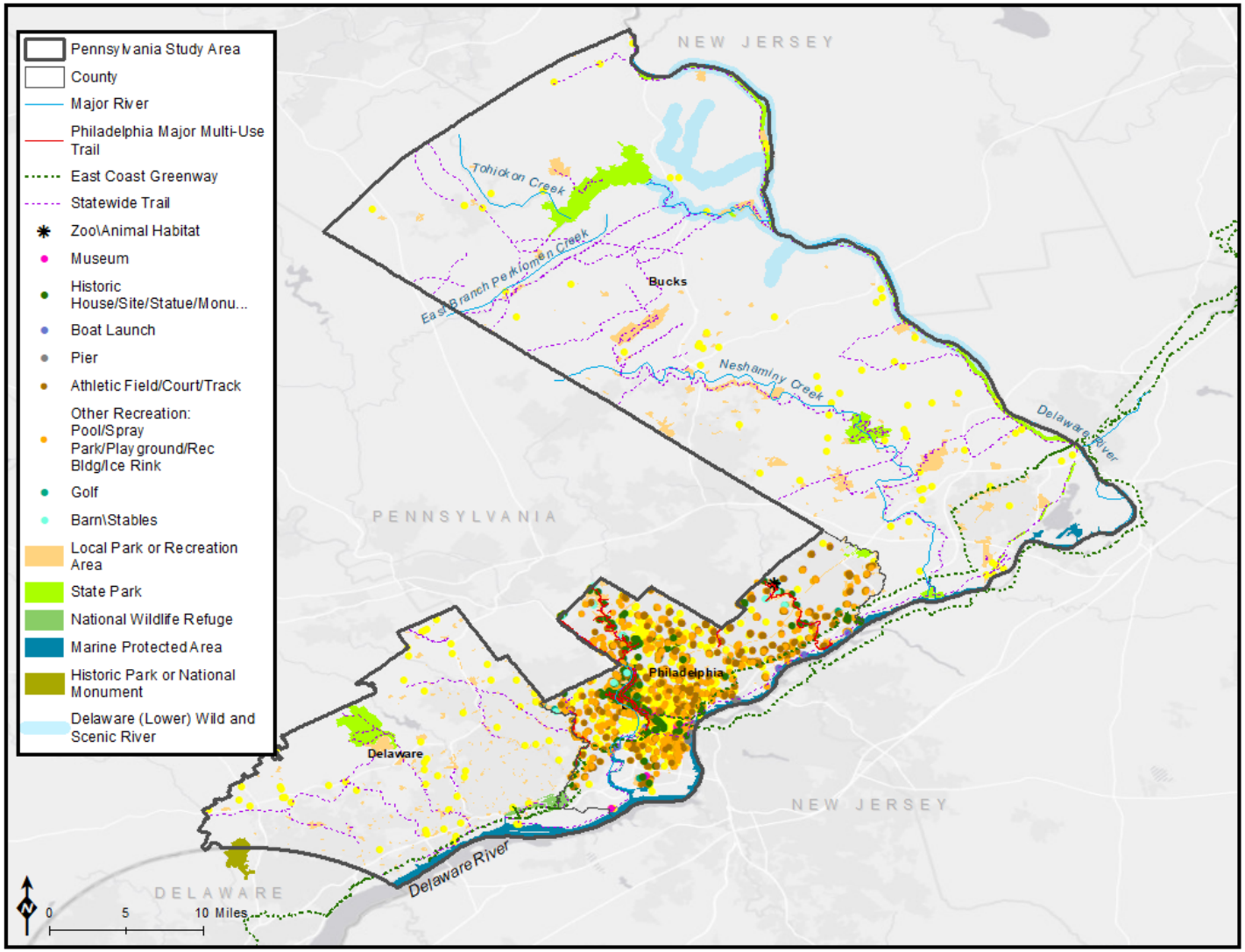
The Study Area has several recreational opportunities including State and local parks, golf courses, country clubs, John Heinze NWR, historical buildings, monuments, and districts, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 9-17. The cultural and historic resources shown in Figure 9-15 can also be considered recreational resources as can many of the protected areas shown in Figure 9-14. As described in Chapter 9.4.4.1.1, Tourism and Recreation was the dominant industry sector in the Commonwealth in 2016. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas, which may be associated with recreation, include cultural and historic resources (Chapter 9.3.2.6), transportation (Chapter 9.3.2.8), tourism employment (included in Chapter 9.4.4), and rental housing (included in Chapter 9.4.3).

Bucks County

In 2018, it was estimated that 8.15 million people visited Bucks County, with direct spending of $660 million and generating $1.1 billion in economic impact (Econsult Solutions 2019). In Bucks County, there are several State parks that are open year-round.

Nockamixon State Park is a 5,286-acre park with a 1,450-acre lake, Lake Nockamixon. Visitors can hike, picnic, camp, swim, boat, fish, hunt, bike, mountain bike, ride horses, and cross-country ski (PADCNR 2019b). Neshaminy State Park is a 339-acre park with picnic areas, playgrounds, boat access to the Delaware River, a pool, children's spray park, and 4 miles of trails (PADCNR 2019c). Delaware Canal State Park is a 60-mile long towpath along the Delaware River that also includes a 90-acre pond and 11 river islands (PADCNR 2019d). Tyler State Park is a 1,711-acre park where people can go hiking, fishing, boating, biking, horse riding, sledding, ice skating, and picnicking (PADCNR 2019e).

There are also two large State Game Lands managed by the Pennsylvania Game Commission and used for habitat management and provide opportunities for lawful hunting and trapping – State Game Lands 56 (1,787 acres) and 157 (2,011 acres) (PGC 2019). Notable county and local parks include Peace Valley Park (1,500 acres), Core Creek Park (1,200 acres), Lake Towhee Park (549 acres), Dark Hallow Park (70 acres), and Silver Lake Park (465 acres). Information on these and other county and local parks can be found on the Bucks County official website (Bucks County 2019) and visitors' website (Visit Bucks County 2019).



Sources: Data.gov 2019, PASDA 2008, PASDA 2015, Open Data Philly 2016, NPS 2014, USFS 2019b

Figure 9-17. Select Recreational Resources within the Pennsylvania Study Area

Some of the annual festivals and events in Bucks County include Peddler's Strawberry Festival (May), Arts Alive (July), New Hope Pride Week and Parade (May), Annual Bristol Antique Auto Show (May), Middletown Grange Fair (August), Delaware Canal Festival (June-July), Bucks County Dragon Boat Festival (September), and Annual Washington's Christmas Day Crossing (December) (Visit Bucks County 2019).

Philadelphia County

Philadelphia is the largest city in Pennsylvania and the sixth most populous city in the U.S. (Visit the USA 2019). In 2018, 45 million people visited the Philadelphia Region, spending $7.6 billion dollars, supporting 103,800 jobs and generating $12.2 billion in economic impact (Visit Philly 2019). Some of the recreational destinations in Philadelphia include Fairmount Park, Wissahichon Park, Pennypack Park, FDR Park, Valley Forge National Historic Park, and the John Heinz NWR.

Fairmount Park is a 2,000-acre urban park where people can bike, ride horses, hike, tour historic mansions, and enjoy outdoor concerts. Within the park is the Philadelphia Zoo (America's oldest zoo), Philadelphia Museum of Art (one of the largest in the U.S.), Eastern State Penitentiary (one of the U.S.' most historic prisons), Please Touch Museum, Shofuso Japanese House and Garden, Mann Music Center, Boathouse Row, and other historical sites and mansions (Visit Philadelphia 2019b).

Wissahickon Valley Park is an 1,800-acre park with 57 miles of trails where visitors can bike, hike, fish, and view wildlife. It is estimated that there are over 1.1 million visitors to Wissahickon Valley Park annually (Friends of Wissahickon 2020). Pennypack Park stretches nine miles following Pennypack Creek to the Delaware River covering 1,600 acres of woodlands, meadows, wetlands, and fields where people can hike, bike, run, ride horses, and visit historical buildings (Visit Philadelphia 2019c). FDR Park is a 348-acre park in South Philadelphia located along the Delaware River. FDR Park includes 20 tennis courts, 8 ball fields, a rugby field, a golf course, the American Swedish Historical Museum, and a skate park (PPR 2019). Visitors to this park can go walking on the trails, biking, fishing, picnicking, play tennis or golf, take painting or yoga classes, or skateboard. FDR Park is about 100 years old and on the Philadelphia Register of Historic Places. A $200 million renovation project was recently awarded to improve the park with improvements including creating elevated boardwalks, restoring wetlands, and expanding a creek for visitors to kayak (Merriman 2019).

Valley Forge National Historical Park is a 3,600-acre park that is visited by runners, bicyclists, and picnickers. There are several historic monuments, statues, and buildings from the American Revolution Era in Valley Forge National Historical Park (Visit Philadelphia 2019d). The John Heinz NWR at Tinicum is America's first urban refuge and spans Philadelphia and Delaware Counties. This refuge has approximately 1,000 acres of woods, pond, marsh, and meadows; and 10 miles of hiking trails. Visitors can hike, fish, kayak, canoe, hunt, view wildlife, and participate in environmental education programs (USFWS 2008, USFWS 2016b).

There are numerous historical monuments, buildings, and sites in Philadelphia. Many of these attractions are in Independence National Historical Park (NPS 2019m). This park preserves several sites associated with the American Revolution some of which include the Liberty Bell, Independence Hall where the Declaration of Independence and U.S. Constitution were signed, Congress Hall, Old City Hall, President's House Site, Ben Franklin Museum, First and Second Bank of the United States, Carpenter's Hall, which is the site of the First Continental Congress, Declaration House, and Washington Square. Other notable museums in Philadelphia include the Philadelphia City Hall, Academy of Fine Arts (the first art museum and school in the U.S.), National Constitution Center, and Museum of the American Revolution.

In South Philadelphia is the Philadelphia Sports Complex, which includes a football stadium for the Philadelphia Eagles (Lincoln Financial Field), an baseball stadium for the Philadelphia Phillies (Citizens Bank Park), a stadium for hockey, basketball, arena football, and concerts (Wells Fargo Center), and over 22,000 parking spaces. It was estimated that the complex holds 380 events and hosts 8 million visitors each year (SportsComplex 2019). There are also numerous annual festivals and events in Philadelphia, including the Philadelphia Marathon (November), Philadelphia Auto Show (February), Philly Theater Week (February), art and food festivals, music and film festivals, and other festivals, events, and holiday parades. A list of at least 60 year-round events are listed on Philadelphia's visitors website (Visit Philadelphia 2019e).

Delaware County

In Delaware County, recreational destinations include Ridley Creek State Park and Brandywine Battlefield National Historic Landmark. Ridley Creek State Park has 2,606 acres of woodlands and meadows where people can ride horses on guided trails, fly-fish, hike, bike, cross-country ski, picnic, and hunt deer (archery only). The park also has playgrounds, athletic fields, and educational programs (PADCNR 2019a). Another attraction is the 52-acre Brandywine Battlefield Park, which is a National Historic Landmark because it is where the largest single-day land battle was fought during the American Revolutionary War. However, the Brandywine Battlefield is only a small part of the Brandywine Battlefield National Historic Landmark, which spans over 50 square miles covering 15 municipalities in two counties (Delaware County, Pennsylvania and New Castle County, Delaware) (Brandywine Battlefield 2019).

Due to the proximity of Delaware County to Philadelphia to the north and Wilmington, Delaware to the south, there are not many annual festivals or events held in Delaware County. Additionally, in the Annual Report *Building Momentum Through Collaboration*, produced by Visit Philadelphia in 2019, the economic impact of tourism to Delaware County is factored in with Philadelphia County (Visit Philly 2019).

Summary

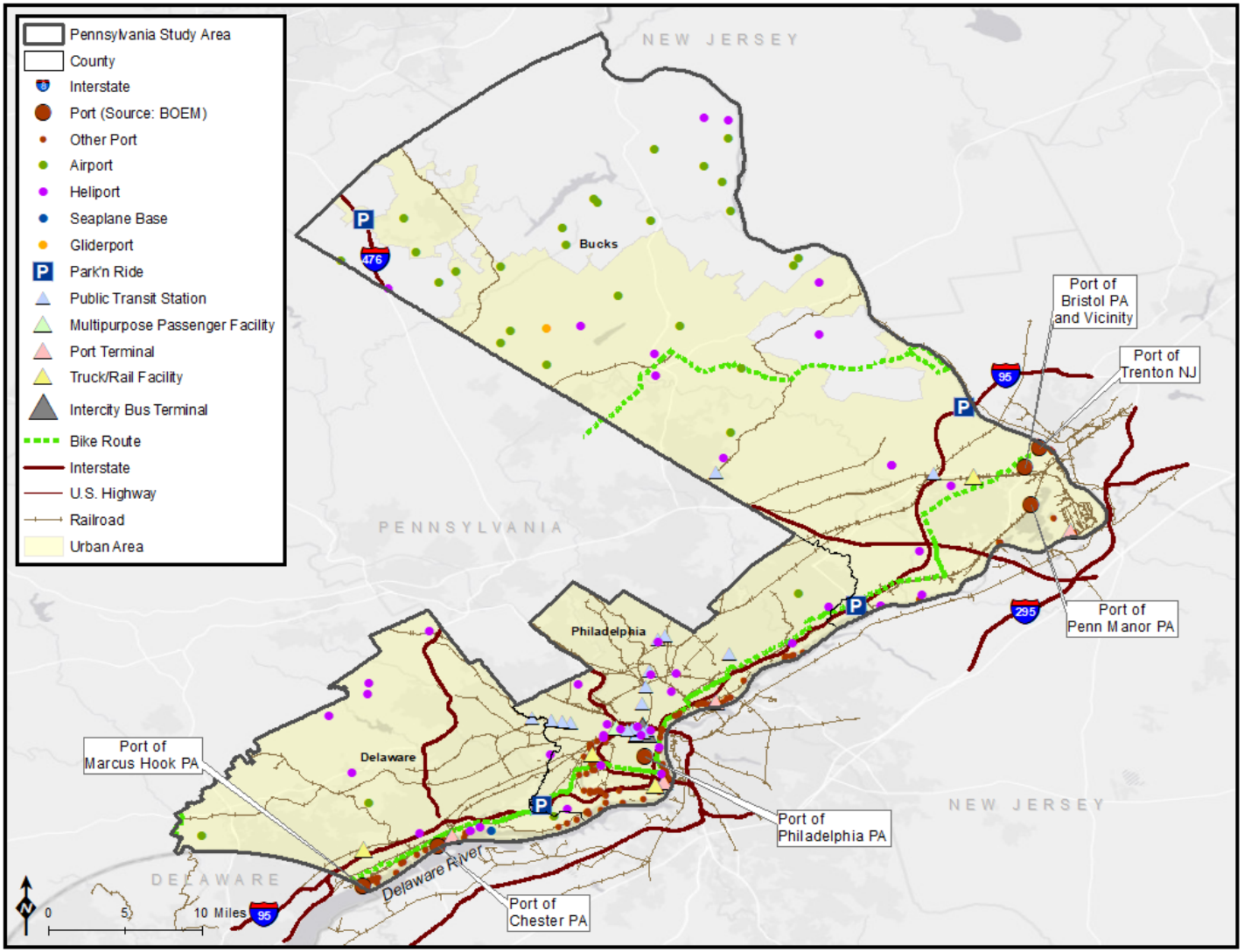
Because many of the recreational attractions are also protected lands and historical landmarks, there will likely be limitations for development near these areas. The proximity of potential future potential projects to these recreational attractions and the annual events and festivals would need to be considered during future evaluations.

9.3.2.8 Transportation

The Pennsylvania Department of Transportation was created in 1970 and oversees programs and policies affecting highways, urban and rural public transportation, airports, railroads, ports, and waterways (PennDOT 2019). There are a variety of transportation methods and resources in Pennsylvania, including (PennDOT 2019):

- 120,596 miles of State and local highways
- 5,600 miles of railroad track
- 127 public airports
- 25,400 State-maintained bridges
- 2,331 miles of intercity bus routes
- 3 major ports

The major transportation resources in the Study Area are shown in Figure 9-18.



Sources: PASDA 2019a, PASDA 2019b, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 9-18. Transportation Resources within the Pennsylvania Study Area

Surface transportation is largely driven by the State's geography and topography. The Study Area is relatively flat and runs parallel to the Delaware River on the East side of the Study Area. Major Interstate 95 runs the eastern length of the Study Area and passes through Philadelphia. Interstates 276 and 476 traverse and intersect the Study Area and connect the Study Area to the interior of the State as well as to neighboring States (Figure 9-18).

Ports and waterways along the Delaware River are an important resource for transportation and trade. The Delaware River flows along the northeast and southeastern perimeters of the Study Area, draining into the Delaware Bay and then Atlantic Ocean (Figure 9-3). There are 12 ports located along the Delaware River, including four in the Study Area (the others are in neighboring States). From north to south, the four ports in the Study Area are the Port of Philadelphia, Penn Terminals, Port of Chester, and Port of Marcus Hook (WPS 2020b). Collectively, the ports in the tri-state area along the Delaware River make up the largest freshwater port in the world. The Study Area ports serve one of the greatest concentrations of heavy industry in the State including chemical, oil refining, and other industries. In 2017, over 90 tons of petroleum and petrochemical products, container cargo, forest products, and automobiles moved through Delaware River ports in the tri-state area. These ports are essential in import of steel, paper, meat, cocoa beans, Chilean and other South American fruit, and bananas from Central America (DRBC 2020c). Port of Philadelphia facilities stretch from the Southport Marine Terminal Complex, through the Packer Avenue Marine Terminal, and up to the Tioga Terminal. The port is equipped with super post-Panamax cranes and nearly 103 miles of channel deepened to 45 feet below mean sea level and with ongoing plans to further develop terminals and auto processing facilities. The Southport Marine Terminal is the premier container handling facility with six berths, super post-Panamax container cranes, and 106 acres. The Tioga Terminal is a 116-acre facility with six berths and direct access to truck and rail connections (PhilaPort 2016a, PhilaPort 2016b, PhilaPort 2019).

There are numerous public airports throughout the Study Area, the largest of these is the Philadelphia International Airport located in Philadelphia near the Delaware River. This hub airport serves over 32 million passengers each year and is a major economic driver and employer for the area bringing in nearly $17 billion dollars annually while providing over 106,000 full-time jobs (PHL 2020).

The State's 5,130 miles of railroad track connect Pennsylvania's industry and people to other major markets within the Northeast U.S. and Canada (AAR 2019, USTR 2020). As of 2017, Pennsylvania had the highest number of freight railroads in the Nation and was ranked fourth in total rail miles (AAR 2019).

9.3.3 Summary – Land Cover and Land Use

Land cover types in the Study Area are primarily developed (mostly urban) and forested lands. Most of the developed areas in the Study Area are in Philadelphia and Delaware Counties, specifically associated with the City of Philadelphia, while most of the forest cover is in Bucks County. It is likely that future industrial development activities will be concentrated in the Bucks and Delaware Counties because Philadelphia County may be too highly developed to support future development. Bucks and Delaware Counties have more open space and low intensity urban development, which has good potential for future growth. These counties have a large percentage of area that has been previously disturbed by other activities, which will help to minimize potential environmental impacts. These counties also have existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.

Most municipalities and counties within the Study Area will have established land controls, comprehensive plans, zoning ordinances, and other planning policies, procedures, and guidelines in accordance with the Municipalities Planning Code. Within Philadelphia County, each of the 18 districts

has a separate District Plan. These planning documents provide information on the municipality, county, or district future land use plans, development, and growth plans and will be useful when considering future OCS-related project development.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, many Project Developers of future OCS-related activities or projects would prefer to adhere to existing zoning ordinances during project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Zoning may or may not apply to pipeline routes. Often, projects attempt to plan the placement of new pipelines within or parallel to existing pipeline rights-of-way to minimize new ground-disturbing impacts to other areas.

Pennsylvania offers several financial incentives with a focus on attracting businesses to the State and encouraging investment in the State and local economies. In particular, Pennsylvania's unique KSDZ Program could be an appealing opportunity for future OCS-related projects as it offers an opportunity for redevelopment of the surplus of abandoned, deteriorated commercial and industrial sites in the State.

There is a variety of industry present in the Study Area. According to the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analysis, the top five industries based on the number of jobs provided in the Study Area are (1) healthcare, (2) education, (3) retail, (4) hospitality, and (5) manufacturing (Bucks, Philadelphia, Delaware County Industry).

Pennsylvania has a long and unique cultural history and as a result there are numerous cultural resource locations of importance throughout the State. Cultural resource surveys, including both archaeological and architectural aspects will be an essential part of the process for future OCS-related project evaluations. Many of these cultural locations are also recreational destinations. Additionally, there are numerous other recreation destinations in the Study Area including State and local parks, the John Heinze NWR and other protected areas, the Delaware River, and modern built experiences. Protected areas are also found throughout the Study Area.

Protected areas, cultural resources, and recreational areas tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternative sites may have lesser impacts to these areas.

The Study Area contains a variety of transportation methods that connect the people and industries located in the State. Major highways that run the whole or partial length of the Study Area, several airports, railroad tracks, and several ports create a cohesive and integrated transportation network for a variety of industries and business needs in the Study Area.

9.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

9.4.1 Population

Pennsylvania's population is increasing, but at a rate slower than the Nation. According to the USCB, Pennsylvania's estimated population was 12.8 million in 2017. As shown in Table 9-6, the population of Pennsylvania grew 0.7% since the 2010 Census, having added approximately 88,126 people. During the same period, the population of the U.S. grew 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). These values are USCB estimates. As estimates they contain "residuals," which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Table 9-6. 2010 and 2017 Total Population and Population Projections Through 2040 in the Pennsylvania Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Bucks	625,249	626,486	629,420	637,730	634,771	0.2	1.3
Delaware	558,979	563,384	588,436	622,307	648,439	0.8	15.1
Philadelphia	1,526,006	1,569,657	1,653,729	1,753,054	1,859,944	2.9	18.5
Study Area Total	**2,710,234**	**2,759,527**	**2,871,585**	**3,013,091**	**3,143,154**	**1.8**	**13.9**
Pennsylvania	**12,702,379**	**12,790,505**	**13,230,170**	**13,759,594**	**14,132,588**	**0.7**	**10.5**
United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**373,528,000**[4]	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - Behney et al. 2014; 4 - USCB 2018b

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While Pennsylvania is affected by the nationwide trend of aging population as indicated by its declining rate of natural increase between 2016 and 2018, natural increase continues to contribute to population growth. According to USCB 2018 estimates, the Commonwealth's natural increase declined 77.3% from 2016 (10,318 people) to 2018 (2,343 people). Natural increase accounted for 14.1% of population increase between 2017 and 2018; the rest of the increase came from positive net migration (USCB 2019b). Net migration includes domestic and international changes of residence.

Nationally, migration remains at historic lows, as those who have moved tend to relocate relatively short distances away from their original residence. However, Pennsylvania is not part of this national trend, as

domestic migration resulted in population loss of 20,463 people between 2017 and 2018 (USCB 2019b). According to USCB 2018 estimates, high percentages of people leaving Pennsylvania moved to Florida, New Jersey, New York, Virginia, Maryland and North Carolina (USCB 2019c). According to a recent article, many people are leaving the Commonwealth because of a new job or transfer (Governing.com 2018). Population loss due to domestic migration was offset by a gain of approximately 35,377 residents from international immigration, resulting in small overall population growth (USCB 2019b).

9.4.1.1 Study Area Trends

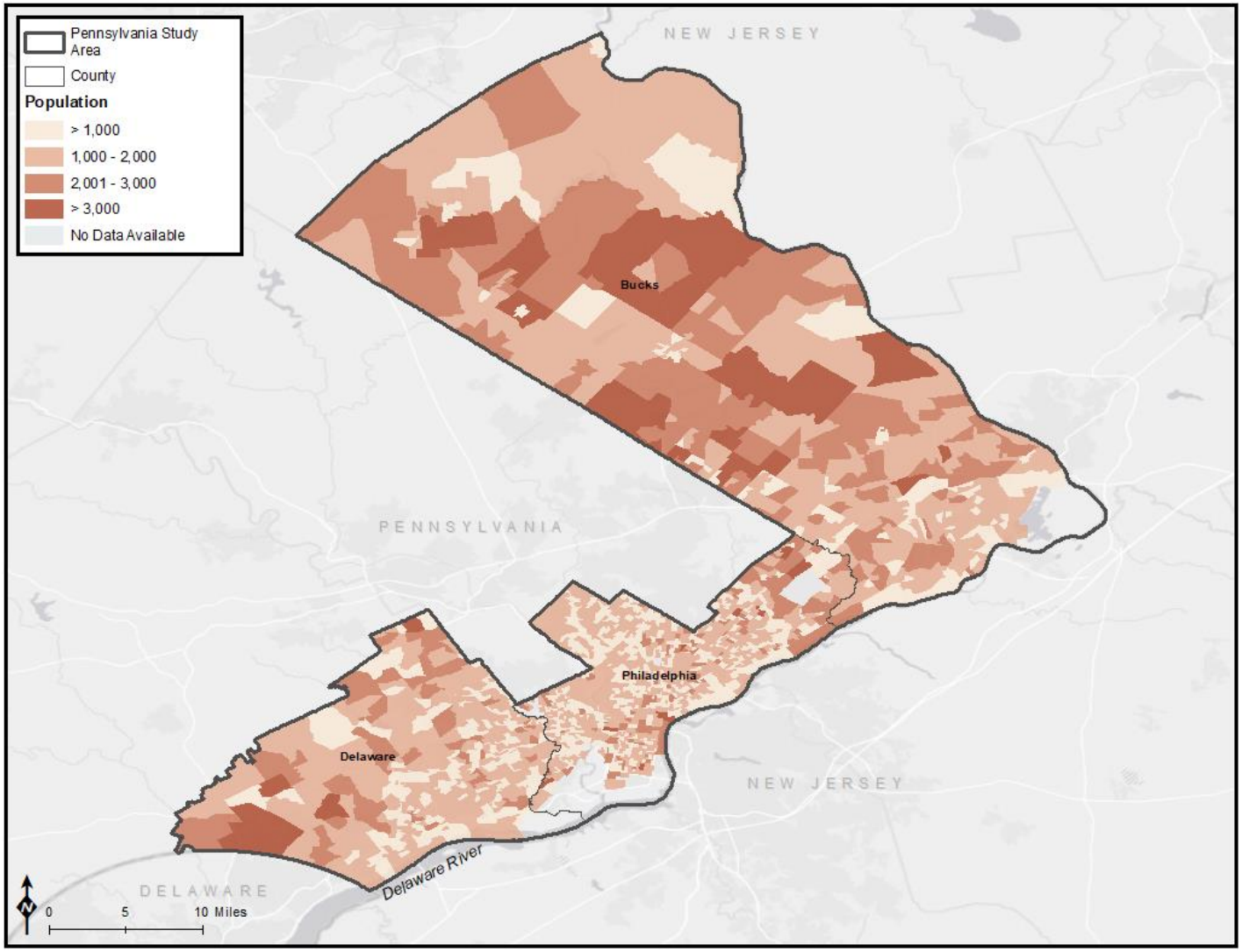
Figure 9-19 shows the three counties (Buck, Delaware and Philadelphia) comprising the Study Area. Given the small number of counties within the Study Area, the counties have not been delineated into regions for the analyses in this chapter.

According to 2017 population estimates, the Study Area represented 21.7% (2.8 million residents) of the overall Commonwealth population of 12.8 million. Table 9-6 shows population growth in the study area counties. Between 2010 and 2017, all three counties experienced growth. During the same period, the population of the Study Area grew 1.8%, slower than the Nation (4.0%). Philadelphia County (home to the city of Philadelphia) had the highest growth with 2.9% increase (43,651 residents) since the 2010 count. Delaware County increased by 0.8% (4,405 residents) while Bucks County had the lowest growth rate at 0.2% (1,237 residents). Population estimates are based on permanent residents (USCB 2017a, USCB 2017d, USCB 2018a).

Figure 9-19 shows population counts in census block groups within the three counties located in the Study Area. The figure illustrates high-density concentrations in all three counties, indicating their proximity to the city of Philadelphia in Philadelphia County. As illustrated in Figure 9-20, each Study Area county is located within the metropolitan statistical areas Philadelphia-Camden-Wilmington, PA-NJ-DE-MD. (Data.gov 2017). An metropolitan statistical area is defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010).

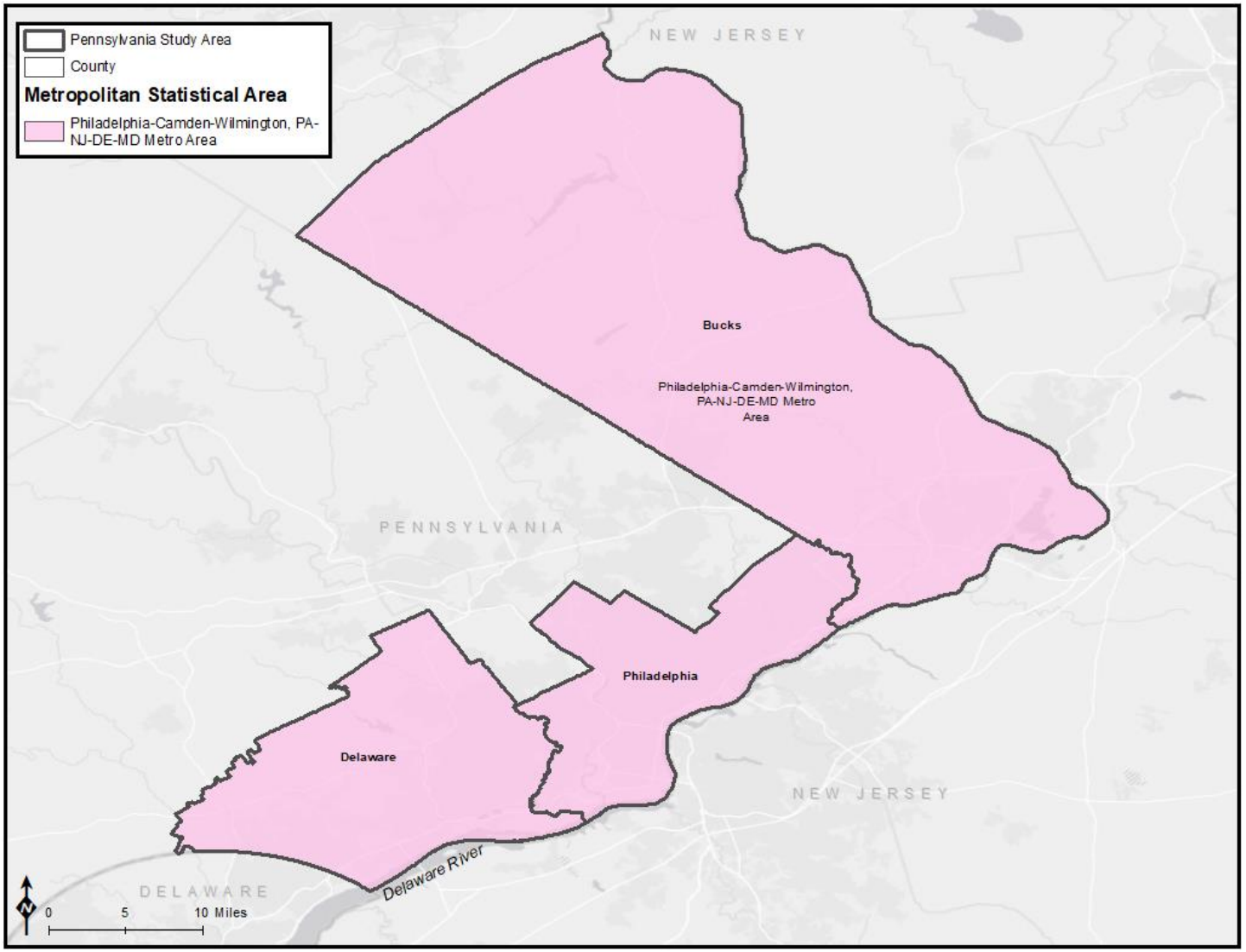
More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). While Pennsylvania is located inland from the coast, the counties in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 9-6, the Study Area is 922 square miles, representing just 2.1% of the Commonwealth's total land area of 44,820 square miles (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.

According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area counties. Population densities in the Study Area ranged from 1,036 persons per square mile in Bucks to 11,693 persons per square mile in Philadelphia County (USCB 2017d, USCB 2017c). Figure 9-21 illustrates geographic population density in the Study Area.



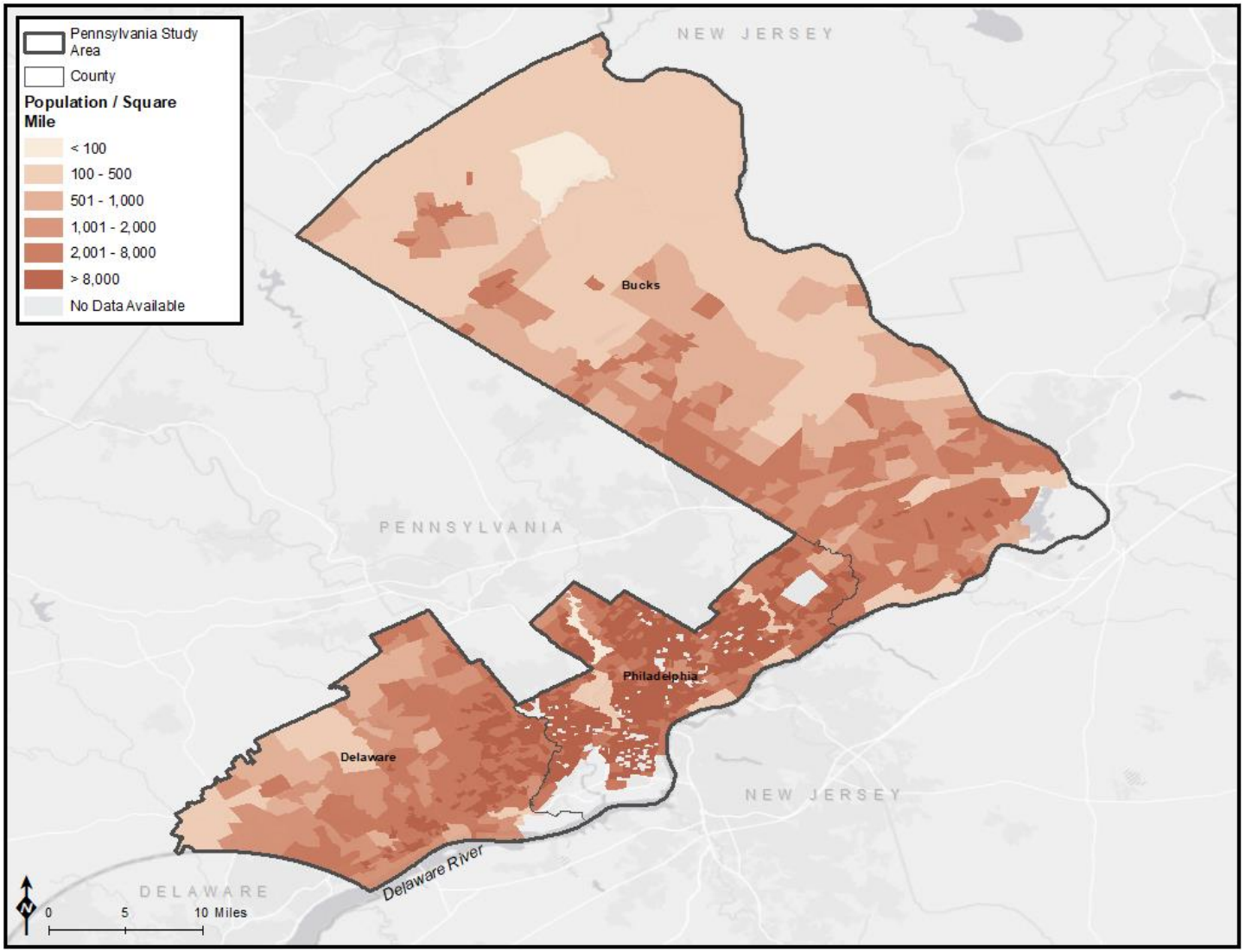
Source: USCB 2017r

Figure 9-19. Population in the Pennsylvania Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 9-20. Metropolitan Statistical Areas Located within the Pennsylvania Study Area



Source: USCB 2017r

Figure 9-21. Population Density in the Pennsylvania Study Area by Census Block Group

9.4.1.2 Population Projections

According to the Center for Rural Pennsylvania, Pennsylvania's population is projected to grow 10.5% (14.1 million residents) between 2017 and 2040. Population in the Study Area is projected to grow 13.9% during the same period (3.1 million residents), faster than the Commonwealth. The Nation's population is projected to grow 16.4% (373.5 million), faster than both the Commonwealth and the Study Area. Table 9-6 provides details of the projected population for the U.S., the Commonwealth, and the counties in the Study Area from 2017 to 2040 (USCB 2017d, USCB 2018b, Behney et al. 2014). Figure 9-22 shows the overall projected percent change in population in each county during the same period.

As shown in Table 9-6, projections indicate that 22.2% (3.1 million people) of the Commonwealth's population will reside in the Study Area by 2040 as compared to 21.7% (2.8 million people) in 2017. Growth is not projected to be uniform across the Study Area. Strong growth trends are expected to continue in Delaware and Philadelphia Counties, with projected growth of 15.1% and 18.5%, respectively, between 2017 and 2040. During the same period, Bucks County is projected to increase only 1.3%. This growth prediction illustrates more rapid growth near Philadelphia (Behney et al. 2014, USCB 2017d, USCB 2018b).

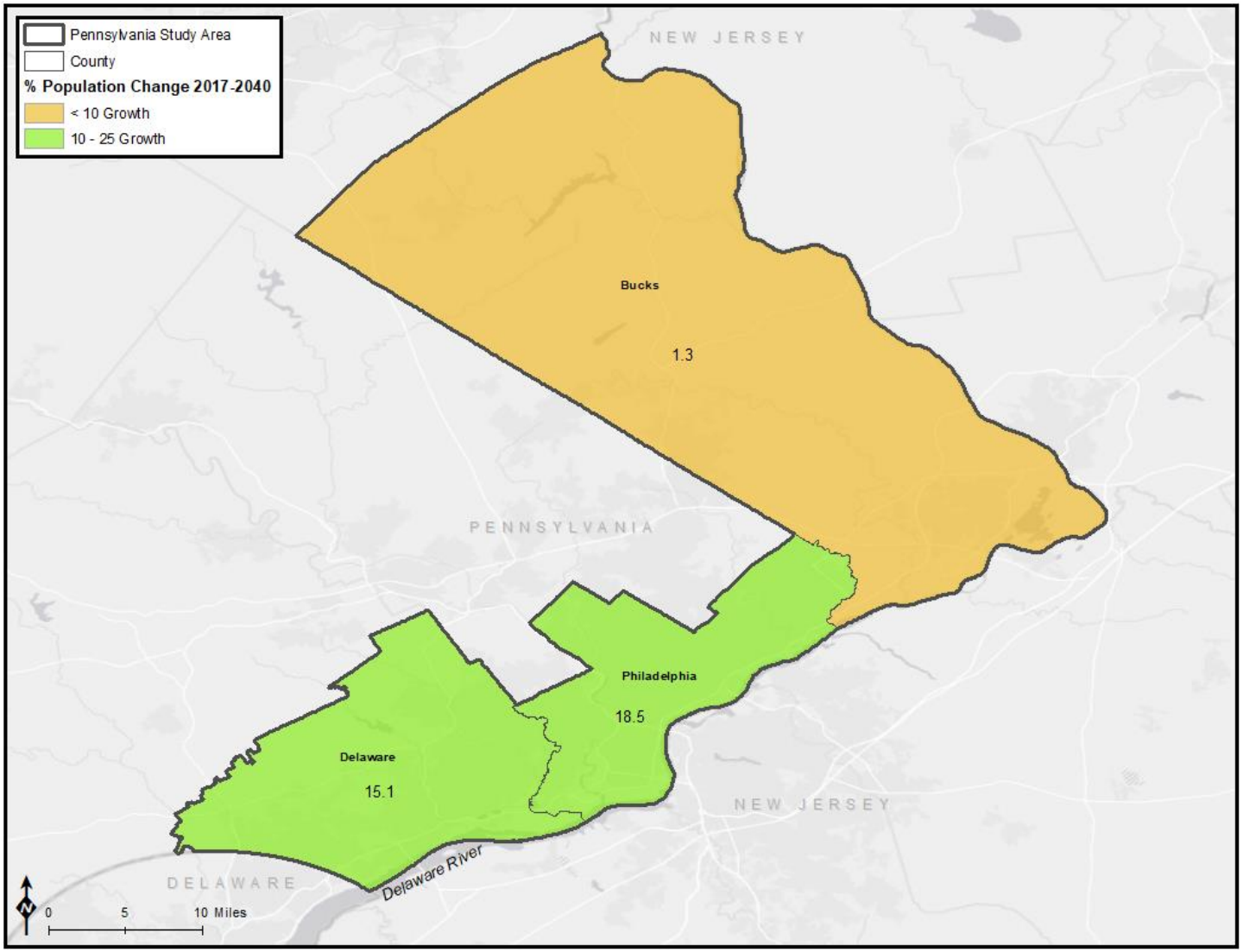
Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future (NOAA 2013). As shown in Table 9-7, this trend is apparent in the Study Area, as population density is projected to increase from 2,991 persons per square mile to 3,407 persons per square mile in the Study Area between 2017 and 2040 (USCB 2017d, USCB 2017c, Behney et al. 2014). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

Table 9-7. 2017 and 2040 Population Density in the Pennsylvania Study Area

Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Bucks	626,486	634,771	604	1,036.5	1,050.2
Delaware	563,384	648,439	184	3,064.9	3,527.6
Philadelphia	1,569,657	1,859,944	134	11,693.5	13,856.1
Study Area Total	**2,759,527**	**3,143,154**	**922**	**2,991.4**	**3,407.3**
Pennsylvania	**12,790,505**	**14,132,588**	**44,820**	**285.4**	**315.3**
United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: USCB 2017d, USCB 2017c, USCB 2018b

The Center for Rural Pennsylvania predicts that approximately 90% of the population increase during the 2010 to 2040 period will occur in urban counties and the remaining 10% will occur in rural counties. This means that the Commonwealth's population will become more urban, increasing from about 73% in 2010 to 74% in 2040. Population in rural counties will decrease from about 27% to about 26% during this same period (Behney et al. 2014).



Source: Behney et al. 2014

Figure 9-22. Overall Projected Population Change from 2017-2040 in the Pennsylvania Study Area by County

9.4.2 Demographics

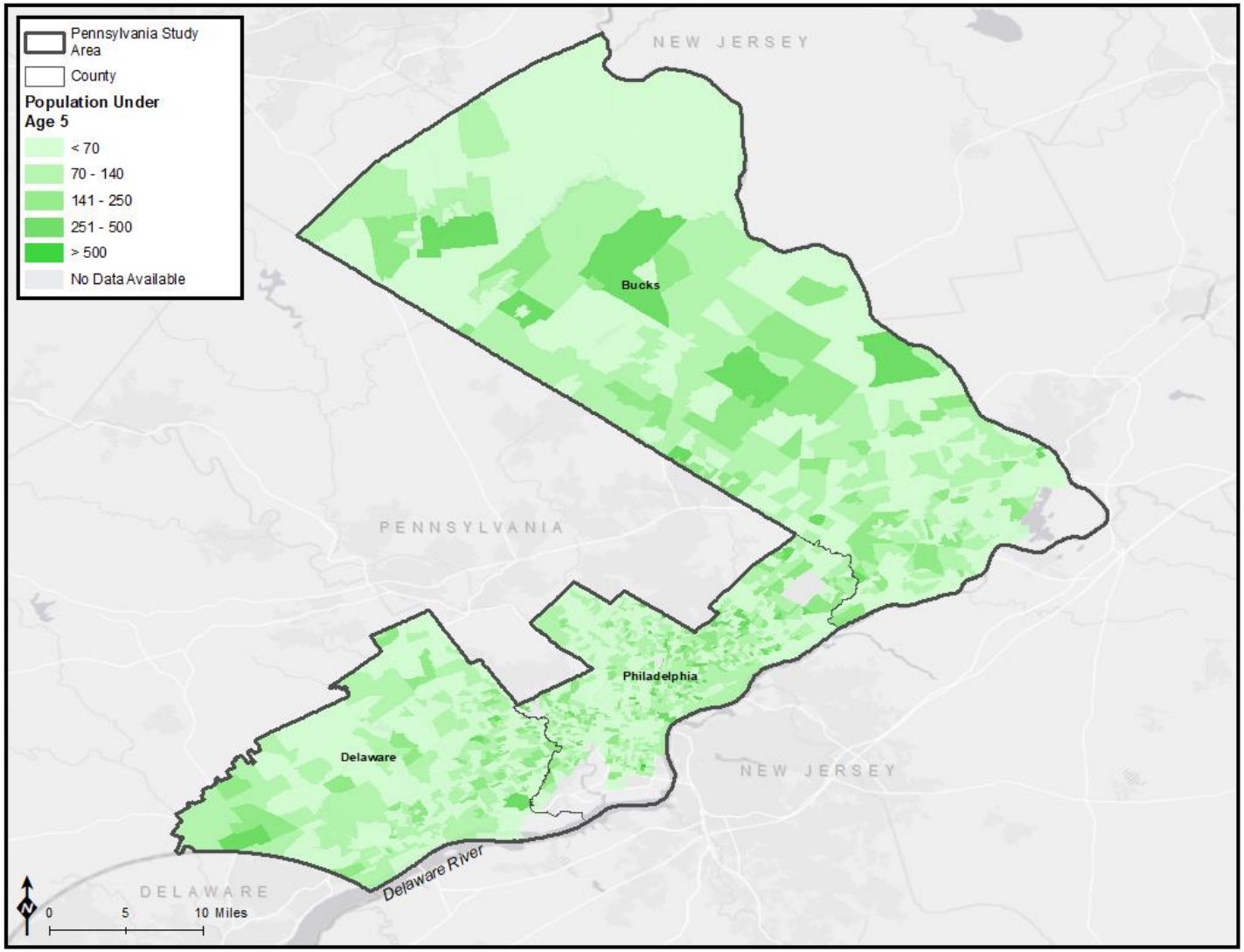
As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Pennsylvania and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 9-23 and Figure 9-24 show the 2017 estimated population "Under Age 5" and "Over Age 65," respectively. Figure 9-25 and Figure 9-26 show the projected change in these groups by 2040. Table 9-8 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Pennsylvania, and the Study Area (USCB 2017b, Brookings Institute 2018, Behney et al. 2014).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017 (USCB 2017b).

According to 2017 estimates shown in Figure 9-25 and Table 9-8, the population of young children represented 6.2% of the U.S. population and in the Study Area, more than the Commonwealth (5.6%). Philadelphia County had a greater percentage of young children (6.9%) as compared to Bucks County (4.9%), which is further away from the urban core. Delaware County had 6.0% of young children.

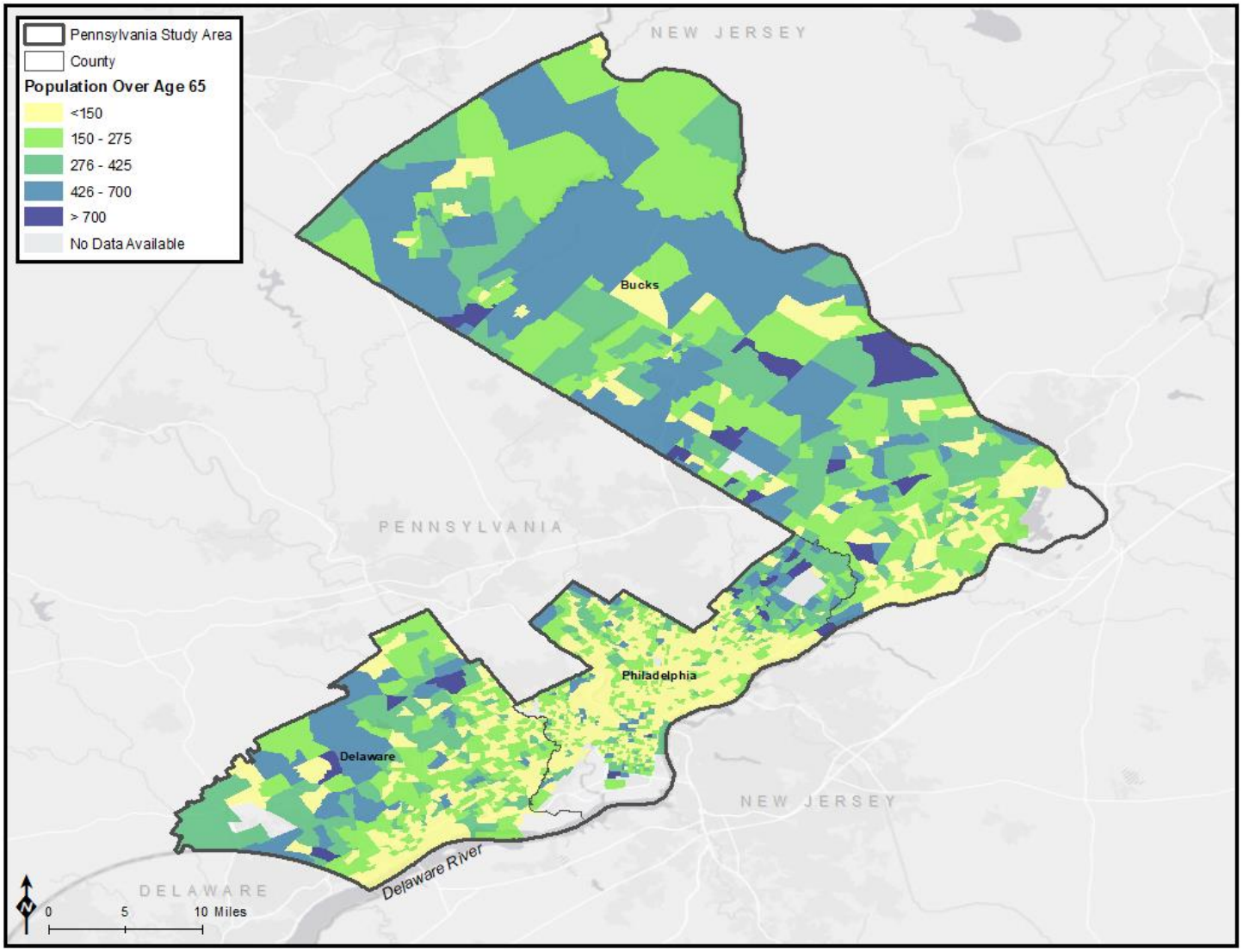
While the number of young children in the Study Area is projected to rise in 2040, the percentage of this group in comparison to the overall population is projected to decline to 5.6% as shown in Table 9-8. This reflects the national trend of a decline of the population of young children. The percentage of young children in the Commonwealth is projected to decline to 5.4%, more than the Nation (5.7%) or the Study Area. For the study area, this is an overall decrease of 0.6% in the proportion of the population under age 5 from 2017-2040 (USCB 2017b, USCB 2018b, Behney et al. 2014).

According to 2017 estimates shown in Figure 9-26 and Table 9-8, the elderly represented 14.9% of the U.S. population and 14.4% in the Study Area. The Commonwealth had a higher percentage (17.1%) of the elderly, indicating lower fertility rates of the elderly population residing in rural areas within the Commonwealth. By 2040, the population as well as the percentage of this group in comparison to the overall population is projected to rise in the Nation (21.6%), the Commonwealth (23.1%), and the Study Area (21.1%). Bucks County is projected to have the greatest percentage of elderly by 2040, while Philadelphia County is projected to have the lowest percentage (18.4%). For the study area, this is an overall increase of 6.7% in the proportion of the population over age 65 from 2017-2040. This is likely reflective of the higher reproduction rate of international immigrants moving closer to the urban core (USCB 2017b, USCB 2018b, Behney et al. 2014).



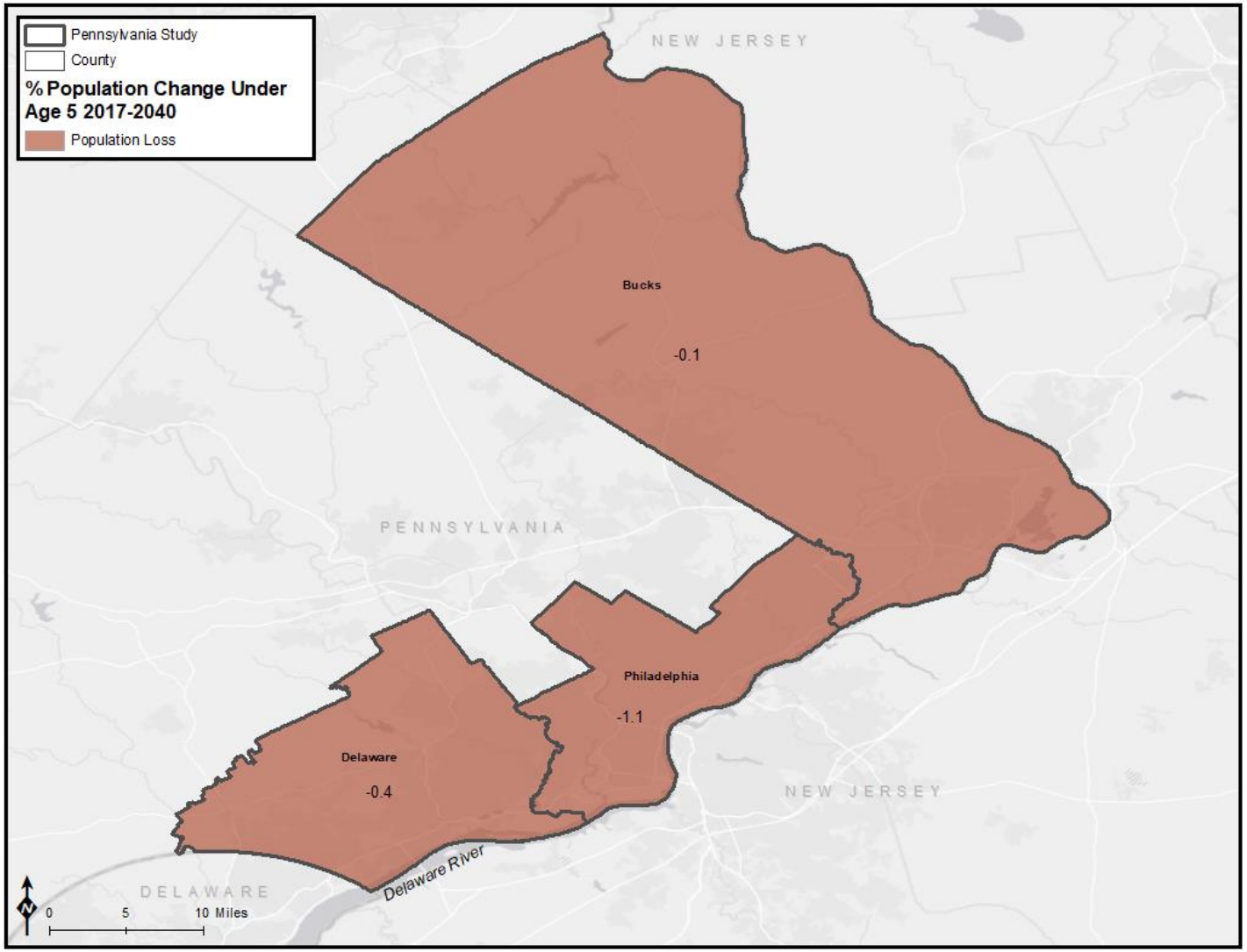
Source: USCB 2017r

Figure 9-23. Population Under Age 5 in the Pennsylvania Study Area by Census Block Group



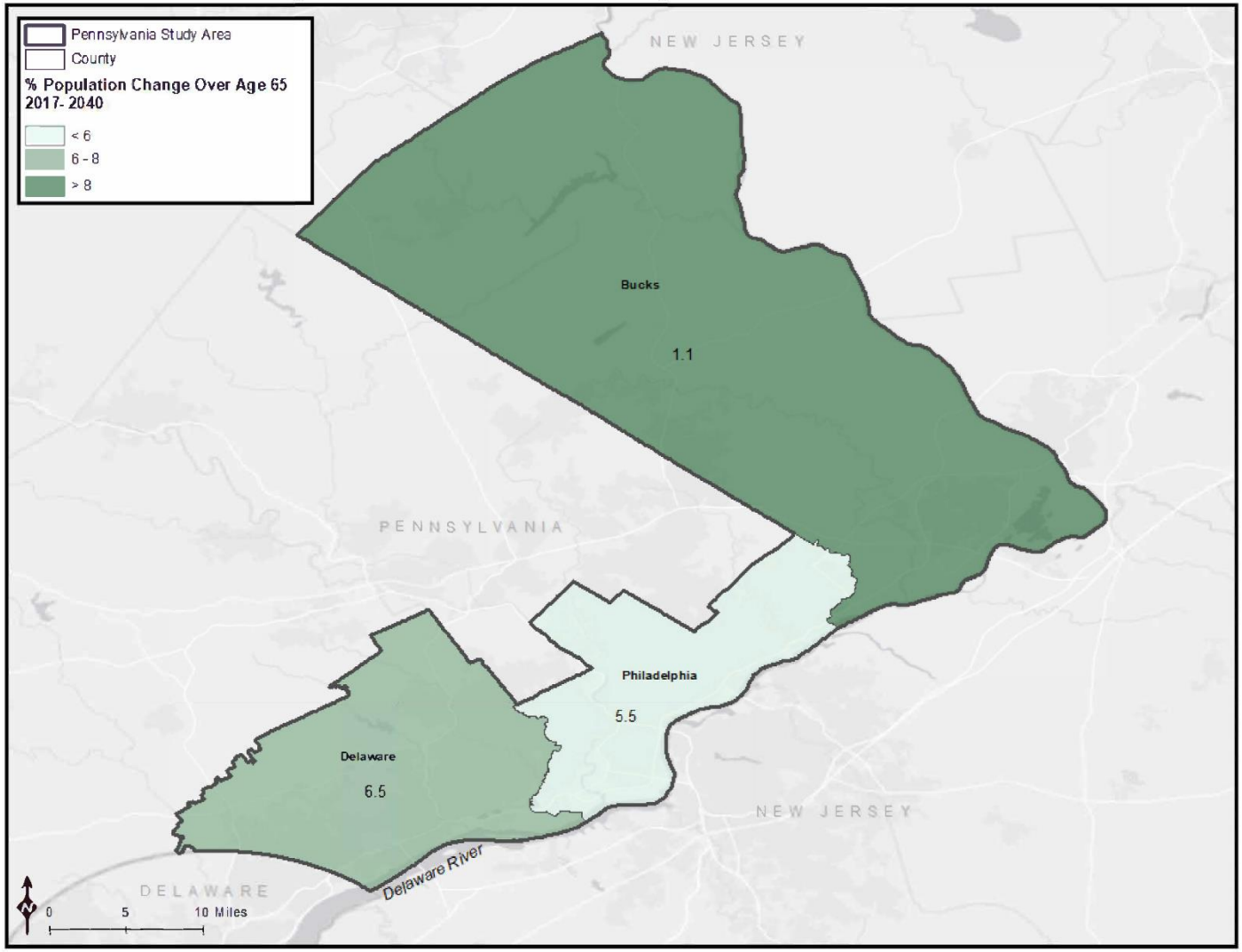
Source: USCB 2017r

Figure 9-24. Population Over Age 65 in the Pennsylvania Study Area by Census Block Group



Source: Behney et al. 2014

Figure 9-25. Projected Change in the Population Under Age 5 from 2017-2040 in the Pennsylvania Study Area by County



Source: Behney et al. 2014

Figure 9-26. Projected Change in the Population Over Age 65 from 2017-2040 in the Pennsylvania Study Area by County

Table 9-8. Population Under Age 5 and Over Age 65 in the Pennsylvania Study Area

Geographic Unit	2017 Estimates					Projected 2040				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Bucks	626,486	30,676	4.9	107,340	17.1	634,771	31,796	5.0	176,602	27.8
Delaware	563,384	33,721	6.0	86,922	15.4	648,439	36,487	5.6	141,989	21.9
Philadelphia	1,569,657	107,736	6.9	203,007	12.9	1,859,944	106,539	5.7	343,069	18.4
Study Area Total	**2,759,527**	**172,133**	**6.2**	**397,269**	**14.4**	**3,143,154**	**174,822**	**5.6**	**661,660**	**21.1**
Pennsylvania	**12,790,505**	**711,647**	**5.6**	**2,181,022**	**17.1**	**14,132,588**	**769,115**	**5.4**	**3,265,555**	**23.1**
United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: USCB 2017b, USCB 2018b, Behney et al. 2014

9.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area are presented in Table 9-9.

As shown in Table 9-9, in 2017 homeownership in Pennsylvania was 69 percent, higher than the Nation (63.8%) and the Study Area (61.2%). Renters comprised approximately 31percent of the Commonwealth population in 2017, lower than the Study Area (38.8%) and the Nation (36.2 percent) (USCB 2017m).

Figure 9-27 illustrates median home values in the Study Area. The figure portrays higher median home values in Bucks County (USCB 2017l).

Home values in the Commonwealth increased 4.1% during the 12-month period ending November 2019, according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio; the prevalence of price cuts on home listings; and time-on-market. The market temperature was characterized as "very hot" by Zillow (Zillow.com 2019y), which indicates market conditions favorable to sellers. Home values in the Philadelphia-Camden-Wilmington metropolitan area were also categorized as "very hot" having risen 3.2 percent during the 12-month period ending November 2019 (Zillow.com 2019z).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

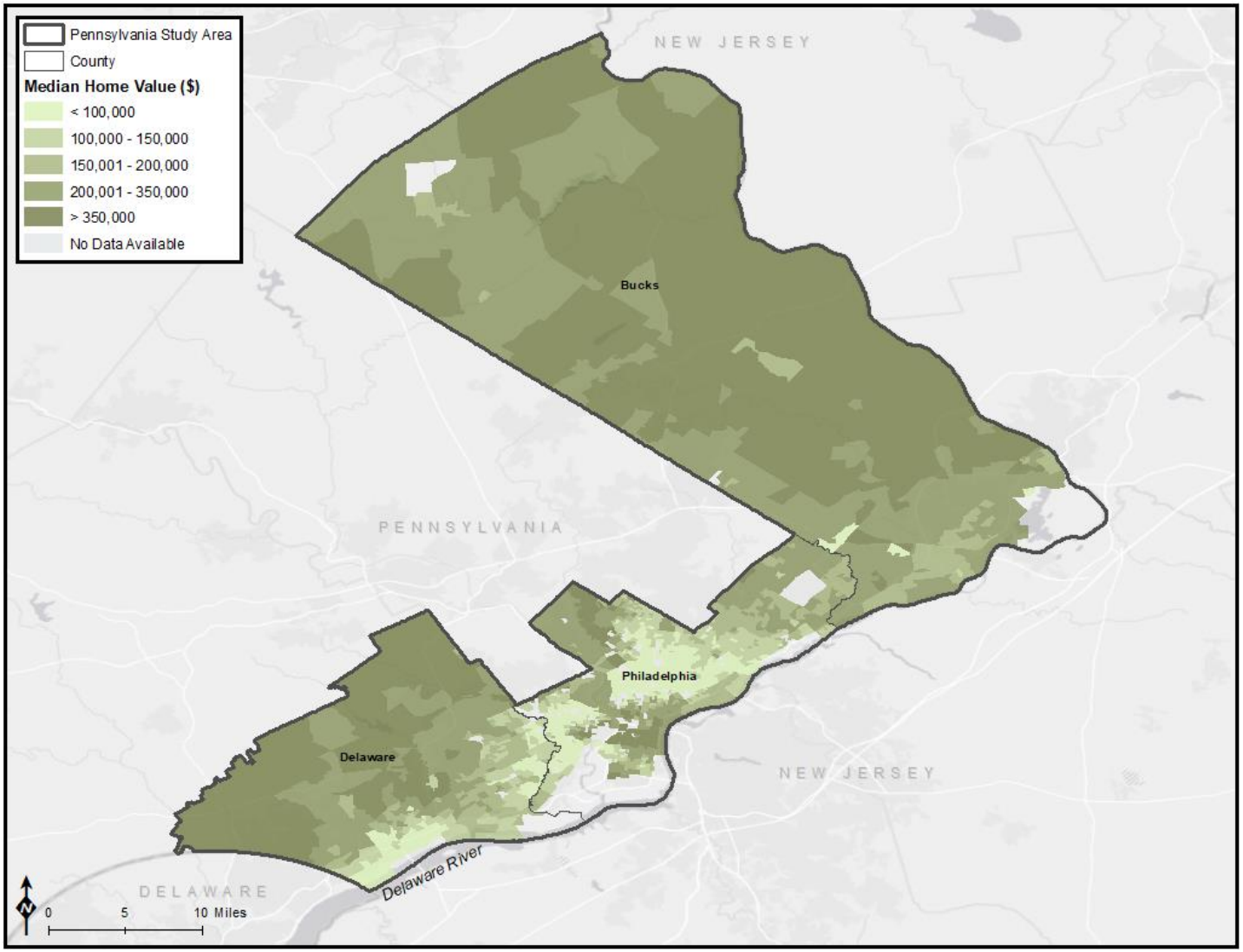
Figure 9-28 illustrates median gross rent by census block group in the Study Area. According to the National Low-Income Housing Coalition, as of 2019, fair market rent for a two-bedroom rental unit in the State is $1,006. In these conditions, it is estimated that a minimum wage worker would have to work approximately 107 hours a week in order to afford a two-bedroom fair market rate home. Pennsylvania has a shortage of approximately 279,009 rental homes affordable and available to extremely low-income households. Approximately 479,358 (30%) of renter households in Pennsylvania are considered extremely low income; approximately 340,344 (71%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (30%), single caregivers (27%), and disabled (25%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

As shown in Table 9-9 , home vacancy rates in the Study Area (10.5%) in 2017 were lower than the Nation (12.2%) and the Commonwealth (11.4). Figure 9-29 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (13.0%) in Philadelphia County and the lowest in Bucks County (5.2%) (USCB 2017g).

Table 9-9. Housing Utilization and Vacancy Rates in the Pennsylvania Study Area

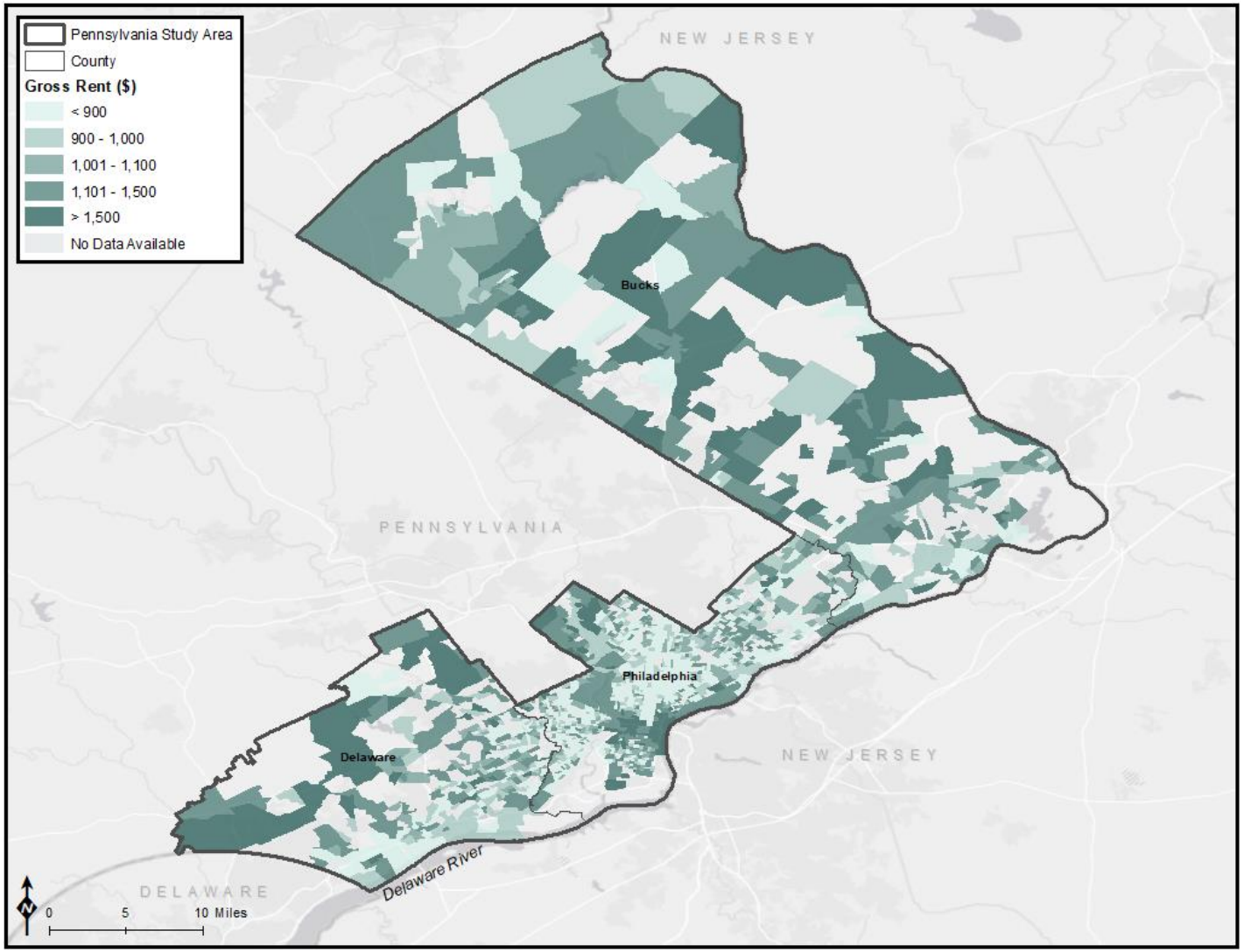
Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Bucks	248,873	235,909	12,964	5.2	180,670	76.6	55,239	23.4	$315,700	$1,171
Delaware	223,769	204,870	18,899	8.4	142,566	69.6	62,304	30.4	$235,200	$1,032
Philadelphia	679,876	591,280	88,596	13.0	308,695	52.2	282,585	47.8	$151,500	$970
Study Area Total	**1,152,518**	**1,032,059**	**120,459**	**10.5**	**631,931**	**61.2**	**400,128**	**38.8**	**$235,200**	**$1,032**
Pennsylvania	**5,653,599**	**5,007,442**	**646,157**	**11.4**	**3,456,360**	**69.0**	**1,551,082**	**31.0**	**$170,500**	**$885**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



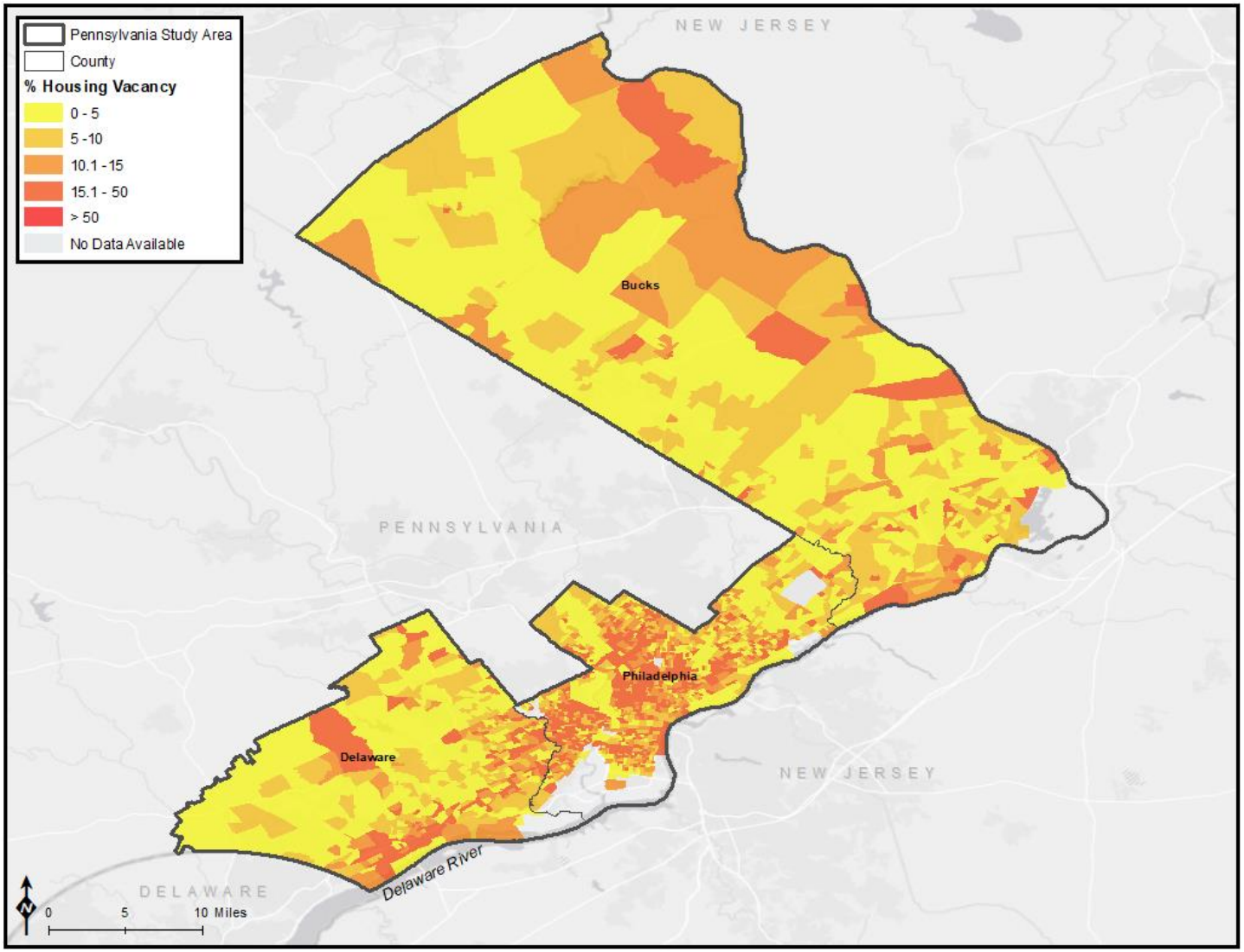
Source: USCB 2017r

Figure 9-27. Median Home Value in the Pennsylvania Study Area by Census Block Group



Source: USCB 2017r

Figure 9-28. Median Gross Rent in the Pennsylvania Study Area by Census Block Group



Source: USCB 2017r

Figure 9-29. Housing Vacancy Rates in the Pennsylvania Study Area by Census Block Group

9.4.4 Employment

9.4.4.1 Employment Types

Employment data by industry sector are presented in Table 9-10. In 2017, the Study Area had a total employment of 1.2 million jobs, representing approximately 20.8% of the total jobs in Pennsylvania, and 0.9% of the total jobs in the U.S. (USCB 2017p). Pennsylvania's 2018 Annual gross domestic product was 783.2 billion, which represented 3.8% of the Nation's gross domestic product (BEA 2019).

Table 9-10. Census Bureau Labor and Industry Statistics for the U.S. Pennsylvania, and the Pennsylvania Study Area (number of jobs)

Industry	United States	Percent (%)	Pennsylvania	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**6,096,977**		**1,267,769**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	85,983	1.4	4,469	0.4
Construction	9,564,541	6.4	351,087	5.8	63,046	5.0
Manufacturing	15,477,389	10.3	726,822	11.9	102,535	8.1
Wholesale trade	4,042,867	2.7	170,078	2.8	32,914	2.6
Retail trade	17,167,000	11.4	702,198	11.5	136,926	10.8
Transportation and warehousing, and utilities	7,681,579	5.1	327,457	5.4	66,727	5.3
Information	3,173,300	2.1	103,432	1.7	25,322	2.0
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	394,251	6.5	88,357	7.0
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	619,991	10.2	151,325	11.9
Educational services, and health care and social assistance	34,781,348	23.1	1,573,451	25.8	362,788	28.6
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	514,393	8.4	113,226	8.9
Other services, except public administration	7,371,226	4.9	282,945	4.6	58,771	4.6
Public administration	7,025,870	4.7	244,889	4.0	61,363	4.8

Source: USCB 2017p

Table 9-10 and Figure 9-30 show the number of jobs in each major industry sector for the U.S., the Commonwealth, and the Study Area. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (28.6%), professional, scientific, and management, and administrative and waste management (11.9%), retail trade (10.8%) and arts, entertainment, and

recreation, and accommodation and food services (8.9%). The Commonwealth has a greater proportion (11.9%) of manufacturing jobs than the Nation (10.3%) and the Study Area (8.1%) (USCB 2017p).

According to the Pennsylvania Center for Workforce Information and Analysis, the healthcare, business services, hospitality and entertainment, education, and advanced manufacturing industries employ 58.5% of the State's workforce (CWIA 2019a). The Healthcare industry includes industries that provide for the health and well-being of Pennsylvania residents, support direct patient care, and social assistance in the form of retirement communities and assisted living. As of 2017, the Healthcare industry accounted for 18.1% of the State's workforce (CWIA 2019a). The Business Services industry includes media and advertising, operational services, and professional and consulting services. As of 2017, this industry accounted for 12.7% of Pennsylvania's workforce (CWIA 2019a). The Hospitality industry includes industries that cater to tourism and recreation, such as hotels, restaurants, casinos, golf courses, and caterers. As of 2017, this industry employed 10.6% of Pennsylvania's workforce (CWIA 2019a). The Education industry includes every school, from elementary through universities, as well as technical schools and junior colleges. As of 2017, Education employed 9.6% of the workforce in Pennsylvania (CWIA 2019a). The Advanced Manufacturing industry includes makers of durable goods, and also wholesalers and some retailers, such as car dealerships. Chemicals, rubbers, plastics, electronics, metals, and vehicle manufacturers are included in this industry cluster. As of 2017, the Advanced Manufacturing industry accounted for 7.5% of Pennsylvania's workforce (CWIA 2019a).

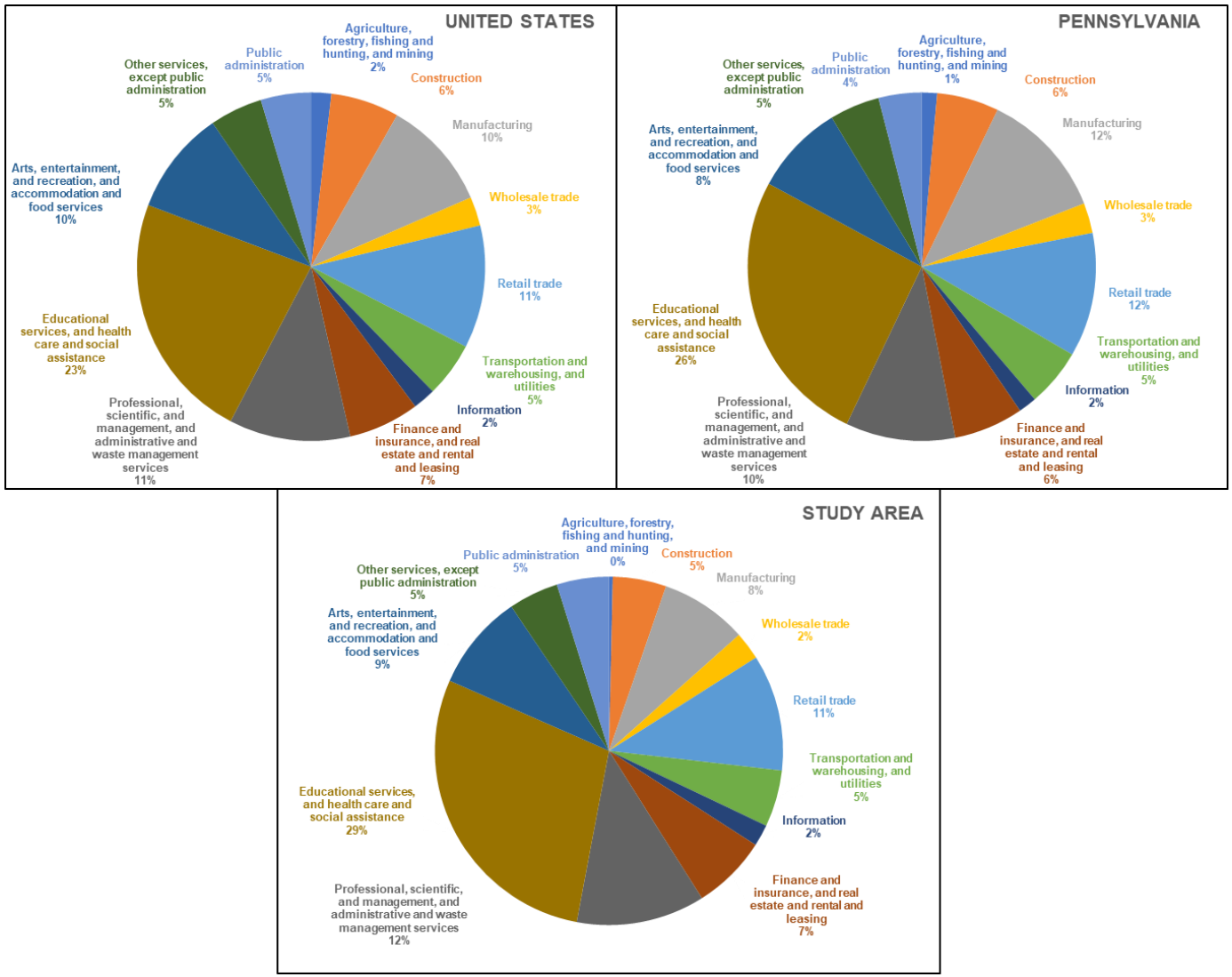
According to the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analysis, Bucks County's top employing industries as of November 2019 are Healthcare, Retail, Manufacturing, Hospitality, and Education (CWIA 2019b). These industries contribute to 58.7% of the total employment of Bucks County's workforce (CWIA 2019b). Philadelphia County's top employing industries are Healthcare, Education, Hospitality, Professional and Technical Services, and Public Administration. These industries account for employing 60.5% of the State's workforce (CWIA 2019b). Delaware County's major industries include Healthcare, Education, Retail, Hospitality, and Manufacturing (CWIA 2019b).

Figure 9-31 shows the location of jobs within the Study Area. The figure illustrates that jobs are plentiful in the Study Area, with the greatest portion located close to the urban core in Philadelphia.

9.4.4.1.1 Pennsylvania's Ocean Economy

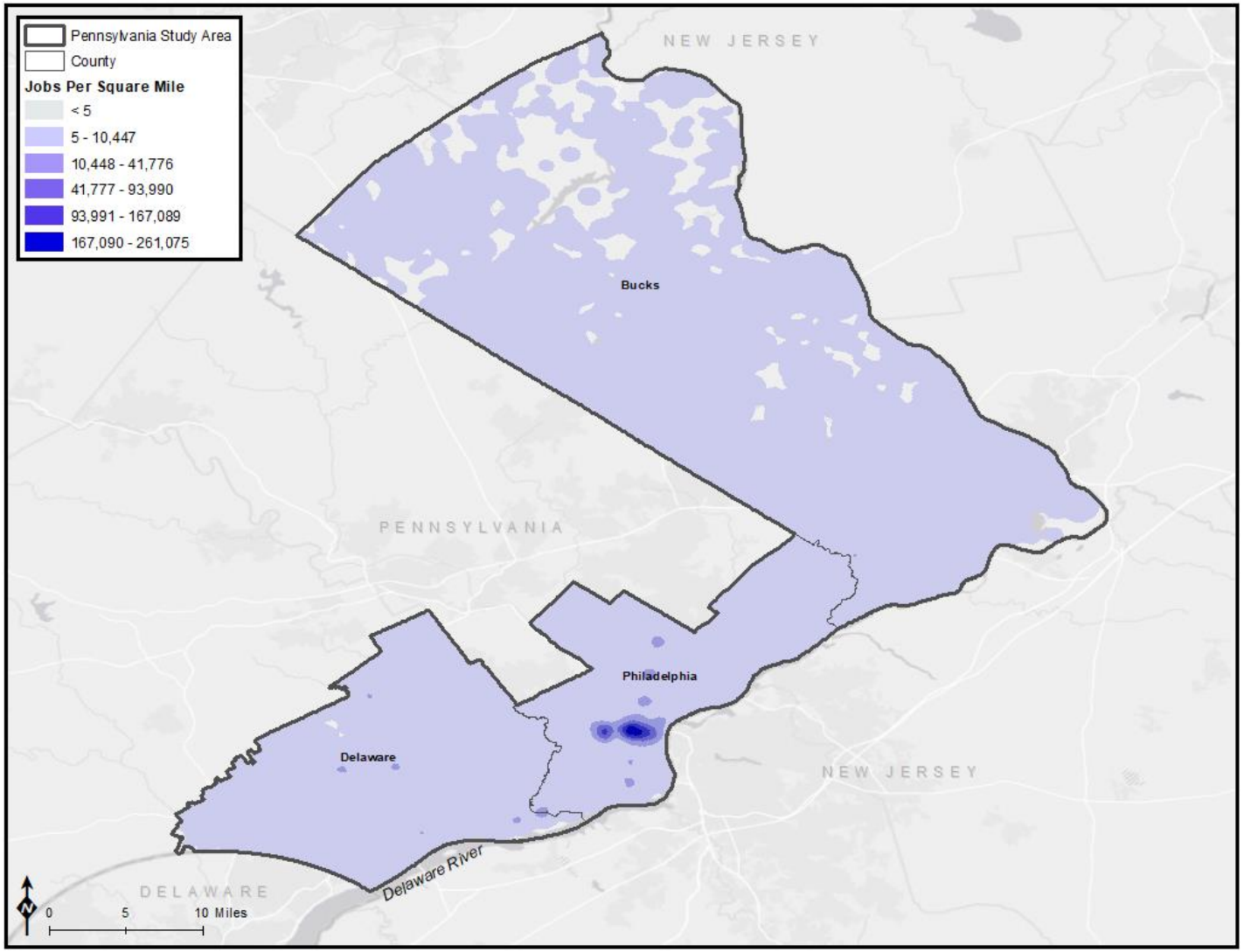
Overall, Pennsylvania's ocean economy ranked 16th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 9-11, Pennsylvania's ocean economy accounted for 55,175 maritime jobs in 2016, accounting for 1.0% of Pennsylvania's employment (NOAA 2016b, USCB 2017i). Within the Commonwealth, Tourism and Recreation was the dominant sector, accounting for 76.3% (41,753) of maritime jobs. The Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 48,636 maritime jobs, representing 88.1% of total maritime jobs in the Commonwealth. Philadelphia County had the greatest number of maritime jobs (44,048), representing 90.6% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). Figure 9-32 shows the percent of maritime-related jobs to total jobs in each county in the Study Area.



Source: USCB 2017p

Figure 9-30. Number of Jobs by Industry Sector for the U.S., Pennsylvania, and the Pennsylvania Study Area



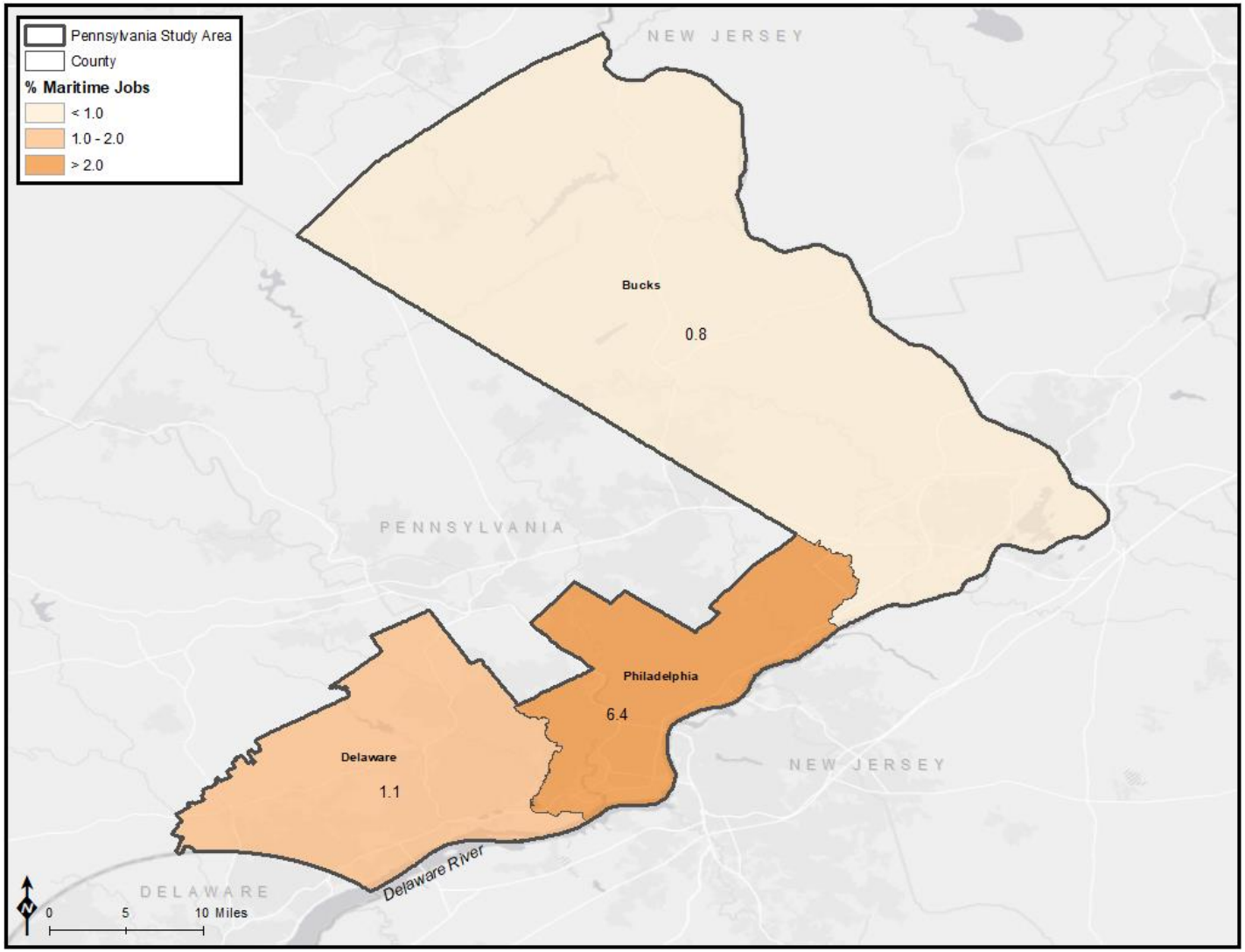
Source: USCB 2017r

Figure 9-31. Jobs Per Square Mile in the Pennsylvania Study Area by Census Block Group

Table 9-11. Employment Data in the Pennsylvania Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force [1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed[1] (%)	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs[3] (%)	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Bucks	345,693	345,501	326,994	18,507	5.4	270,098	2,144	0.8	$82,031	$41,924
Delaware	295,097	294,996	275,010	19,986	6.8	240,928	2,444	1.0	$69,839	$36,747
Philadelphia	751,072	750,824	665,765	85,059	11.3	684,869	44,048	6.4	$40,649	$24,811
Study Area Total	**1,391,862**	**1,391,321**	**1,267,769**	**123,552**	**8.9**	**1,195,895**	**48,636**	**4.1**	**$69,839**	**$34,494**
Pennsylvania	**6,523,666**	**6,518,993**	**6,096,977**	**422,016**	**6.5**	**5,741,293**	**55,175**	**1.0**	**$56,951**	**$31,476**
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 – USCB 2017h; 2 – USCB 2017i; 3 – NOAA 2016b; 4 – USCB 2017k; 5 – USCB 2017n



Source: NOAA 2017b

Figure 9-32. Maritime Jobs in the Pennsylvania Study Area by County

9.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 9-11, in 2017 Pennsylvania had a lower median household income and a higher per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, Pennsylvania had a median income of $56,951 (1.2% lower than the Nation's median income) and a per capita income of $31,476 (0.9% higher than the Nation's per capita income). Median and per capita income in the Study Area were higher than the Commonwealth at $69,839 and $34,494, respectively (USCB 2017k, USCB 2017n).

As shown in Table 9-11, in 2017 median household income by county in the Study Area ranged from an average of $40,649 (Philadelphia County) to an average of $82,031 (Bucks County). In 2017, per capita income ranged from an average of $24,811 (Philadelphia County) to an average of $41,924 (Bucks County). Figure 9-33 shows median household income in the Study Area by census block group. Figure 9-34 shows per capita income in the Study Area by census block group (USCB 2017k, USCB 2017n).

9.4.4.3 Unemployment Rates

Figure 9-35 shows the 2017 unemployment rates in the Study Area counties by census block group. Table 9-11 presents unemployment rates for each county in the Study Area. The average unemployment rate in the Study Area was 8.9%, higher than the Commonwealth (6.5%) and the Nation (6.6%). Within the Study Area, unemployment rates ranged from 5.4% in Bucks County to 11.3% in Philadelphia County in 2017 (USCB 2017h, USCB 2017p).

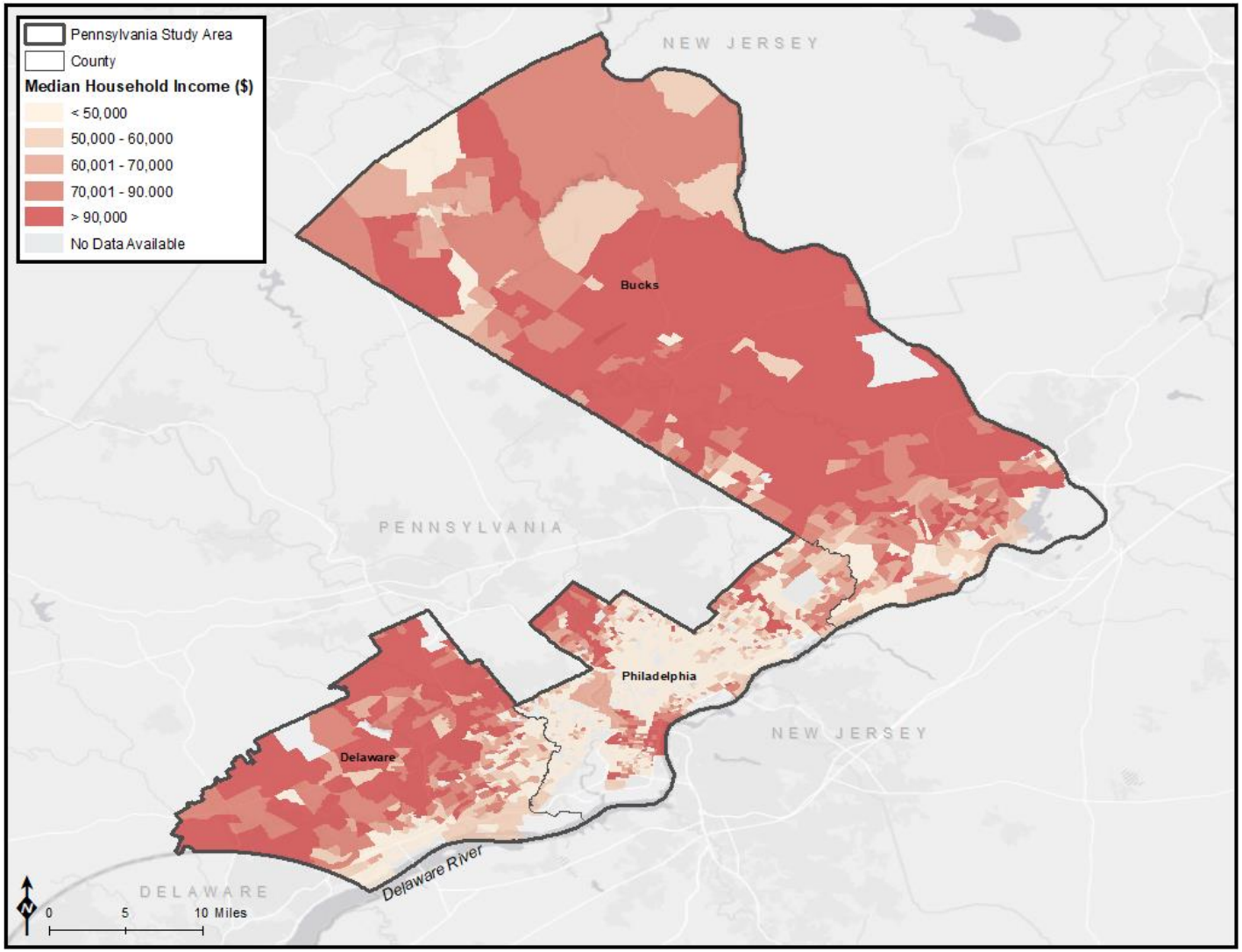
9.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the Commonwealth, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 9-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the Commonwealth, and the Nation (USCB 2017t).

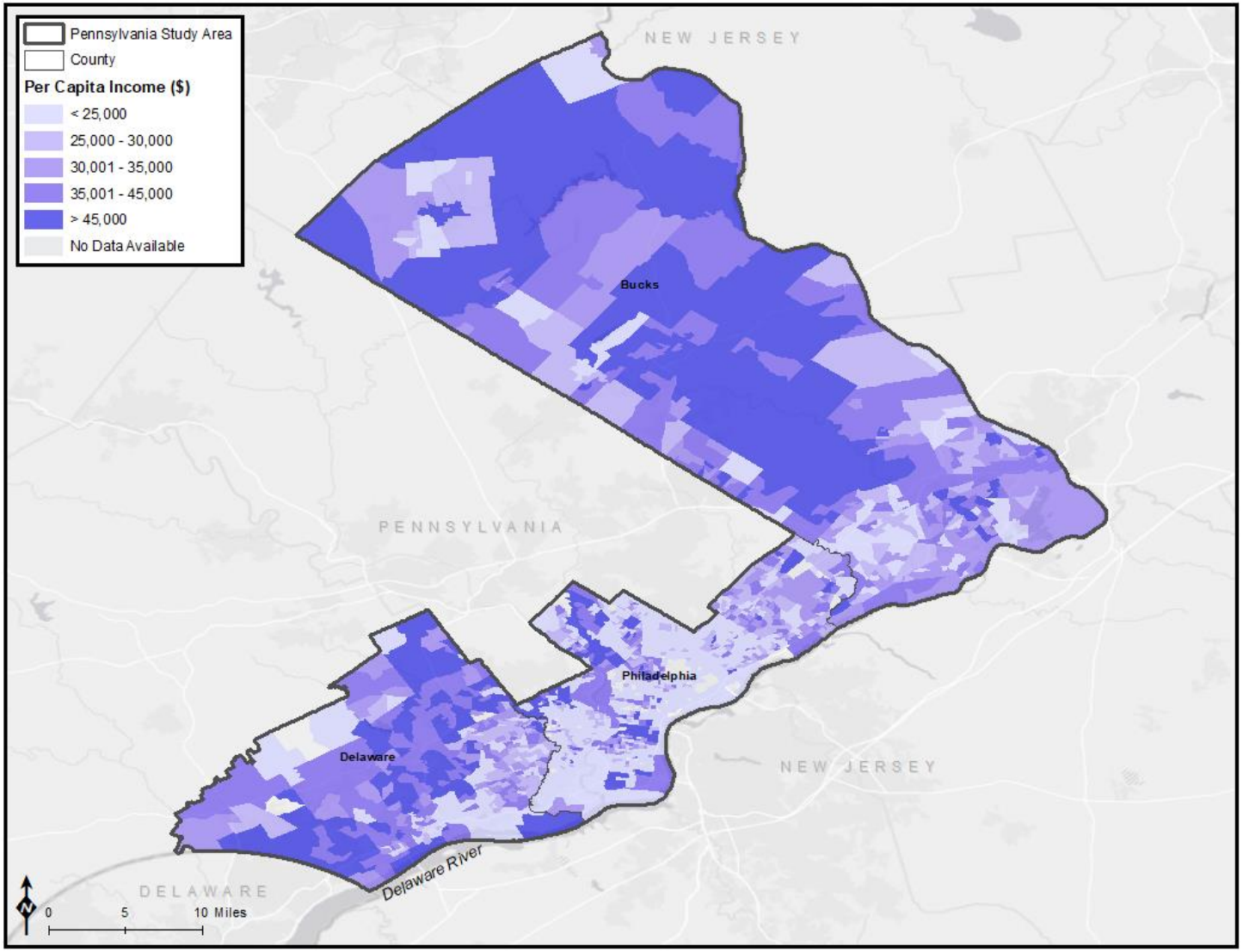
Figure 9-36 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the Commonwealth, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Pennsylvania, 34.8% of the working-age population earned only a high school diploma; 36.7% earned a college or advanced degree.
- In the Study Area, 32.1% of the working-age population earned only a high school diploma; 35.3% earned a college or advanced degree (USCB 2017q).



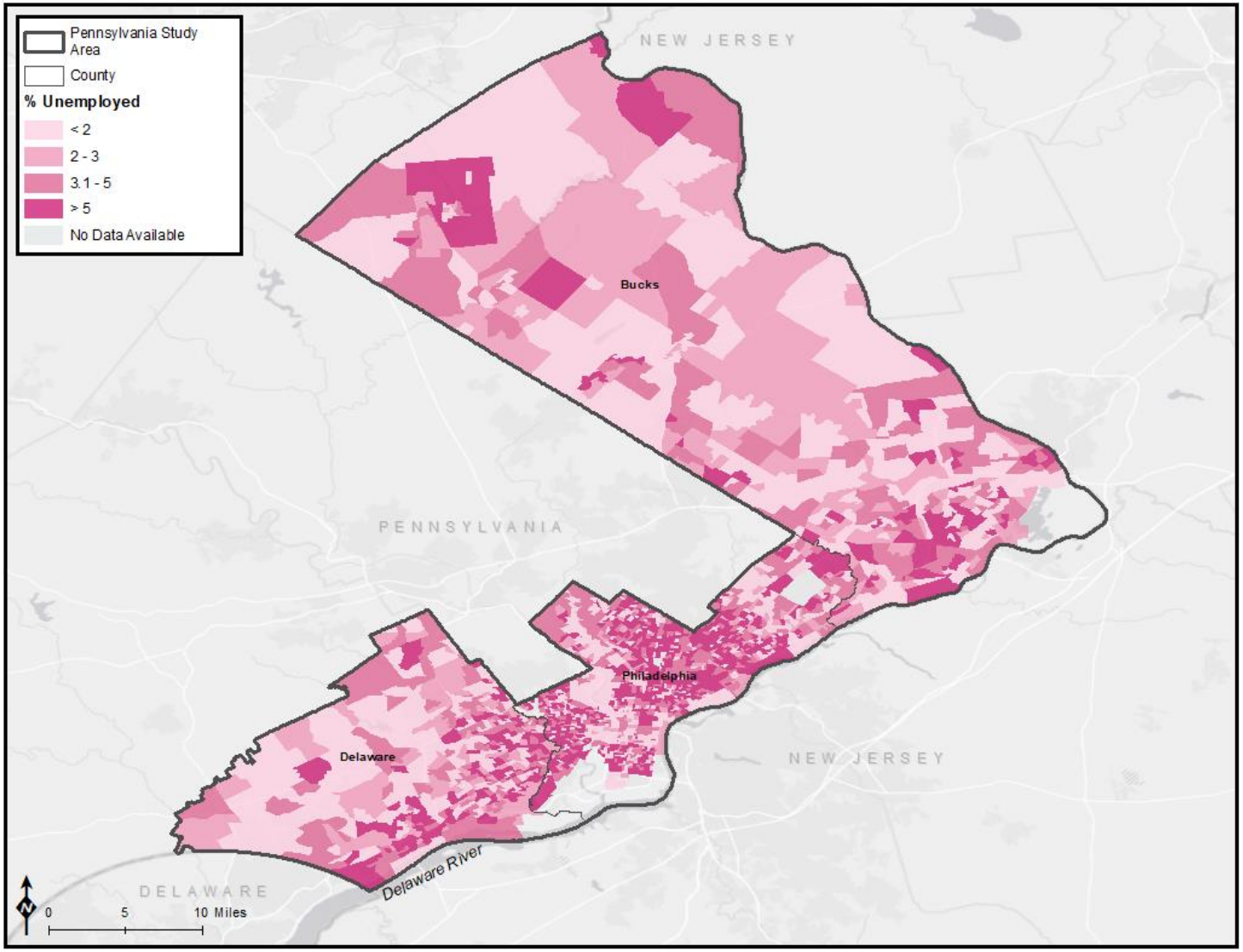
Source: USCB 2017r

Figure 9-33. Median Household Income in the Pennsylvania Study Area by Census Block Group



Source: USCB 2017r

Figure 9-34. Per Capita Income in the Pennsylvania Study Area by Census Block Group



Source: USCB 2017r

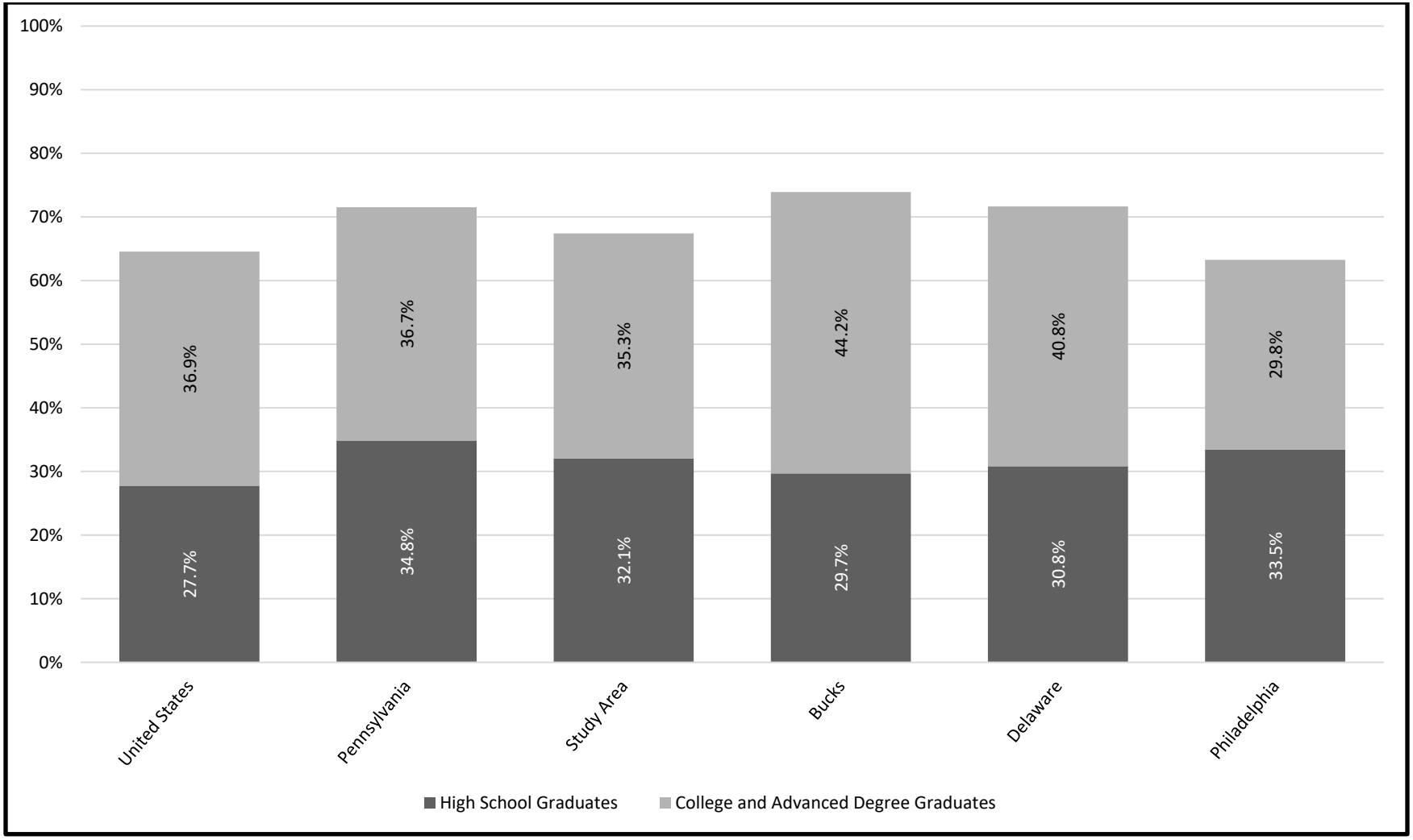
Figure 9-35. Unemployment Rates in the Pennsylvania Study Area by Census Block Group

Table 9-12. Educational Data for the Pennsylvania Study Area

Geographic Unit	Number							Total	Percent						
	Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less Than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Bucks	8,327	24,823	146,715	95,702	34,638	113,778	70,111	494,094	1.7	5.0	29.7	19.4	7.0	23.0	14.2
Delaware	8,856	24,871	135,061	90,532	27,988	90,096	60,727	438,131	2.0	5.7	30.8	20.7	6.4	20.6	13.9
Philadelphia	60,757	137,440	409,479	251,645	58,296	188,182	118,269	1,224,068	5.0	11.2	33.5	20.6	4.8	15.4	9.7
Study Area Total	**77,940**	**187,134**	**691,255**	**437,879**	**120,922**	**392,056**	**249,107**	**2,156,293**	**3.6**	**8.7**	**32.1**	**20.3**	**5.6**	**18.2**	**11.6**
Pennsylvania	**283,386**	**702,374**	**3,533,950**	**1,902,244**	**747,997**	**1,850,776**	**1,119,839**	**10,140,566**	**2.8**	**6.9**	**34.8**	**18.8**	**7.4**	**18.3**	**11.0**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between district-level summarization and State-level summarization methods. Therefore, the district statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 9-36. High School, College, and Advanced Degree Graduate Rates in the Pennsylvania Study Area

Figure 9-37 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q). These data show that overall, Bucks and Delaware Counties tend to have a more highly educated workforce than Philadelphia County. Percentages of the working-age population with only a 9th grade education only vary from 1.7% in Bucks County to 5.0% in Philadelphia County. Those with some high school range from 5.0% in Bucks County to 11.2% in Philadelphia County. Workers with a high school degree only range from 29.7% in Bucks County to 33.5% in Philadelphia County. Those with some college range from 19.4% in Bucks County to 20.7% in Delaware County. Workers with an associate's degree only ranges from 4.8% in Philadelphia County to 7.0% in Bucks County. Those with a bachelor's degree ranges from 15.4% in Philadelphia County to 23.0% in Bucks County. Workers with a graduate or professional degree range from 9.7% in Philadelphia County to 14.2% in Bucks County. The concentration of the less skilled workers in Philadelphia County corresponds to the greater population concentration in the more urban area of the City of Philadelphia as compared to the surrounding suburban areas.

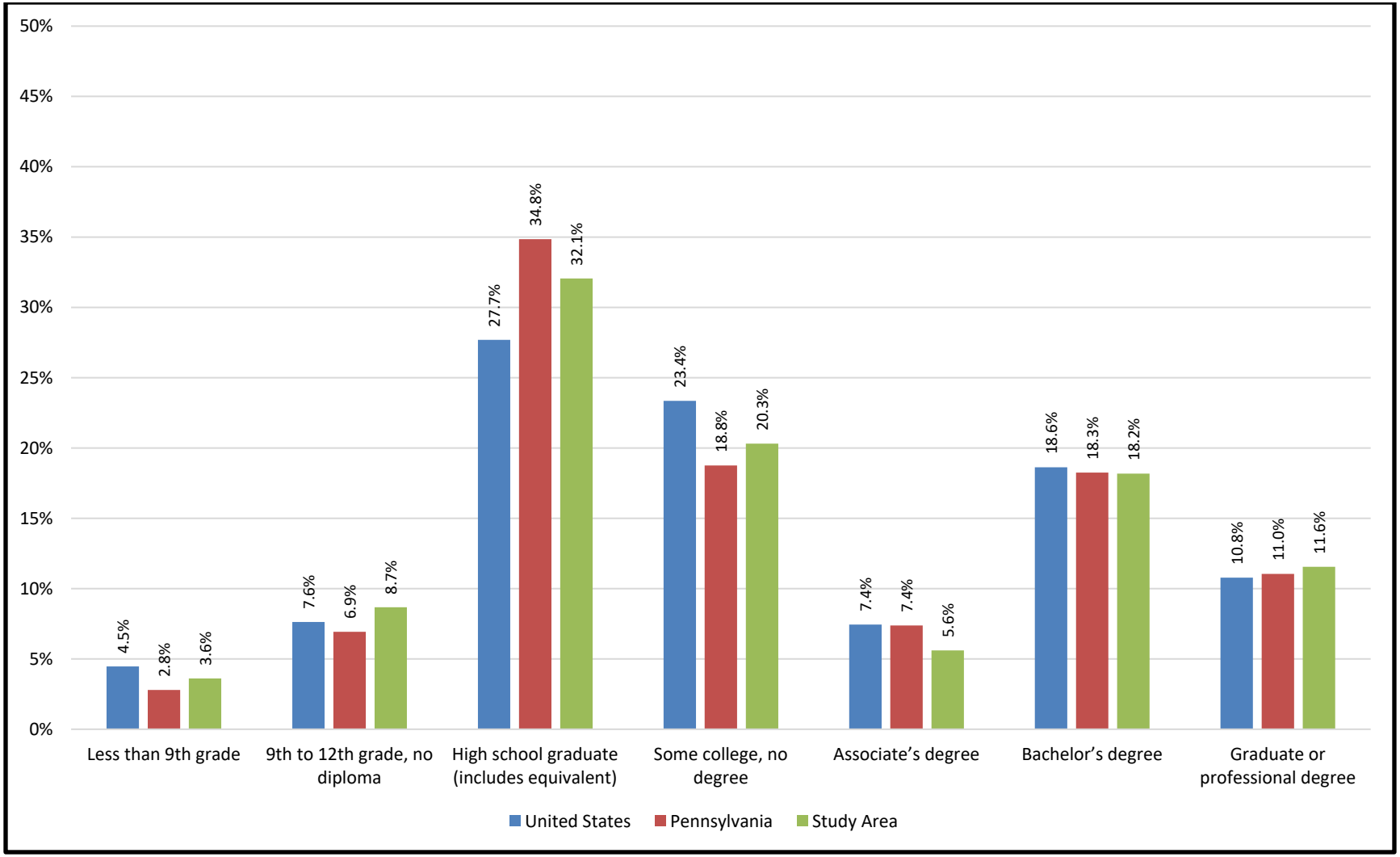
Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce-related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

9.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice;
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area;
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area; these populations/communities may depend more heavily on natural resources than other populations in the region;
- Tribes within the Study Area; and
- Limited-English speaking populations based on USCB data.



Source: USCB 2017q

Figure 9-37. Educational Attainment in the Pennsylvania Study Area

9.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 9-38 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.

9.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential Environmental Justice communities of concern. Table 9-13 presents population and Environmental Justice-related characteristics for the Study Area regarding minority populations. Of the 2,759,527 people living in the Study Area, approximately 1,296,950 (47.0%) are minority. This is significantly higher than the State (22.7%) and the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 2,154 block groups in the Study Area, approximately 48.6% (1,046 block groups) are considered minority populations (USCB 2017f).

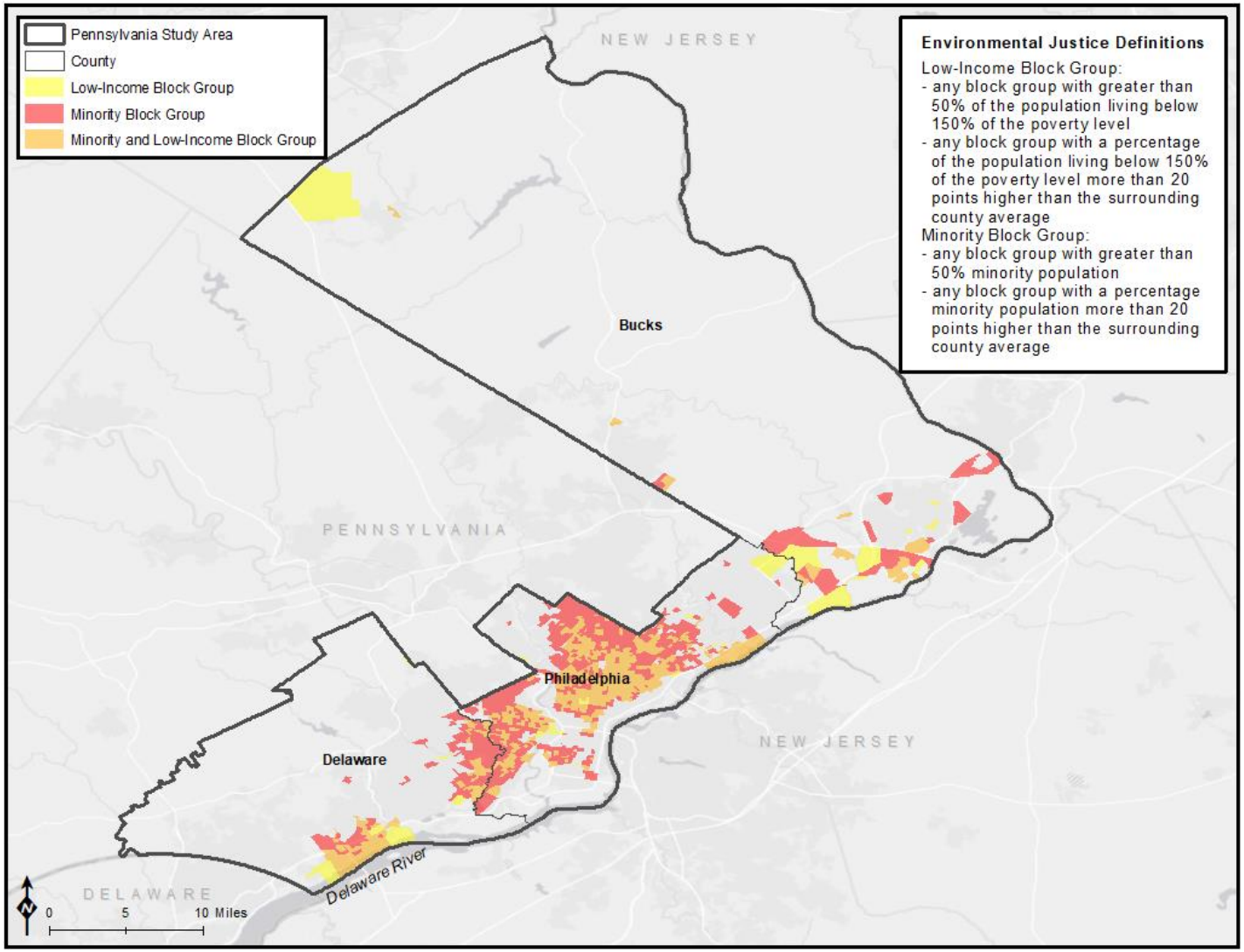
Each of the counties contain census block groups with high percentages of minority populations. As shown in Table 9-13, Philadelphia County has the highest percentage of minority persons (65.1%); Bucks County has the lowest (15.2%). Within the overall Study Area, the largest minority group is Black or African-American (28.6%) followed by Asian (6.1%) and Hispanic or Latino (5.0%) (USCB 2017f).

Table 9-13 provides detail of the high percentages of minority block group populations. The county with the highest percentage of minority block groups is Philadelphia (67.1%) (USCB 2017f).

9.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 9-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 2,687,318 people for whom poverty status is determined living in the Study Area, approximately 720,949 (26.8%) individuals have incomes less than 150% of the poverty level. This is somewhat higher than the State (21.2%) and the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 2,154 census block groups in the Study Area, approximately 22.2% (479 block groups) are considered low-income populations (USCB 2017o).

Table 9-13 provides detail of the high percentages of low-income block groups in Study Area counties. Philadelphia County has the highest percentage of low-income block groups (29.9%) (USCB 2017o).



Source: USCB 2017r

Figure 9-38. Minority and Low-Income Population in the Pennsylvania Study Area by Census Block Group

Table 9-13. Low-Income and Minority Populations in the Pennsylvania Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less Than 150% of the Poverty Level	Percent Population with Incomes Less Than 150% of the Poverty Level (%)
Bucks	626,486	531,406	95,080	15.2	381	23	6.0	34	8.9	618,095	67,842	11.0
Delaware	563,384	382,859	180,525	32.0	437	57	13.0	116	26.5	542,641	91,611	16.9
Philadelphia	1,569,657	548,312	1,021,345	65.1	1,336	399	29.9	896	67.1	1,526,582	561,496	36.8
Study Area Total	**2,759,527**	**1,462,577**	**1,296,950**	**47.0**	**2,154**	**479**	**22.2**	**1,046**	**48.6**	**2,687,318**	**720,949**	**26.8**
Pennsylvania	**12,790,505**	**9,881,135**	**2,909,370**	**22.7**						**12,377,251**	**2,618,947**	**21.2**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

9.4.5.2 Socially Vulnerable Populations

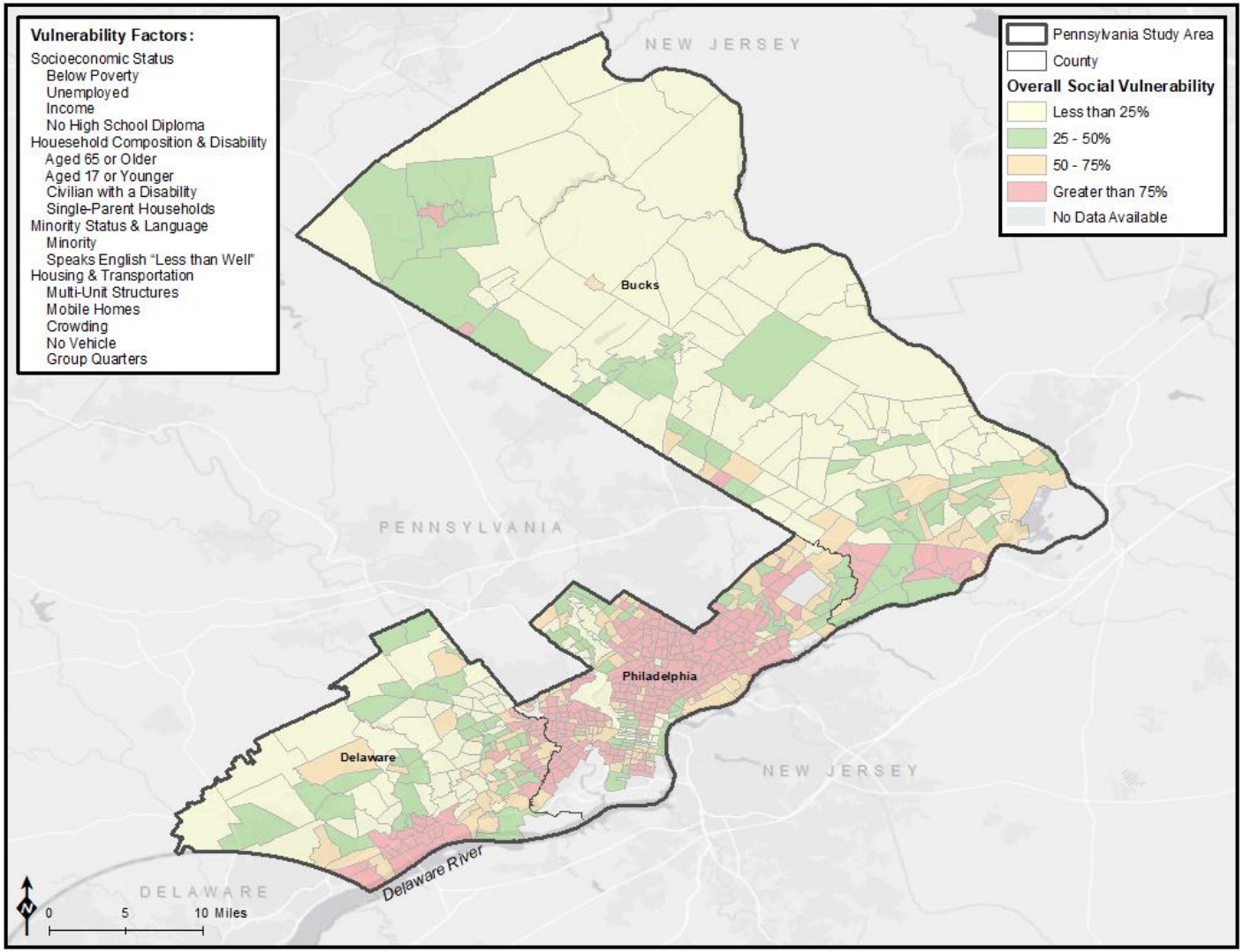
As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this chapter, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this chapter we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 9-39 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 9-39, Philadelphia County has the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).

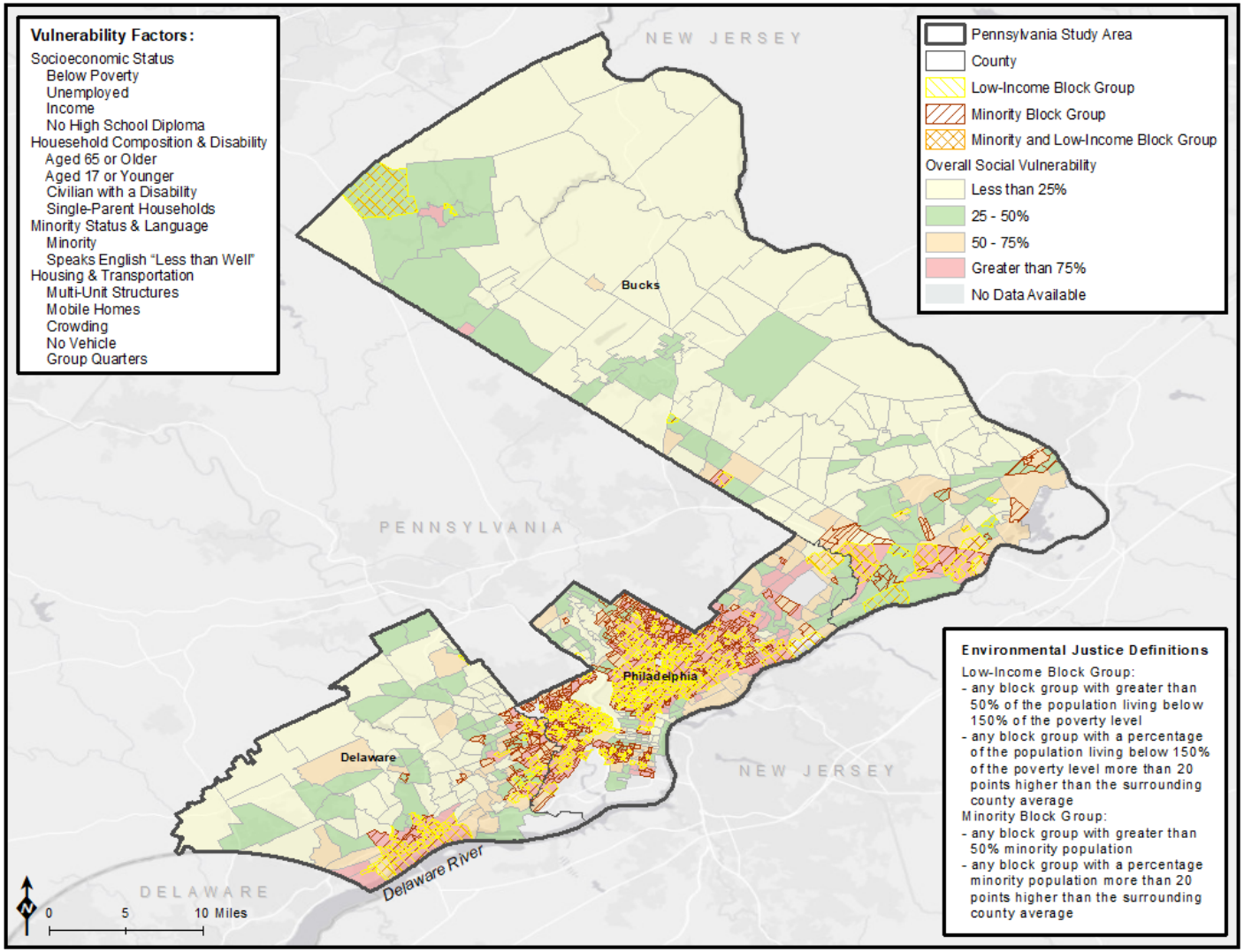
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 9-40 combines the CDC SoVI index (as shown in Figure 9-39) with minority and low-income populations (as shown in Figure 9-38) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; particularly notable in Philadelphia County and metropolitan Philadelphia.

Figure 9-41 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 9-41 shows that many vulnerable communities along the Delaware River are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 9.2.2.2 above), are risks associated with storm surge. Communities subject to sea level rise (i.e., those located along the Delaware River) would also therefore be subject to storm-surge effects. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge as a result of the pressures on and changes in the environment associated with sea level rise. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing Figure 9-41.



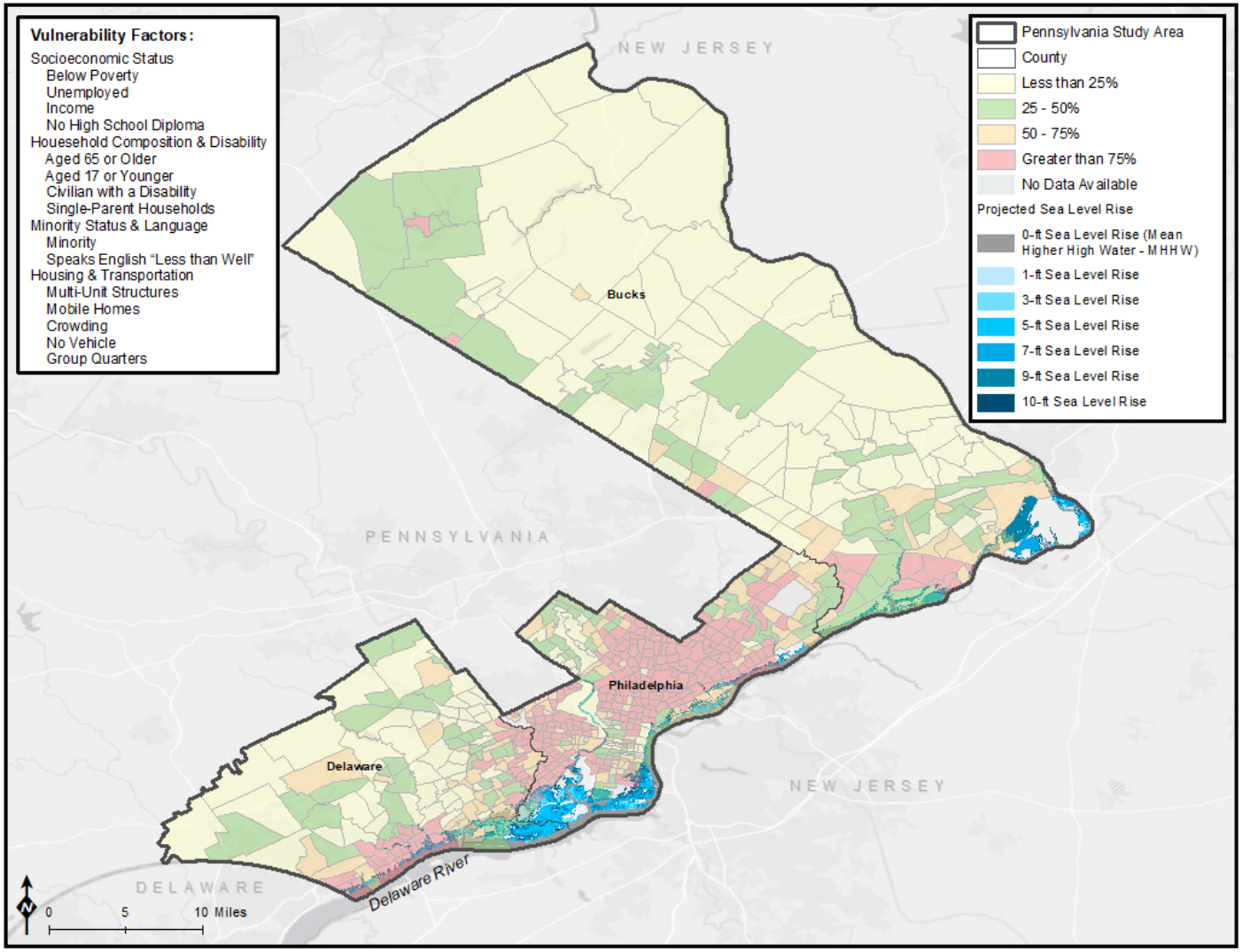
Source: CDC 2016

Figure 9-39. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Pennsylvania Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 9-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Pennsylvania Study Area



Sources: CDC 2016, NOAA 2018a

Figure 9-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Pennsylvania Study Area by Census Tract

As discussed in Chapter 9.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

9.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.

9.4.5.3.1 Fishing Communities

Because Pennsylvania is an inland State without coastline along the Atlantic Ocean, there are no NOAA identified fishing communities in the Study Area. Because the Delaware River provides direct access to the Atlantic Ocean, it is likely that individual fishermen reside in the area; however, whole communities with a primary focus on commercial fishing are not present.

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

9.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general. Communities that are dependent on commercial fishing can be more socially vulnerable than other communities (NOAA Fisheries 2019e) and can rely on subsistence fishing for their personal sustenance and can have other vulnerability factors as described in Chapter 1.6.5.3.1. As described in Chapter 9.4.5.3.1, there are no NOAA identified fishing communities in Pennsylvania. Therefore, identification of commercial fishing communities is not a useful source of information regarding potential subsistence fishing communities in the Study Area. Analysis of potential OCS-related projects should

consider other avenues such as local community planners, organizers, or groups to help discover if there are any such communities in the Study Area.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

9.4.5.3.3 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3. With an estimated population of 79,200 in 2019, Pennsylvania leads the Nation in number of Amish communities (Young Center 2019b). Most Amish live in Pennsylvania Dutch Country, which includes nearby Lancaster County and which is the largest and best-known of all Amish settlements, located within 50 miles of Study Area counties (PA Visitors Network 2020). Amish and Mennonite settlements are not present within the Study Area.

Proximity of unique religious populations to prospective sites for future OCS-related development should be considered in analysis as these communities may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources.

9.4.5.4 Tribes

As of 2019, Pennsylvania has 12 federally recognized tribes that have historical ties to the State, but there are no State-recognized tribes in Pennsylvania. Five of the 12 federally recognized tribes have historical ties to the Study Area and thus may have an interest in modern activities impacting lands within the Study Area (NCSL 2019). There are no tribes that currently reside in the Study Area. Table 9-14 lists the tribes who have lived in Pennsylvania and those that have historical ties to lands within the Study Area in Pennsylvania:

Table 9-14. Federally and State-Recognized Tribes with Historical Ties to Pennsylvania

Tribe	Federal and/or State Recognition	Historical Ties the Study Area	Geographic Unit(s)
Federally Recognized Tribes Outside the Study Area			
Catawba Indian Nation	Federal	Yes	Tribal members reside outside of Pennsylvania (primarily in South Carolina) but have historical ties to Delaware County.
Cayuga Nation	Federal	No	Tribal members reside outside of Pennsylvania, primarily in New York.
Delaware Nation, Oklahoma	Federal	Yes	Tribal members reside outside of Pennsylvania (primarily in Oklahoma) but have historical ties to Bucks, Delaware, Philadelphia Counties.

Table 9-14. Federally and State-Recognized Tribes with Historical Ties to Pennsylvania

Tribe	Federal and/or State Recognition	Historical Ties the Study Area	Geographic Unit(s)
Delaware Tribe of Indians	Federal	Yes	Tribal members reside outside of Pennsylvania (primarily in Oklahoma) but have historical ties to Bucks, Delaware, Philadelphia Counties.
Eastern Shawnee Tribe of Oklahoma	Federal	Yes	Tribal members reside outside of Pennsylvania (primarily in Oklahoma) but have historical ties to Bucks and Philadelphia Counties.
Onondaga Nation	Federal	No	Tribal members reside outside of Pennsylvania, primarily in central New York.
Osage Nation	Federal	No	Tribal members reside outside of Pennsylvania, primarily in Oklahoma
Seneca Nation of Indians	Federal	No	Tribal members reside outside of Pennsylvania, primarily in New York.
Seneca-Cayuga nation	Federal	No	Tribal members reside outside of Pennsylvania, primarily Oklahoma.
Stockbridge Munsee Community, Wisconsin	Federal	Yes	Tribal members reside outside of Pennsylvania (primarily in Wisconsin) but have historical ties to Bucks County.
Tonawanda Band of Seneca	Federal	No	Tribal members reside outside of Pennsylvania, primarily in western New York.
Tuscarora Nation	Federal	No	Tribal members reside outside of Pennsylvania, primarily in western New York.

Sources: NCSL 2019, HUD 2019b

Even though there are no federally or State-recognized tribes residing in Pennsylvania, many federally registered tribes listed above have historic ties to the land within the Study Area, as noted above. According to the USCB, Population Estimates Program and the American Community Survey states that the American Indian and Alaska Native percent in Bucks County at 0.3%, Delaware County at 0.2% and Philadelphia County at 0.9%, respectively, with a total value at 0.4% for the State (Index Mundi 2017).

Of the tribes that have historical ties to the Study Area, the Catawba Indian Nation are primarily located in South Carolina; the Delaware Nation, the Delaware Tribe of Indians, and Eastern Shawnee Tribe of Oklahoma are primarily located in Oklahoma; and the Stockbridge Munsee Community are primarily located in Wisconsin. At the time of European exploration and colonization, the Delaware people (originally the Lenape or Lenni Lenape) were living in an area that is now known as the States of Delaware, New York, New Jersey, and Pennsylvania. They were considered one of the two most powerful American Indian groups in North America. Over time, the Delaware people slowly got pushed south and west, splitting into two modern groups (the Delaware Nation of Oklahoma and the Delaware Tribe of Indians). Eventually, both groups settled in Oklahoma. Many of the living descendants of the Delaware people with ties to Pennsylvania live in Oklahoma (Monck 2015).

The Catawba people were primarily living in an area that is now known as South Carolina and North Carolina, and even areas as far north as Virginia during the time of European arrival (Catawba Indian Nation 2020). Periodic conflict with neighboring tribes such as the Iroquois occasionally led to Catawba warriors chasing the Iroquois all the way to Pennsylvania (Tribalpedia Native American Indians 2020). Many of the living descendants of the Catawba people with ties to Pennsylvania live in South Carolina at the Catawba Nation Reservation (Catawba Indian Nation 2020a).

Prior to the arrival of the Europeans, the Shawnees lived throughout much of the area east of the Mississippi River. The Shawnee formerly occupied parts of Alabama, North and South Carolina, Delaware, Illinois, Indiana, Kentucky, Michigan, Pennsylvania, Tennessee, Virginia, and West Virginia. Over time, the Shawnee people split into several different groups over time. Today, the Eastern Shawnee Tribe of Oklahoma is one of three federally recognized Shawnee tribes, though it is the only one recognized by the U.S. Department of Housing and Urban Development as having historical ties to the counties within the Study Area. Many of the living descendants of the Shawnee people with ties to Pennsylvania live in Oklahoma on the 60,000-acre reservation north and east of the Cherokee in present Ottawa County, Oklahoma (Eastern Shawnee Tribe of Oklahoma 2020).

The ancestors of the Stockbridge-Munsee Tribe came from Massachusetts, New York, and Pennsylvania. The Stockbridge contingent of the tribe originated in the community of Stockbridge in western Massachusetts in the 1770s. This community was composed of American Indian and White Christians. The American Indian members of the community included members of the Mahikan or Mohican tribe from eastern New York, western Massachusetts, and parts of western Connecticut. The Stockbridge Indians were relocated to Wisconsin where they were joined by Munsees. The Munsees were originally part of the Delaware peoples who originated in southeastern New York and northeastern Pennsylvania. This community had originally migrated to Canada after the Revolutionary War before later ending up in Wisconsin and forming the combined Stockbridge-Munsee Tribe. Currently the Stockbridge-Munsee have about 1,500 enrolled tribal members, 900 of whom live on the reservation in Wisconsin (MPM 2019).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

9.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 9-15 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 17.9% of the population do not speak English at home. Spanish is the language spoken by the majority (186,072 people or 7.2%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 135,337 people (5.2%) of the Study Area population (USCB 2017e).

Figure 9-42 illustrates the percent of people who speak a language other than English at home in the Study Area. The county with the highest percentages of these populations was Philadelphia (22.7%). Delaware and Bucks Counties had percentages of 11.7% and 11.6%, respectively. As seen in Figure 9-38 and Figure 9-40, Philadelphia County is ranked as over 75% vulnerable and impacted by rising sea levels. Bucks and Delaware Counties are less vulnerable and will experience lesser sea level rise impacts.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities and who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

9.4.6 Summary – Demographics and Socioeconomics

Pennsylvania's population is growing, but at a rate much slower than the Nation. Pennsylvania is affected by the nationwide trend of aging population as indicated by its declining rate of natural increase, which accounted for 14.1% of population increase between 2017 and 2018. While many residents of the Commonwealth moved to other States, population loss was offset by gains from international immigration, resulting in small overall population growth (USCB 2017a, USCB 2017d).

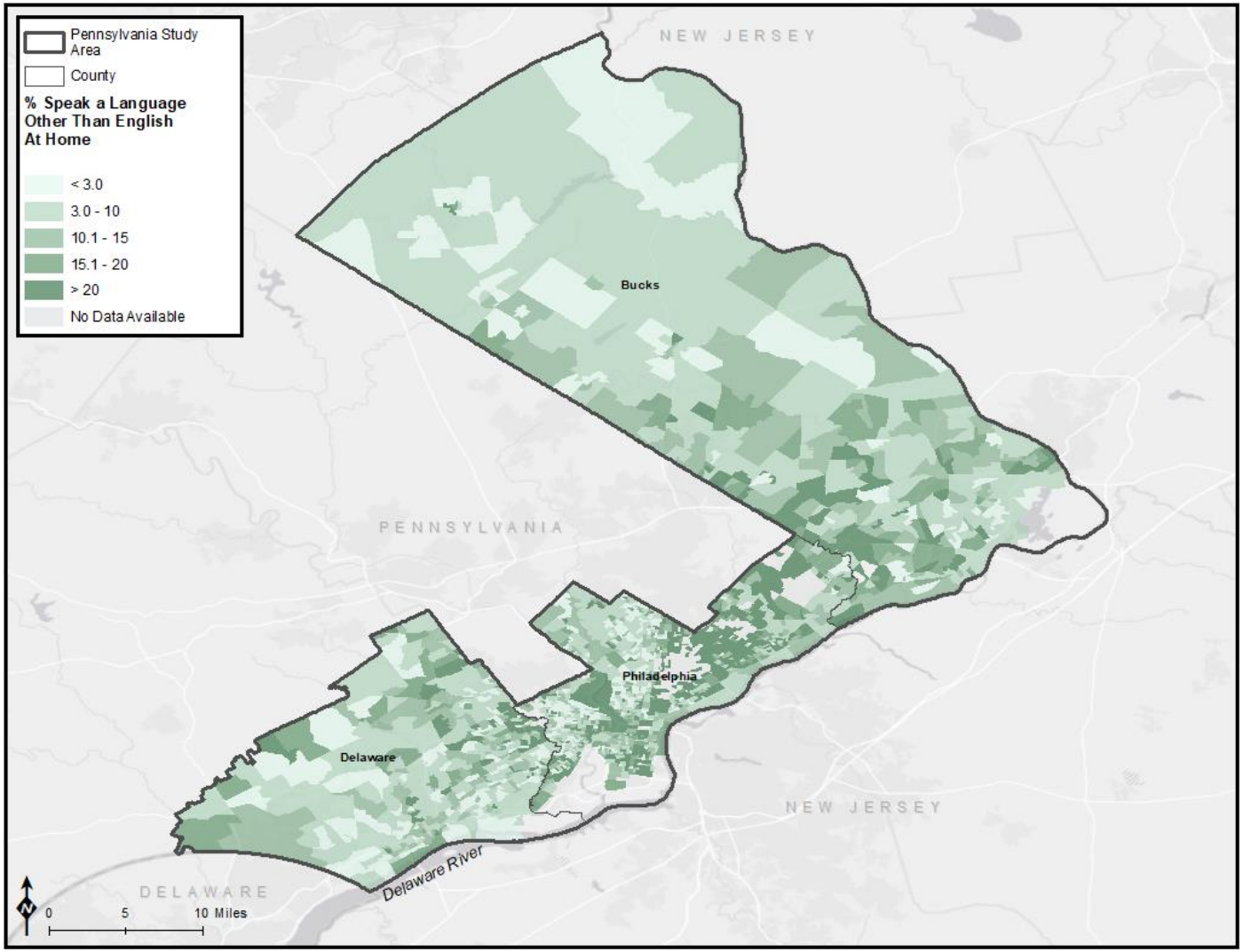
The population density of the Study Area was 2,991 persons per square mile in 2017, greater than the Commonwealth (285 persons per square mile) and the Nation (90 persons per square mile), signifying that the coastal counties are more densely populated than the Commonwealth and the Nation.

Population in the Study Area is projected to grow 13.9% between 2017 and 2040 to 3.1 million residents, faster than the Commonwealth (10.5%) but less than the Nation (16.4%). Growth is not projected to be uniform across the Study Area. Strong growth trends are expected to continue in Delaware and Philadelphia Counties, near the city of Philadelphia, with projected growth of 15.1% and 18.5%, respectively. Bucks County is projected to grow only 1.3% during the same period (USCB 2017d, USCB 2018b).

Table 9-15. People Who Speak a Language Other than English at Home in the Pennsylvania Study Area by Census Block Group

Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Bucks	595,810	68,919	11.6	20,027	32,947	12,744	3,201
Delaware	529,663	61,998	11.7	14,253	24,295	16,789	6,661
Philadelphia	1,461,921	331,302	22.7	151,792	78,095	78,342	23,073
Study Area Total	**2,587,394**	**462,219**	**17.9**	**186,072**	**135,337**	**107,875**	**32,935**
Pennsylvania	**12,078,858**	**1,328,055**	**11.0**	**576,232**	**431,456**	**241,299**	**79,068**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017r, USCB 2017e

Figure 9-42. Percent of People Who Speak a Language Other than English at Home in the Pennsylvania Study Area by Census Block Group

Population distribution will also be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017 (USCB 2017b). According to 2017 estimates, the population of young children represented 6.2% of the U.S. population and in the Study Area, more than the Commonwealth (5.6%). Philadelphia County had a greater percentage of young children (6.9%) as compared to Bucks County (4.9%), which is farther away from the urban core. Delaware County had 6.0% of young children. While the number of young children in the Study Area is projected to rise by 2040, the percentage of this group in comparison to the overall population is projected to decline to 5.6%. This reflects the national trend of a decline of the population of young children, which is projected to be 5.7% in the Nation by 2040. During that same period, the percentage of young children in the Commonwealth is projected to decline to 5.4%, more than the Nation or the Study Area (USCB 2017b, USCB 2018b, Behney et al. 2014).

According to 2017 estimates , the elderly represented 14.9% of the U.S. population, and 14.4% in the Study Area. The Commonwealth had a higher percentage (17.1%) of the elderly, indicating lower fertility rates of the rural areas within the Commonwealth. By 2040, the elderly population is projected to rise in the Nation (21.6%), Commonwealth (23.1%), and Study Area (21.1%). Rural Bucks County is projected to have the greatest percentage (27.8%) of elderly by 2040, while urban Philadelphia County is projected to have the lowest percentage (18.4%). This is likely reflective of the higher rate of fertility of international immigrants moving closer to the urban core (USCB 2017b, USCB 2018b, USDA 2013, Behney et al. 2014).

Homeownership in Pennsylvania was 69.0%, higher than the Nation (63.8%) and the Study Area (61.2%), according to 2017 estimates. Renters comprised approximately 31.0% of the Commonwealth population in 2017, lower than the Study Area (38.8%) and the Nation (36.2%) (USCB 2017m).

Median Home Values were higher in the Study Area ($235,200) than the Commonwealth ($170,500) and Nation ($193,500) (USCB 2017l). The Philadelphia-Camden-Wilmington metropolitan area is categorized as "very hot" by Zillow (Zillow.com 2019z).

Housing affordability for low- and moderate-income workers is a problem in Pennsylvania. A large proportion of the Commonwealth (30%) is considered extremely low income, and of these households, 71% have a severe cost burden due to housing costs. Demographics of extremely low income households include persons in the labor force (30%), single caregivers (27%), and disabled (25%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

Home vacancy rates in Pennsylvania (11.4%) in 2017 were lower than the Nation (12.2%) but higher than the Study Area (10.5%). Vacancy rates were highest in Philadelphia County (13.0%), and the lowest in Bucks County (5.2%) (USCB 2017g).

The Study Area had a total employment of 1.2 million jobs in 2017, representing approximately 20.8% of the total jobs in Pennsylvania and 0.9% of the total jobs in the U.S. The largest employment industry sectors in the Study Area are educational services, and health care and social assistance (28.6%), professional, scientific, and management, and administrative and waste management (11.9%), retail trade (10.8%) and arts, entertainment, and recreation, and accommodation and food services (8.9%). The

Commonwealth has a greater proportion (11.9%) of manufacturing jobs than the Nation (10.3%) and the Study Area (8.1%). The greatest portion of jobs are located close to the urban core in Philadelphia (USCB 2017p).

Overall, Pennsylvania's ocean economy ranked 16th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). Pennsylvania's ocean economy accounted for 55,171 maritime jobs in 2016, accounting for 1.0% of Pennsylvania's employment. The Study Area had 48,636 maritime jobs, representing 88.1% of total maritime jobs in the Commonwealth. Philadelphia County had the greatest number of maritime jobs (44,048) (USCB 2017i, NOAA 2016b).

The U.S. economy has experienced long-term real wage stagnation and a persistent lack of economic progress for many workers likely due to the forces of globalization and technological change. Median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Pennsylvania had a lower median household income and a higher per capita income than the U.S.in 2017. Median and per capita income in the Pennsylvania Study Area were higher than the Commonwealth at $69,839 and $34,494, respectively (USCB 2017k, USCB 2017n).

The average 2017 unemployment rate in the Study Area was 8.9%, higher than the Commonwealth (6.5%) and the Nation (6.6%). Within the Study Area, unemployment rates ranged from 5.4% in Bucks County to 11.3% in Philadelphia County in 2017 (USCB 2017h, USCB 2017p).

As compared to the Nation, the Commonwealth and the Study Area have higher percentages of educational attainment as it relates to high school graduation rates, and similar rates for college or advanced degrees (associate's, bachelor's, and/or graduate degree). In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree. In Pennsylvania, 34.8% of the working-age population earned only a high school diploma; 36.7% earned a college or advanced degree. In the Study Area, 32.1% of the working-age population earned only a high school diploma; 35.3% earned a college or advanced degree (USCB 2017t). Higher attainment levels positively impact the individual, the local community, the region and the Commonwealth, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Minority and low-income status are two of several factors that the CDC use to calculate potentially vulnerable populations. The Study Area contains low-income and minority populations. Of the 2,154 census block groups in the Study Area, approximately 22.2% (479 block groups) are considered low-income populations and approximately 48.6% (1,046 block groups) are considered minority populations (USCB 2017f, USCB 2017o).

Each of the counties contain census block groups with high percentages of minority populations. Philadelphia County has the highest percentage of minority persons (65.1%). Bucks County has the lowest (15.2%). Within the overall Study Area, the largest minority group is Black or African-American (28.6%) followed by Asian (6.1%) and Hispanic or Latino (5.0%). Philadelphia County has the highest percentage of low-income block groups (29.9%) (USCB 2017o, USCB 2017f).

The output of the CDC SoVI indicates areas with populations deemed vulnerable to varying degrees. Philadelphia County has the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees. There are many vulnerable communities along the Delaware River that are at risk for impacts associated with sea level rise (CDC 2016, NOAA 2018a).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. These communities are particularly susceptible to projected sea level rise and storm surge changes. In the Study Area, this includes linguistically challenged

populations. There are no fishing communities that are formally recognized by NOAA or other identified subsistence populations. Neither are there any known religious settlements of Amish or Mennonites in the Study Area. However, the Study Area is in close proximity (within 50 miles) to Amish settlements in Pennsylvania Dutch Country, and new Amish settlements may be founded. Proximity of unique religious populations to prospective sites for OCS-related development should be evaluated early in the site selection process. These communities also may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources. Evaluating the locations of such communities can inform the development process for various projects. There are no tribes living within the Study Area, though five tribes have historical ties to the area, and some tribal members may continue to live in the region.

Populations that speak a primary language other than English are present within the Study Area. These are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public. Within the Study Area, 17.9% of the population do not speak English at home. Spanish is the language spoken by the majority (186,072 people or 7.2%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 135,337 people (5.2%) of the Study Area population (USCB 2017e). The county with the highest percentages of these populations was Philadelphia (22.7%). Delaware and Bucks Counties had percentages of 11.7% and 11.6%, respectively.

Proximity to potentially vulnerable communities is a factor that future project developers should consider during their site selection process.

9.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future development near the Study Area that may occur in response to future OCS-related leasing activities.

9.5.1 Regional Observations

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. Sea level rise is projected to impact areas in Pennsylvania along the Delaware River and its tributaries, especially in Philadelphia, FDR Park, the Philadelphia International Airport, and farther north at the oxbow feature defined by Van Sciver Lake, which holds the U.S. Steel Industrial Park (NOAA 2018a). The physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

Land cover in the Study Area is primarily developed (mostly urban in the City of Philadelphia area) and forested lands (large portions of Bucks County). Philadelphia County is highly developed whereas Bucks and Delaware Counties have more open space and low intensity urban development, which has good potential for future growth.

Protected areas, cultural resources, and recreational destinations abound throughout the Study Area. Pennsylvania has a long and unique cultural history and as a result there are numerous cultural resource locations of importance throughout the State. Many of these cultural locations are also recreational destinations. Additionally, there are numerous additional recreation destinations some of which are also protected areas in the Study Area including State and local parks, the John Heinze NWR and other protected areas, the Delaware River, and modern built experiences.

Pennsylvania's population is growing, but at a rate much slower than the Nation. There are large minority populations throughout the Study Area, particularly around the City of Philadelphia County.

Median home values were higher in the Study Area than compared to the rest of Pennsylvania and the Nation. However, housing affordability for low- and moderate-income workers is a problem in Pennsylvania. A large proportion of the Commonwealth is considered extremely low income and have a severe cost burden due to housing costs.

9.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Given the extent of urban development already present in Philadelphia County, it is likely that Delaware and Bucks Counties have more capacity to support potential future large-scale future projects. However, all three counties have extensive infrastructure and industrial networks which could support potential future projects.
- Most municipalities and counties within the Study Area will have established land controls, comprehensive plans, zoning ordinances, and other planning policies, procedures, and guidelines in accordance with the Municipalities Planning Code. Adherence with the Municipalities Planning Code should be considered in future project analysis.
- Within Philadelphia County, each of the 18 districts has a separate District Plan. These planning documents provide information on the municipality, county, or district future land use plans, development, and growth plans and should be considered in future project analysis.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Pennsylvania offers several financial incentives with a focus on attracting businesses to the State and encouraging their investment in the State and local economies. In particular, Pennsylvania's unique KSDZ Program could be an appealing opportunity for future projects as it offers an opportunity for redevelopment of the surplus of abandoned, deteriorated commercial and industrial sites in the State.
- Cultural resource surveys may be required once site-specific information is known.
- Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis are relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis are presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 10

DELAWARE

10 Delaware

10.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Delaware to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Delaware is located near the Mid-Atlantic Planning Area. Delaware has a total of three counties all of which border the Atlantic Coast and comprise the Delaware Study Area (Study Area). Counties range in population size from around 10,835 in Kent County to 18,406 in Sussex County. There is only one city in Delaware with a population over 50,000; it is Wilmington with a population of 70,635 (ESRI 2019a). Delaware cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Delaware's location in the mid-Atlantic has geographical commonalities with many of the other Atlantic States with open coastlines in the southern portion of the State, and more sheltered coastlines to the north along the Delaware Bay. The Delaware coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast. Delaware's mid-Atlantic location places it in range of a number of issued, pending, and withdrawn OCS-related permit applications.

The Study Area includes all three counties (Kent, New Castle, and Sussex) located within the State of Delaware. The Study Area is shown in Figure 10-1 and Figure 10-2 and includes the three counties.

10.1.1 Methodology

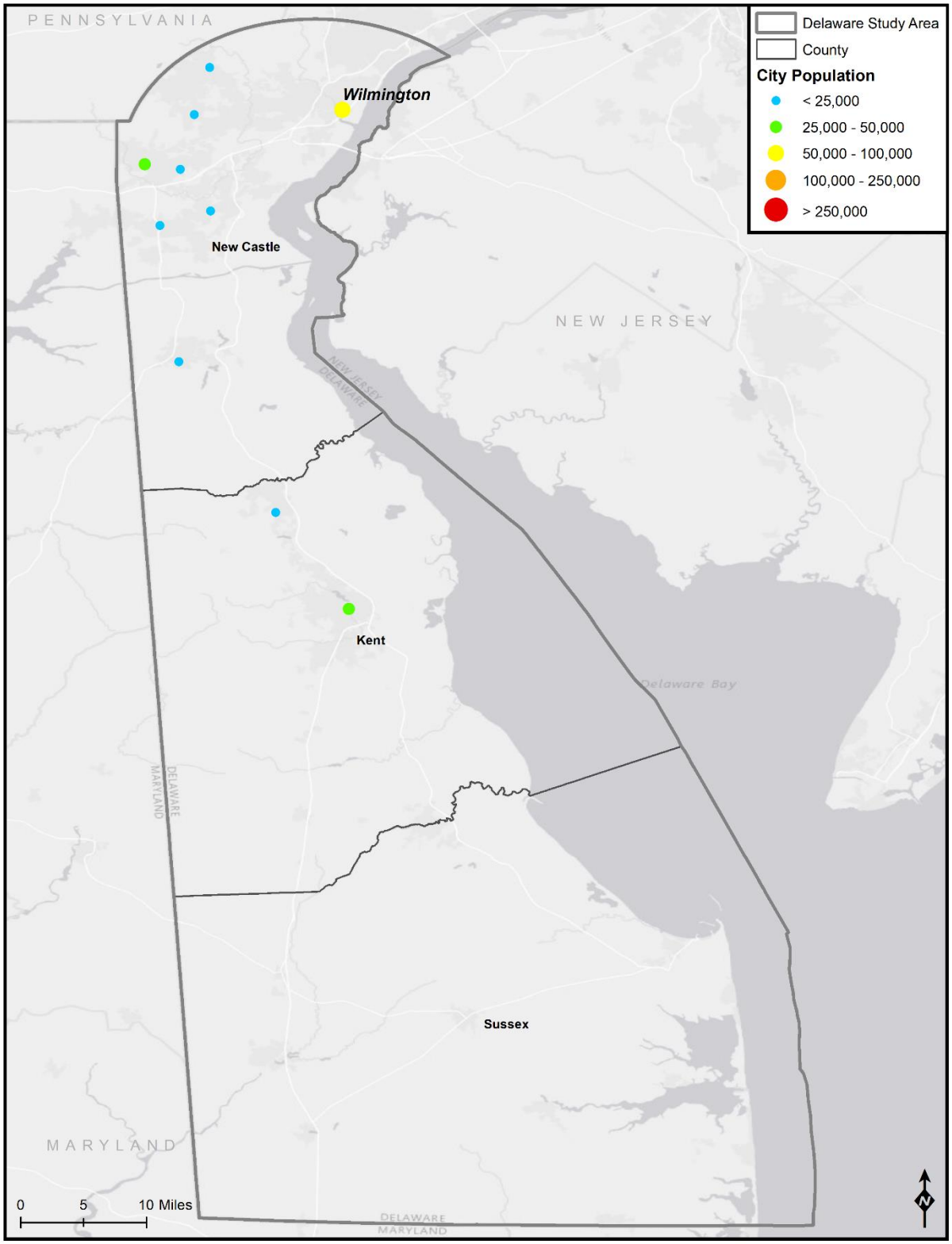
National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Delaware are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- Delaware Population Consortium
- Delaware Division of Parks and Recreation
- FirstMap Delaware
- Delaware Division of Climate, Coastal and Energy
- Delaware Office of State Planning Coordination

Source: ESRI 2019a

Figure 10-1. State of Delaware Study Area



Source: ArcGIS 2019

Figure 10-2. Cities in the Delaware Study Area

Data from county or local data sources such as information from county GIS, planning, assessors, or other departments, or from relevant State, county and local non-government organizations and agencies was not collected though future OCS-related projects would benefit from this type of finer scale analysis once site-specific project information is known.

The metadata database for Delaware specific State, county, and local data sources is included in Appendix A.

10.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

10.2.1 Water Resources

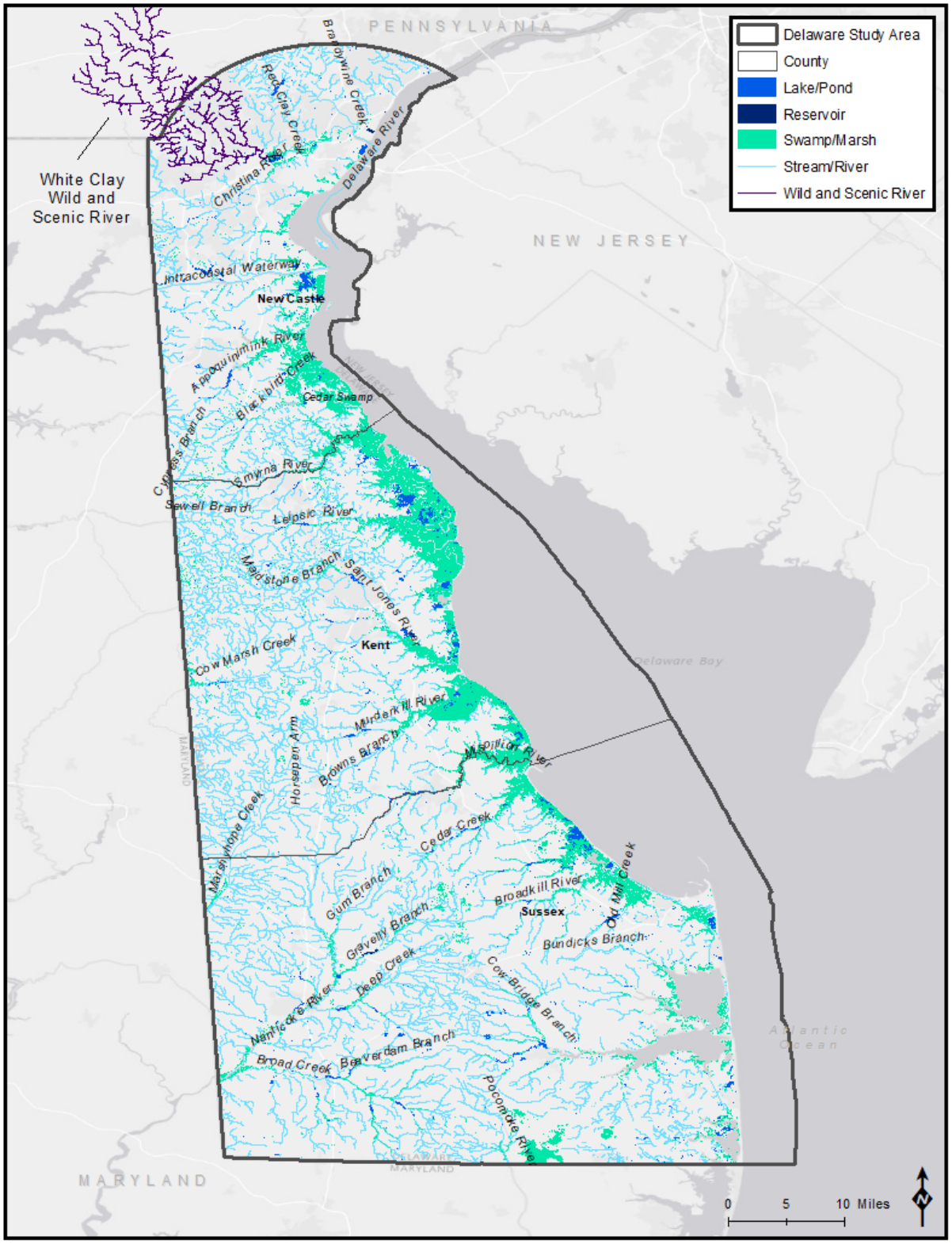
Delaware's water resources include the Delaware Bay, rivers, floodplains, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

10.2.1.1 Delaware Bay

Delaware Bay, shown in Figure 10-3 , is part of an estuary, a body of water where fresh and saltwater mix. The 133-mile Delaware Estuary extends from the head of tide in Trenton, New Jersey to the mouth of 747-square mile Delaware Bay at Cape May, New Jersey and Cape Henlopen, Delaware. The Delaware Estuary is tidally dominated with average tidal ranges of 4.25 feet and 8.25 feet at Cape Henlopen, Maryland and at Trenton, New Jersey, respectively. Tidal flow from the Atlantic is estimated to be 300 times greater than the freshwater flow from the Delaware River, D&C Canal, and other tributaries into the estuary (Delaware DNREC 2005, PDE 2017, DSPC 2019, Dupont 2019).

Home to the world's largest spawning horseshoe crab population and an integral link in migratory bird habitat, the Delaware Estuary provides a unique low energy, intertidal environment. The low energy environment of the Bay helps reduce the risk of stranding during spawning. The largest horseshoe crab spawning population on the Atlantic Coast is found in this Bay. The Bay provides the second largest migratory bird area with horseshoe crab eggs providing essential food for several shorebirds (PDE 2017). Management actions in the Bay include protection of horseshoe crabs to try and provide sufficient population to sustain migratory shorebird populations including the Red Knot, which doubles its weight in two weeks on a diet consisting of more than 90% horseshoe crab eggs (PDE 2017, Delaware DNREC 2019a).

The Delaware Estuary is also home to a large industrial hub and the world's largest freshwater port, with numerous ports located in all three states that border the estuary. Ports located in the Study Area are discussed in greater detail in Chapter 10.3.2.8.



Source: USGS 2019e

Figure 10-3. Hydrography in the Delaware Study Area

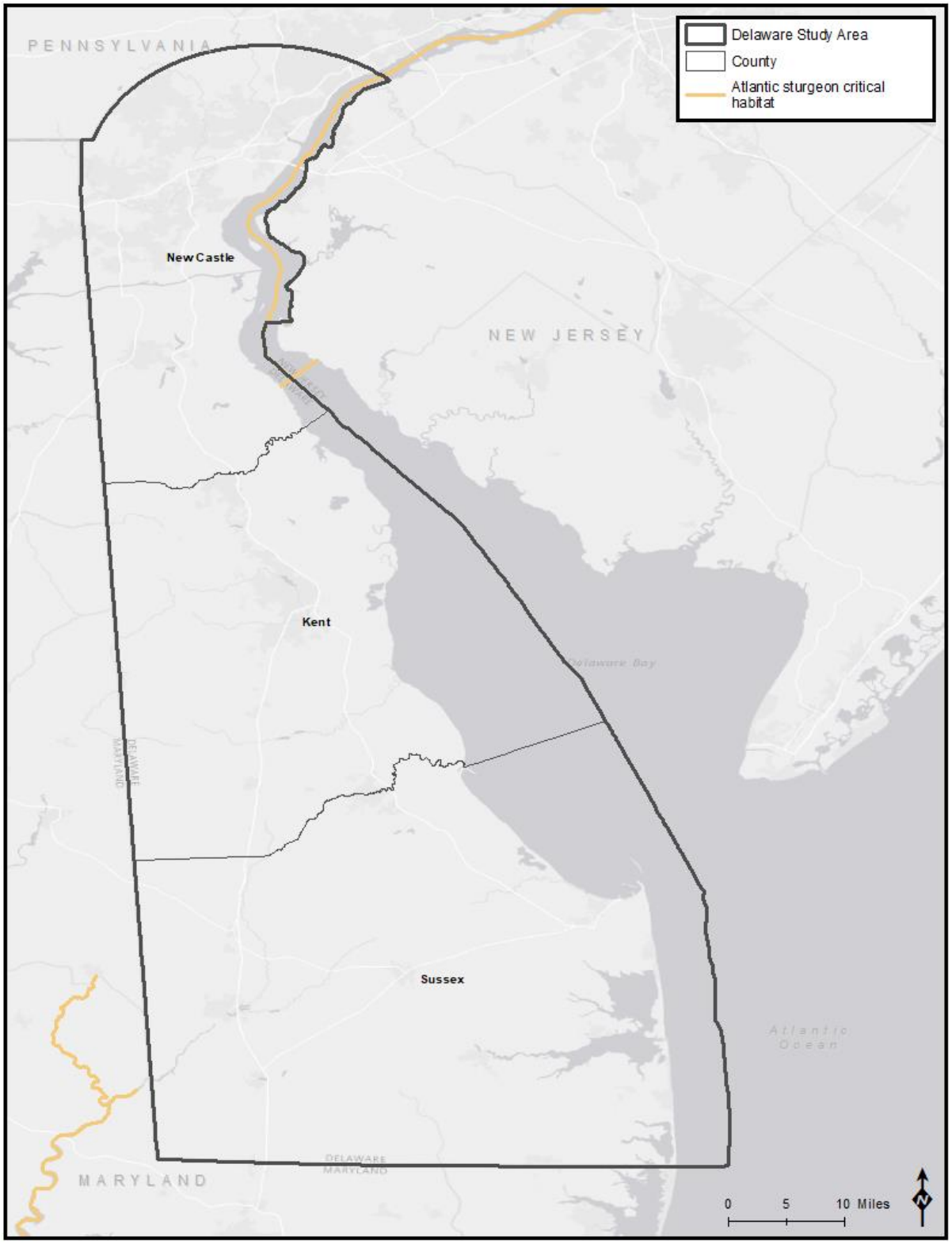
Delaware Bay is ringed with beaches, dunes, and tidal wetlands including tidal salt marshes, freshwater impoundments, and uplands. These tidal wetlands help hold and filter water, removing contaminants and buffering inland areas from coastal storms and flooding, while providing habitat for a diverse array of plants and animals. Delaware Bay is also home to the Prime Hook NWR and the Bombay Hook NWR, protecting more than 10,000 acres and 16,000 acres, respectively, of unique habitat and wildlife. Both refuges are located in the Study Area and protect a mix of fresh and saltwater wetlands with uplands and forest, providing habitat for migrating birds as well as native birds, mammals, fish, and plants. Water levels in refuge impoundments are manipulated to maximize food and habitat for the animals. Tidal salt marshes provide nurseries for fish and crabs. The refuges also provide mature hardwood forest habitat for the bald eagle and the endangered Delmarva Peninsula fox squirrel. The bald eagle prefers to nest in very tall trees, typically 180 feet or more above the ground and preferably near a water source such as a river, reservoir, or ocean. The adult eagles will generally return to the same nest each year (Audubon 2020). The Delmarva Peninsula fox squirrel is the largest tree squirrel species. Historically, the Delmarva Peninsula fox squirrel's habitat included the extent of the Delmarva Peninsula in Delaware, Maryland, and Virginia between the Chesapeake Bay and Atlantic Ocean. The squirrel prefers mature forests with both hardwoods and pines, a closed canopy and an open understory as the squirrel spends much of its time foraging for food on the ground (USFWS 2012a, USFWS 2014, PDE 2013, DGS 2017, USFWS 2008).

The health of Delaware Bay/Estuary is threatened by pollution and climate change. Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. Climate change may result in rising seas, harsher storms of longer duration, and more frequent extreme high tides. Shoreline erosion is magnified by higher seas and increased wind fetch. Inundated by higher seas and more intense storms, beaches and dunes can be washed away. Tidal wetlands can become saltier, no longer providing their unique habitat, possibly becoming over-washed into muddy flats and open water (USFWS 2012b, PDE 2013, DGS 2017).

As shown in Figure 10-4, the coastal area of Delaware in the Study Area includes designated critical habitat for the New York Bight distinct population segment of the Atlantic sturgeon. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Delaware, the designated critical habitat of the Atlantic sturgeon is in the Delaware River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

10.2.1.2 Rivers

Within the Study Area, the major drainage basins include Delaware Bay to the east and Chesapeake Bay to the west. Effectively ascribing the border between New Jersey and Delaware, and with headwaters in New York, the Delaware River watershed also includes Pennsylvania, New Jersey, and Delaware before widening into Delaware Bay and flowing to the Atlantic Ocean. From north to south, major rivers in Delaware include the Christina River, the St. Jones River, the Mispillion River, and the Nanticoke River. Of this list, the Nanticoke is the only one flowing west to Chesapeake Bay. Figure 10-3 shows the major surface water bodies within the Study Area.



Sources: USFWS 2019i, USFWS 2019j

Figure 10-4. Critical Habitat within the Delaware Study Area

In Delaware, major tributaries for the Delaware River include the Christina River, Chesapeake & Delaware Canal, Smyrna River, Leipsic River, St. Jones River, Murderkill River, Mispillion River, Cedar Creek, and Broadkill River. Flowing south from headwaters in New York to the Atlantic Ocean, streamflows of the tidal Delaware River fluctuate with freshwater inflows from precipitation, tributaries, and aquifers. Upstream migration of the salt line, the location where the river has more than 250 milligrams chloride per liter water, is monitored. Releases from upstream reservoirs in New York and Pennsylvania are used to help prevent salt-laced water from migrating upstream and corroding the industrial and public water supply systems upstream. Typical salt line locations are upstream of the Chesapeake & Delaware Canal near the outfall of the Christina River (DRBC 2019a). North of the State of Delaware, consolidated rocks protruding from the Delaware River near Trenton, New Jersey, mark the Fall Line, the transition from the Piedmont's crystalline metamorphic rocks to the Coastal Plains' sedimentary deposits; limiting progress upriver to small, shallow-draft boats and allowing the Delaware to broaden and slow downstream. The Delaware River continues to broaden into a slowly moving river, becoming Delaware Bay (USGS 1997, Delaware DNREC 2005, DRBC 2019b).

Traveling southeast through the Piedmont, the Christina River flows northeasterly near the Fall Line to join the Delaware. With headwaters in Pennsylvania and Maryland, the Christina River flows southeast from Newark, Delaware turning east northeast near the Fall Line to be joined by the confluence of White Clay Creek and Red Clay Creek before reaching Newport. The Christina continues onward to Wilmington where it turns southeast and is joined by Brandywine Creek before flowing into the Delaware River. The Christina River and these three major tributaries provide most of the water supply for New Castle County north of the Chesapeake & Delaware (C&D Canal) (UD 2002, DRBC 2019c).

South of the Christina River, the C&D Canal, a man-made structure built in the 1820s, joins the Chesapeake Bay to the Delaware River and is part of the Atlantic Intracoastal Waterway. Originally with multiple locks, the USACE purchased the Chesapeake & Delaware Canal in 1919 and converted it to a sea level canal. Managed by the USACE, the C&D Canal undergoes regular dredging to maintain its 35 feet deep, 450 feet wide channel over its 14-mile length (ASCE 2019). Flow through the C&D canal is typically towards the Delaware River (Delaware DNREC 2005, USACE 2012b, USACE 2017a, USACE 2019h).

South of the C&D Canal, in central Kent County, the St. Jones River flows southeasterly towards the Delaware River. St. Jones River is tidal throughout its lower half, becoming turbid, sluggish, and meandering in this generally flat terrain. Soils in the area are important farmland and the river is used for water supply (Delaware DNREC 2005).

South of St. Jones River, the Mispillion River flows easterly to the Delaware River. Lower Mispillion is under tidal influences and soils are important farmland. The mouth of Mispillion is marked with a lighthouse along with several wharfs used by fishing boats and oystermen (Delaware DNREC 2005).

To the southwest of the Mispillion River, the Nanticoke River flows southwesterly from the well-drained uplands of the Coastal Plain towards Chesapeake Bay. The topography is generally flat with short, steep slopes near rivers and streams. Ancient sand dunes along parts of the Nanticoke are excessively well-drained and prone to erosion. Much of this soil is important farmland. Leaving Delaware, the tidal Nanticoke River enters Chesapeake Bay at Tangier Sound in Maryland (Delaware DNREC 2001a).

To the south of the Mispillion and east of the Nanticoke, a group of inland bays in eastern Sussex County drains to the Atlantic Ocean, south of Delaware Bay. Major contributors in this flat region, from north to south, include the Rehoboth Bay, Indian River Bay, and Little Assawoman Bay. A barrier island protects these inland bays from the coastal storms, while further inland, vegetated dunes and marshes reduce the impact of the ocean on the inland bays. These bays are shallow, Rehoboth and Indian River are only 6.5 feet deep and Little Assawoman is only 20 feet deep, with tidal range averaging 3 feet. Sandy loam

soils dominate the area, well-drained north of Indian River Bay and poorly drained south of the bay. Fifteen hundred miles of man-made drainage ditches are used to channel excess water from the soil (Delaware DNREC 2001b). The Delaware River provides critical habitat for the Atlantic sturgeon as shown in Figure 10-4.

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Delaware has approximately 2,183 miles of river, White Clay Creek, is the only designated wild and scenic river. Providing important habitat and an important water source, Delaware's 94.7-mile watershed is an exceptional resource (USFWS 2019q).

While surface water supplies the majority of water in the Piedmont Region, an important source of water in the Coastal Plain is groundwater; 70% of water supplies north of the C&D Canal are from surface water sources and 98% of water south of the C&D Canal is from groundwater (DGS 1995, DGS 2019, USGS 1997, Delaware DNREC 2005, UD 2002).

10.2.1.3 Floodplains

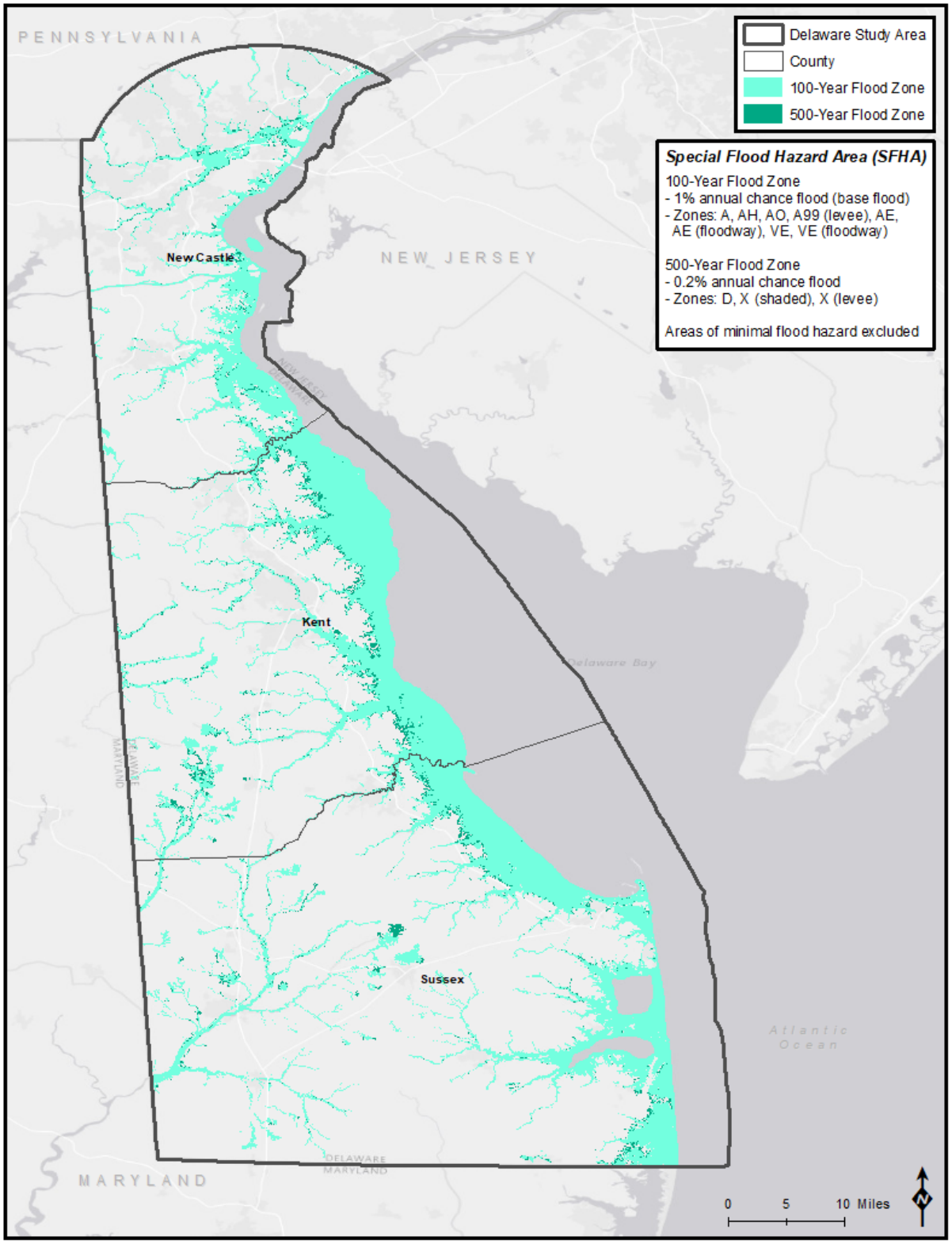
Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As seen in Figure 10-5, floodplains are a large part of the land area of the Study Area. Table 10-1 details the flood zone acreage within the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

Table 10-1. Floodplains in the Delaware Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Kent	85,028	22.7	9,101	2.4
New Castle	44,720	16.4	3,810	1.4
Sussex	103,645	17.3	6,429	1.1
Study Area Total	**233,393**	**18.7**	**19,341**	**1.6**

Source: FEMA 2019b
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: FEMA 2019b

Figure 10-5. Floodplains of the Delaware Study Area

10.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 10-6, wetlands are a large part of the land area in the Study Area.

The USACE regulates the discharge of fill material into waters of the United States, including wetlands pursuant to Section 404 of the CWA (33 U.S.C. § 1344). Additionally, EO 11990 (Protection of Wetlands) requires Federal agencies to avoid, to the extent possible, adverse impacts to wetlands and to preserve and enhance their natural and beneficial values.

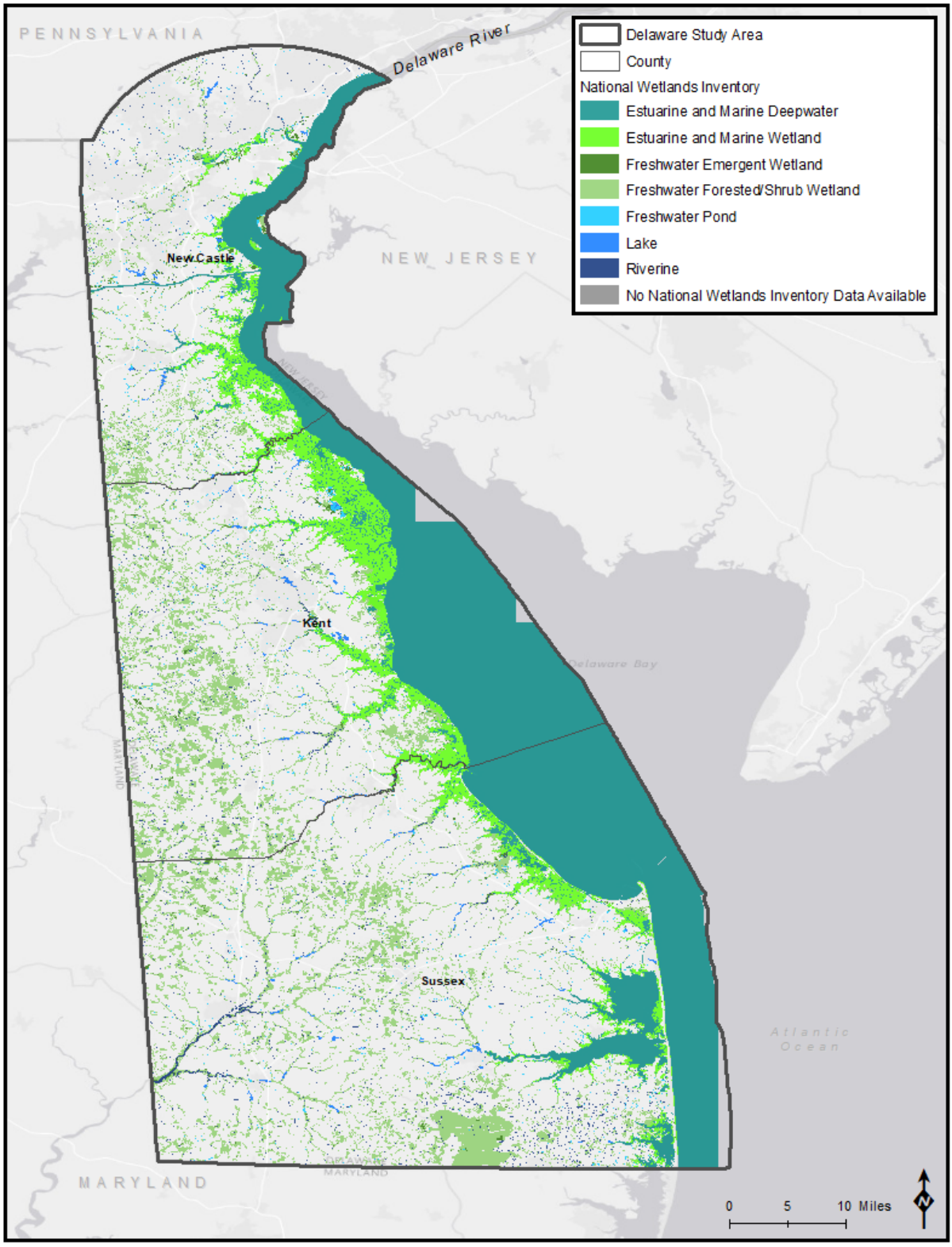
In 1979, the USFWS adopted a wetland classification system developed by Cowardin et al. providing a clear definition and classification system for wetlands and deepwater habitats, thus allowing comparison of information over large areas (Cowardin et al. 1979). Reprinted with revisions in 1992 and adopted by the FGDC as a National Standard (FGDC-STD-004) in 1996, this was the governing document until 2013 when Cowardin et al. (1979) was adapted into the Second Edition (FGDC 2013). Using the Cowardin et al. Second Edition (2013) definition of wetland, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland specific species), and soil (hydric soils being most common in wetlands). Table 10-2 details the wetland acreage in the Study Area along with other water resources. Estuarine and marine wetlands are tidal habitats, open to the ocean, with a mix of fresh and salt waters. Freshwater emergent wetlands, sometimes called marshes or wet meadows, are characterized by perennial, upright plants during most of the growing season. Freshwater forest and shrub wetlands are described as forested swamps or shrubby bogs. Estuarine and marine deepwater systems have deep tidal habitats with partly obstructed or occasional access to the ocean and occasional influence from freshwater. Lakes are deepwater bodies, whereas freshwater ponds are shallow water bodies, possibly with marshy bottoms. Riverine systems are river or stream beds and channels (Delaware DNREC 2007, Jennette et al. 2014, FGDC 2013, USFWS 2019c).

Table 10-2. Wetland Acreage in the Delaware Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Kent	238,459	36,044	1,828	61,676	131,774	1,398	2,079	3,660
New Castle	86,925	16,360	2,215	19,170	44,242	1,057	1,751	2,130
Sussex	281,358	21,250	2,361	83,616	161,084	2,037	2,895	8,113
Study Area Total	**606,742**	**73,654**	**6,404**	**164,462**	**337,100**	**4,493**	**6,725**	**13,903**

Source: USFWS 2018a

The Study Area contains a total of 606,742 acres of wetlands and surface waters regulated by the CWA. Of these, there are 73,654 acres of estuarine/marine wetlands, 6,404 acres of emergent wetlands, 164,462 acres of freshwater forested/shrub wetlands, and the remaining 362,221 acres account for lakes, rivers, ponds, and other open waters.



Source: USFWS 2018a

Figure 10-6. Wetlands in the Delaware Study Area

10.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

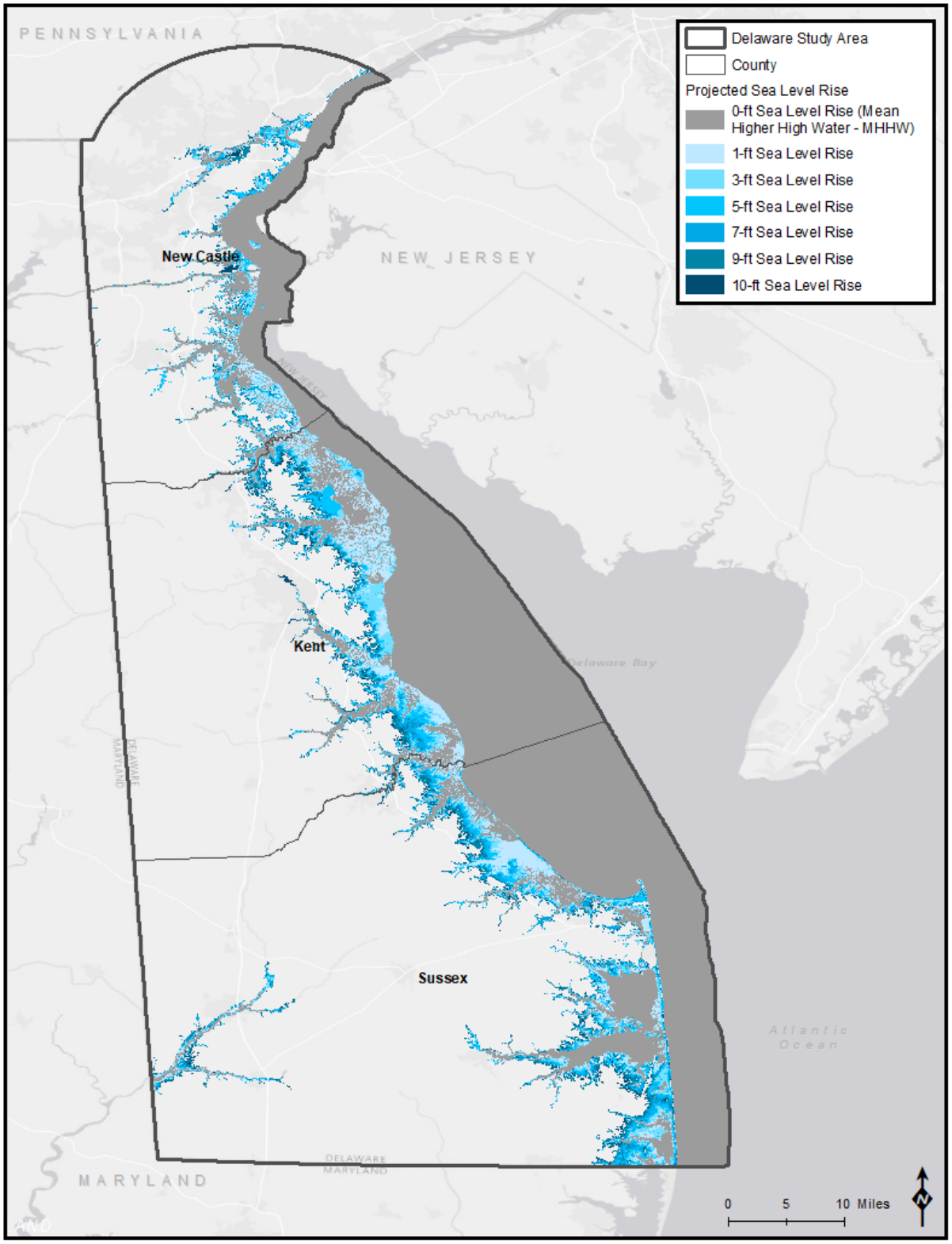
Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods, because higher seas increase the potential for storm surge to reach further inland (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in Delaware coastal areas reflects the national trend for increasing population growth in the coastal areas. The population projections and socioeconomic impacts of this relationship are discussed in Chapter 10.4. Further, land subsidence increases the rate of relative sea level rise in areas with certain geological characteristics (Eggleston and Pope 2013).

10.2.2.1 Sea Level Rise

Delaware is highly vulnerable to sea level rise because of its flat topography, low elevation and significant development in coastal areas (DGS 2017). Human development and alterations to the landscape do not allow the coastline to adapt to the rising waters as naturally as it has been able to in the past. Also compounding the issue of sea level rise, land in the Mid-Atlantic Region is sinking as a result of natural geologic changes, which contributes to a faster rate of sea level rise in Delaware than in other parts of the world (DGS 2017, Eggleston and Pope 2013). Land in Delaware is experiencing subsidence due to the relative sinking of the tectonic plate Delaware sits upon compared to the surrounding tectonic plates (Delaware DNREC 2019b). Additionally, land subsidence in the Delaware Bay Region results from glacial isostatic adjustment, sediment compaction in the Coastal Plain area, and possibly in localized areas from groundwater pumping (USGS 2000, Engelhart 2010, DGS 2017, NOAA 2018d).

This suite of contributing factors to sea level rise coupled with an increasing rate globally means Delaware is already or shortly to experience impacts such as inundation of low-lying coastal areas; increased extent and severity of flooding during storm events; increased coastal erosion during storm events; saltwater intrusion into groundwater supplies; and increased salinity in rivers and streams (DNREC DCP 2009). Over the past century, Delaware has experienced a sea level rise of more than one foot (Delaware DNREC 2019b). Projections by the Department of Natural Resources and Environmental Control (DNREC) proposes to low, medium, and high sea level rise scenarios for Delaware of 0.5, 1.0, and 1.5 meters (above 2010 levels), respectively, by the year 2100 (DNREC DCP 2009). That is a range of between 0.22 inches a year and 0.66 inches a year, as compared to the current global rate of 0.125 inches a year (DNREC DCP 2009, Lindsay 2019).

Figure 10-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in Delaware primarily along the immediate coastline and its river and bay inlets, and also farther inland along the Chesapeake and Delaware Canal, Nanticoke River, and Christian Rivers (NOAA 2018a). These sea level rise data depict the potential inundation of the coastal areas as a result of 0-10 foot rise in sea level above current mean higher high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account local effects from geology (subsidence or vertical land movement) or physiological effects like erosion. According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Delaware Study Area is 0.14 inches/year (NOAA 2019b).



Source: NOAA 2018a

Figure 10-7. Projected Sea Level Rise throughout the Delaware Study Area

10.2.2.2 Storm Surge

According to Delaware's Emergency Management Agency, Delaware's most prevalent natural hazards are: nor'easters, occurring with highest severity between September and April, coastal mid-latitude cyclones, most likely October-May, tropical storms and hurricanes, occurring May-December, and inland flooding associated with these storms; these storm systems are described in greater detail in Chapter 1.4.2.2 (PrepareDE.org 2020, Leathers et al. 2011, NWS 2020). Delaware's tucked-in position in the Mid-Atlantic protects it from most hurricanes, which usually pass further out to sea, although they may still lead to record rainfalls and flood events (Delaware HCA 2018). Nor'easters, which come from a low-pressure system offshore, can be intensified when high-pressure systems over northeastern New England or in the northern Atlantic blocks the northward movement of the low-pressure system. High winds blow in one direction over a long period of time, which creates huge waves. Coastal storms are most destructive when they persist over time and multiple high tides (NOAA 2020c).

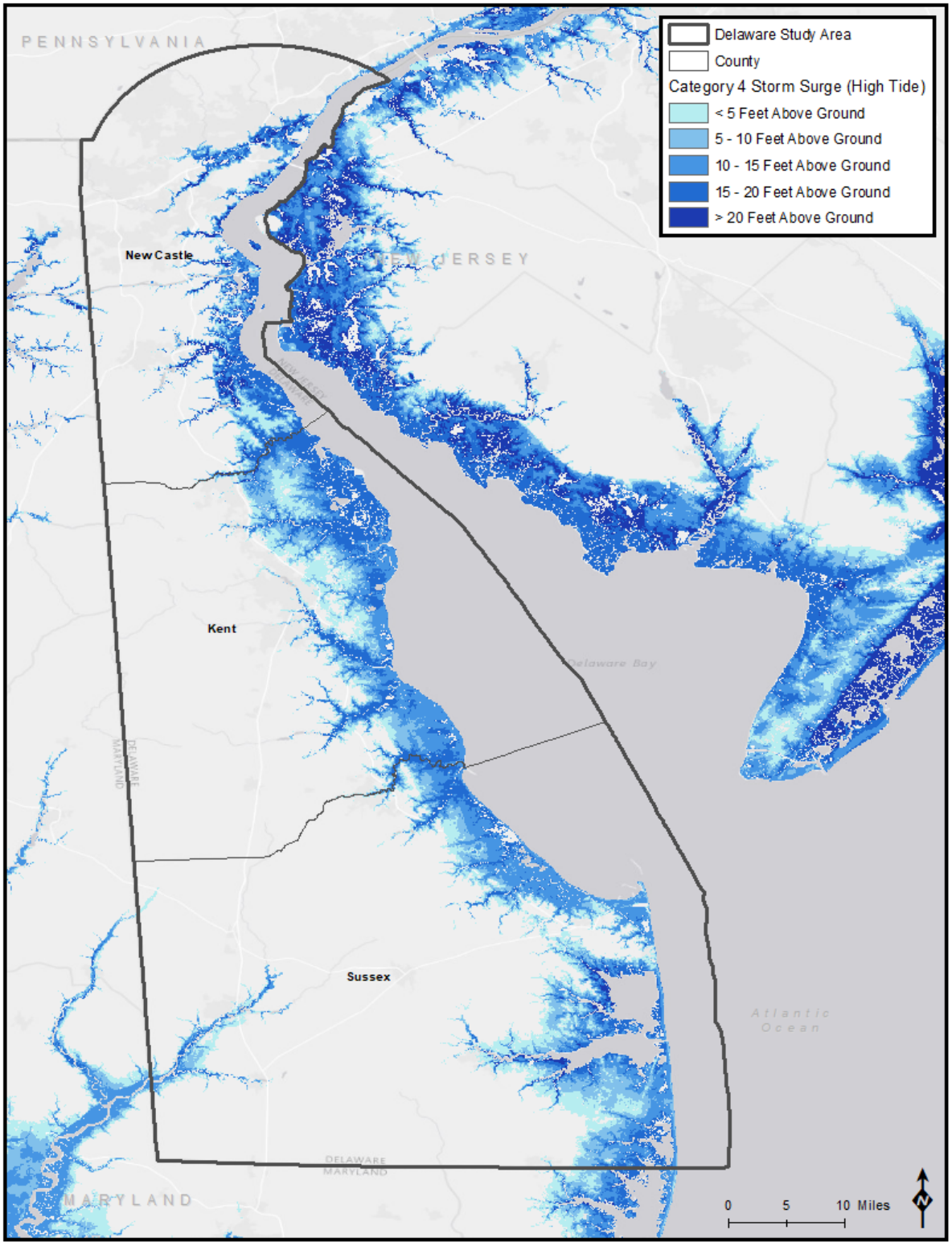
Local research teams have examined storms of meteorological importance to develop a real-time coastal flood monitoring system for the State of Delaware. The analysis of meteorological data from weather and tide gauges was compared to data on land surface elevation, proximity to the coast and major streams, population density, and the tropical system storm climatology. The results showed that coastal communities along the Delaware Bay, Atlantic Coast, and in close proximity to Delaware's inland bays are at significant risk from these systems due mainly to tidal flooding concerns, and in Sussex County from increasing population density. High population communities in New Castle County located along major streams are also at significant risk from flooding related to heavy precipitation and from possible storm surges up Delaware Bay. Areas in southwestern Delaware have relatively high susceptibility values due mainly to surges and tidal flooding associated with storm surges in the Chesapeake Bay and up the Nanticoke River (Leathers et al. 2011).

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Figure 10-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario. It is unlikely that a Category 4 or 5 hurricane would strike the Delaware coastline; however, recent storm events indicate that a lesser category super storm could cause similar storm surge impacts. Storm surge is projected to impact areas in Delaware similar to those affected by sea level rise, along the immediate coast, inlets, and rivers, but also appears to disproportionately impact the northern coast of Kent County (Zachry et al. 2015).

10.2.2.3 Subsidence

Subsidence is a factor of concern in Delaware. A small factor in land subsidence in the Delaware Bay Region is glacial isostatic adjustment, the flexing of the Earth's crust in response to ice loading or melting. The earth's crust flexes downward from the weight of the overlying ice causing the surrounding area, the glacial forebulge, to flex upward. Because Delaware was in the forebulge area of the Laurentide ice sheet during the last Ice Age, land has continued adjusting slowly downward since the weight of the ice sheet was removed starting when the ice sheet began melting approximately 7,000 years ago.

Another factor in land subsidence in Delaware is sediment compaction in the Coastal Plain area. Thick sediments in the Coastal Plain may subside, compacting under their own weight. In addition, groundwater withdrawal from these sediments can allow sediments to compact; land subsidence from groundwater pumping has occurred in Bowers Beach and in Dover is nearly 0.13 inches (DGS 2017).



Source: NOAA 2020a

Figure 10-8. Projected Storm Surge throughout the Delaware Study Area for a Category 4 Hurricane

In combination with sea level rise, subsidence could contribute to additional physical vulnerability for certain areas within the State. In areas where both sea level rise and subsidence occurs, storm surge could also ultimately travel further inland. The combined effects of sea level rise, subsidence, and any storm surge events could impact land use, population distribution and density in certain areas over time.

10.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area have helped shaped the land use, development of cities and towns, and the locations of various cultural, historic, and natural areas. In particular, the location of major rivers and the shape of the shoreline, the presence of the Delaware Bay in the east, the locations of floodplains and wetlands, the swift moving streams in the northern Piedmont, have all influenced where settlers first established settlements, how far inland they first traveled, and where transportation routes were established. Rivers in Delaware provide a vital food source and transportation route; making them prime focal areas for cities. The locations of other cities and towns may have been selected based on certain topographic or geologic features such as beachside communities and flatlands appropriate for agriculture. Those same features may have helped the towns prosper and grow both by providing natural resources for exploitation and also by providing natural attractions that may draw in additional businesses and tourists thus influencing the economics and growth of the community.

The Delaware Bay provides wild habitat and access to the intracoastal waterway and the Port of Wilmington, ultimately linking Delaware to the shipping related economy of Philadelphia, Pennsylvania via the Delaware River. The C&D Canal is important as part of the Atlantic Intracoastal Waterway and as a surface water source for much of northern Delaware. Future projects located within and around the Delaware Bay will need to take into account current regulatory requirements associated with construction (in-water work, runoff, etc.) and any operational discharge. The presence of the Bay and the myriad beaches along the Delaware coastline also influences the maritime industry and maritime jobs in the region.

The physical characteristics of the Study Area contribute to the physical vulnerability of the communities within this area. Delaware's combination of relatively flat topography, low elevation, significant development in coastal areas dominated by tourism, subsidence from natural geologic changes, and a potential for severe coastal storms contributes to a faster rate of sea level rise in Delaware than in other parts of the world. Projections by the Department of Natural Resources and Environmental Control (DNREC) predict sea level rise at a range between 0.22 inches a year and 0.66 inches a year, as compared to the current global rate of 0.125 inches a year. Sea level rise is projected to impact areas in Delaware primarily along the immediate coastline and its river and bay inlets, and also farther inland along the C&D Canal, Nanticoke River, and Christian Rivers. Coastal communities along the coast and bays are at risk from coastal storms due mainly to tidal flooding concerns, while high population communities located along major rivers and streams are also at significant risk from flooding from heavy precipitation and storm surges. Combined with the effects of sea level rise, storm surge would push further inland in the future. Developers of potential future OCS-related activities within these areas will need to be cognizant of the projected changes in sea level and storm surge. Potential future projects could exacerbate impacts if built in areas projected to experience sea level rise and increased storm surge if these expected changes are not taken into account during the planning and design process. Early consideration of projected future changes is beneficial to the project to avoid potential future expenditures for costly repairs or relocations show sea level rise and/or storm surge affect project facilities and/or equipment.

In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics. Physical characteristics can also influence transportation routes and facilities, population distribution and density, and, therefore, housing and business distribution. All of those factors also influence employment trends which may in turn influence vulnerable populations. Therefore,

understanding physical characteristics are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

10.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

10.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the United States, including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

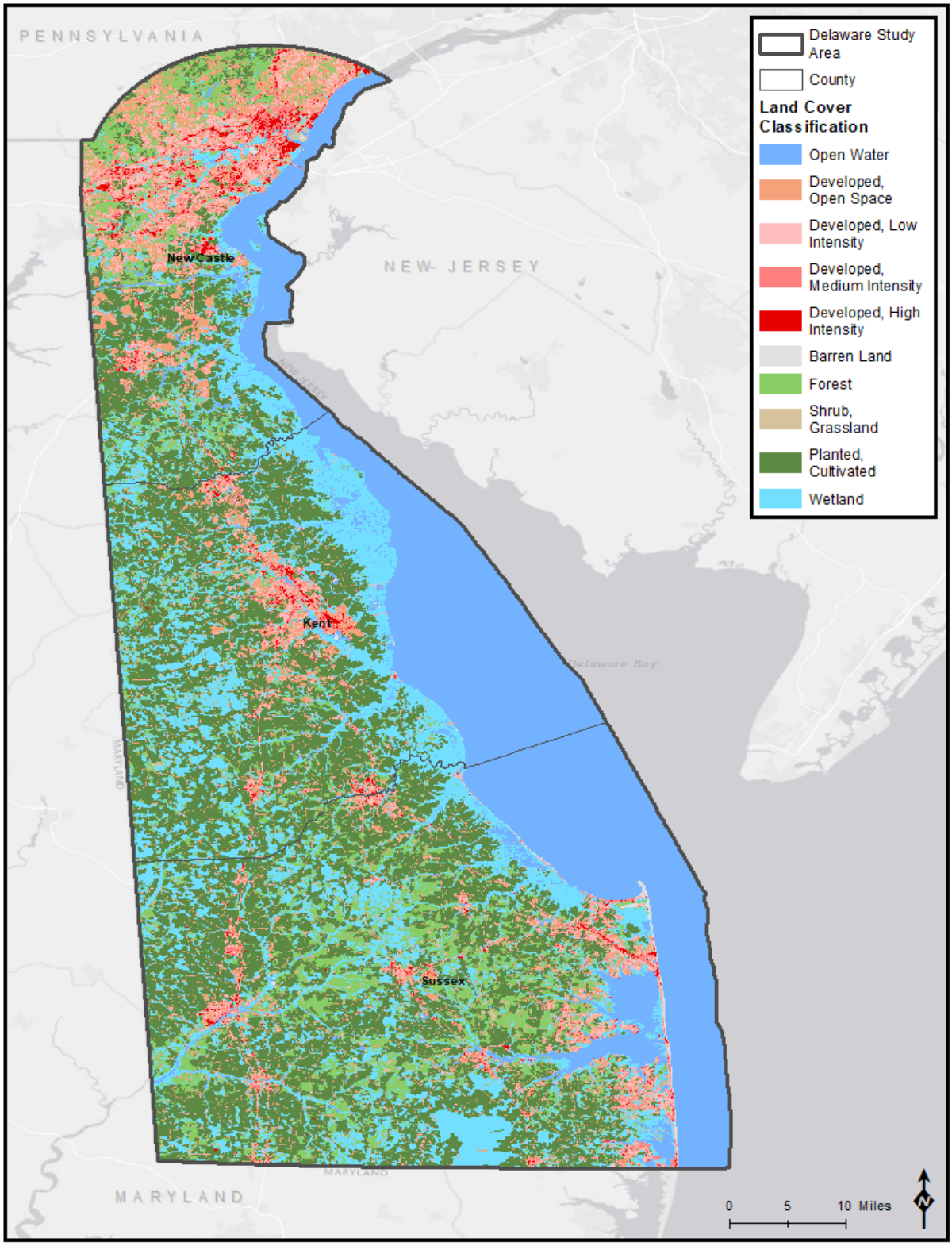
Figure 10-9 displays the NLCD data for the Study Area. Table 10-3 presents the NLCD data for each county within the State by acreage. Table 10-4 presents the same NLCD data by percentage and overall land cover classification for each county (NLCD 2016a). Open water land use was excluded in Table 10-4 because this type of land cover would not be considered in future industrial development. The following section discusses the key findings of this analysis.

As shown in Table 10-4, the predominant land cover type in Delaware is primarily agricultural. Only New Castle County has a significant cover from developed urban land, from the City of Wilmington, although agricultural land is also a dominant land cover type. Of the just over 40% of New Castle County that is developed (when excluding open water), 30% is open space or low intensity development, indicating good potential for future growth. In central and south Delaware, both Kent and Sussex Counties are a mix of agricultural land and wetlands. Undeveloped areas of Delaware are a balance of forest, wetland, and cultivated land.

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In Delaware, 4.0% of the land cover in the Study Area changed at least once. Figure 10-10 and Table 10-5 show the land cover change within the Study Area from 2001 to 2016. Sussex County experienced the most significant land cover change at 4.8%. In Sussex, the land cover change is a combination of change from or to any of the development land classes and change from or to any of the three Forest classes. Kent County experienced the least land cover change at 2.4%. In Kent and New Castle Counties, most of the change is from or to any of the developed land classes (MRLC 2016).

10.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.



Source: NLCD 2016a

Figure 10-9. National Land Cover in the Delaware Study Area

Table 10-3. Acres of Land Cover by NLCD Classifications in Delaware Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (Acres)	Developed, Low Intensity (Acres)	Developed, Medium Intensity (Acres)	Developed, High Intensity (Acres)	Total Developed (Acres)	Barren Land (Acres)	Forest (Acres)	Shrub/ Grassland (Acres)	Planted/ Cultivated (Acres)	Wetland (Acres)	Open Water (Acres)
Kent	510,931	27,115	13,971	6,356	2,895	50,337	463	23,289	902	180,661	118,534	136,745
New Castle	316,178	47,283	34,373	19,252	8,895	109,804	590	43,576	3,014	71,174	43,971	44,050
Sussex	765,704	40,751	27,517	12,596	3,440	84,305	2,924	93,559	5,283	265,517	144,026	170,090
Study Area Total	**1,592,814**	**115,149**	**75,861**	**38,204**	**15,231**	**244,445**	**3,978**	**160,423**	**9,199**	**517,353**	**306,531**	**350,885**

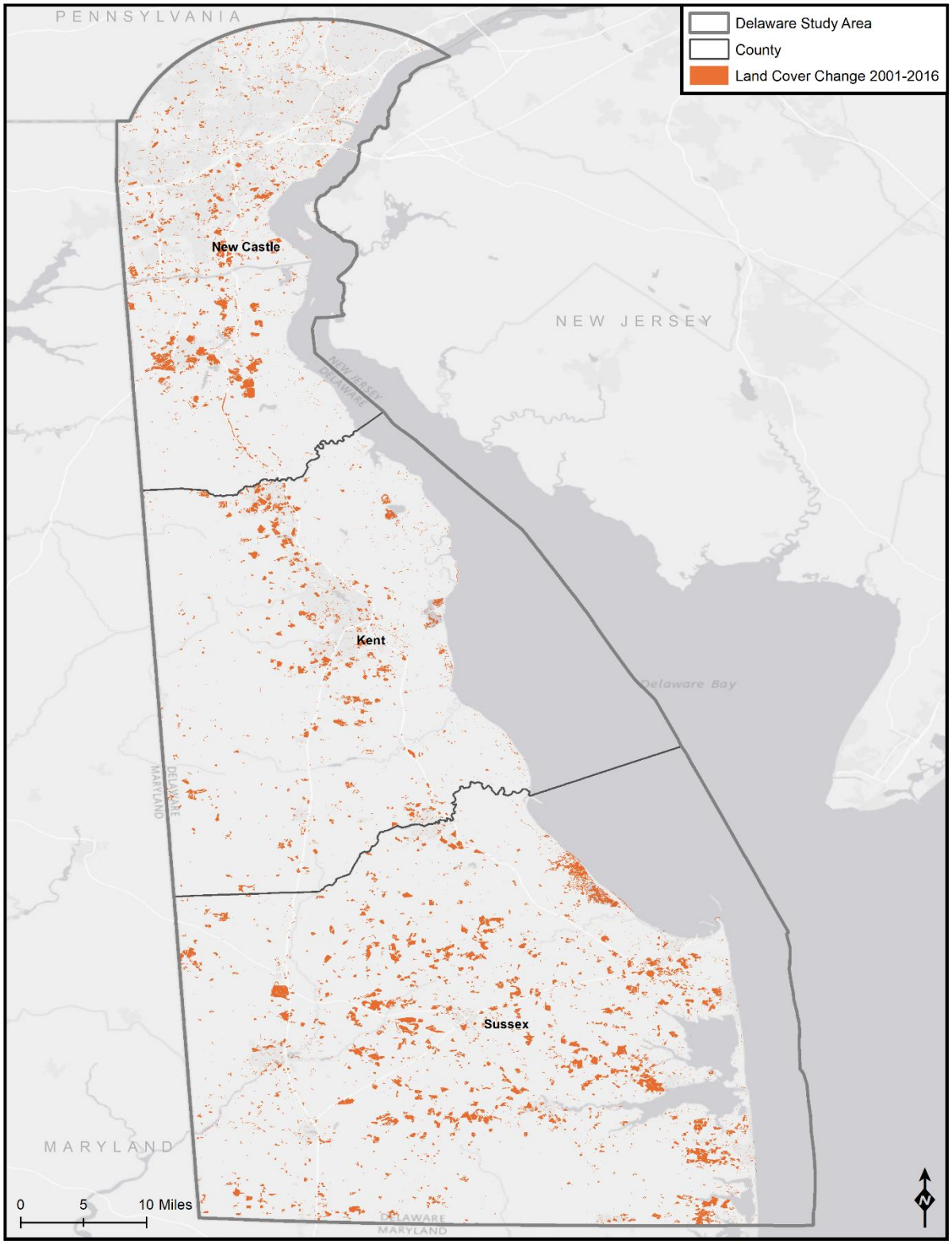
Source: NLCD 2016a

Table 10-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties in the Delaware Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Kent	7.3	3.7	1.7	0.8	13.5	0.1	6.2	0.2	48.3	31.7	Agricultural/ Wetland
New Castle	17.4	12.6	7.1	3.3	40.4	0.2	16.0	1.1	26.2	16.2	Urban/ Agricultural
Sussex	6.8	4.6	2.1	0.6	14.2	0.5	15.7	0.9	44.6	24.2	Agricultural/ Wetland
Study Area Total	9.3	6.1	3.1	1.2	19.7	0.3	12.9	0.7	41.6	24.7	Agricultural/ Wetland

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2001-2016

Figure 10-10. Land Cover Change in the Delaware Study Area

Table 10-5. Land Cover Change in the Delaware Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Kent	510,932	12,262	2.4
New Castle	316,178	14,264	4.5
Sussex	765,709	36,723	4.8
Delaware/Study Area Total	1,592,819	63,249	4.0

Source: NLCD 2001-2016

10.3.2.1 Existing and Future Land Use

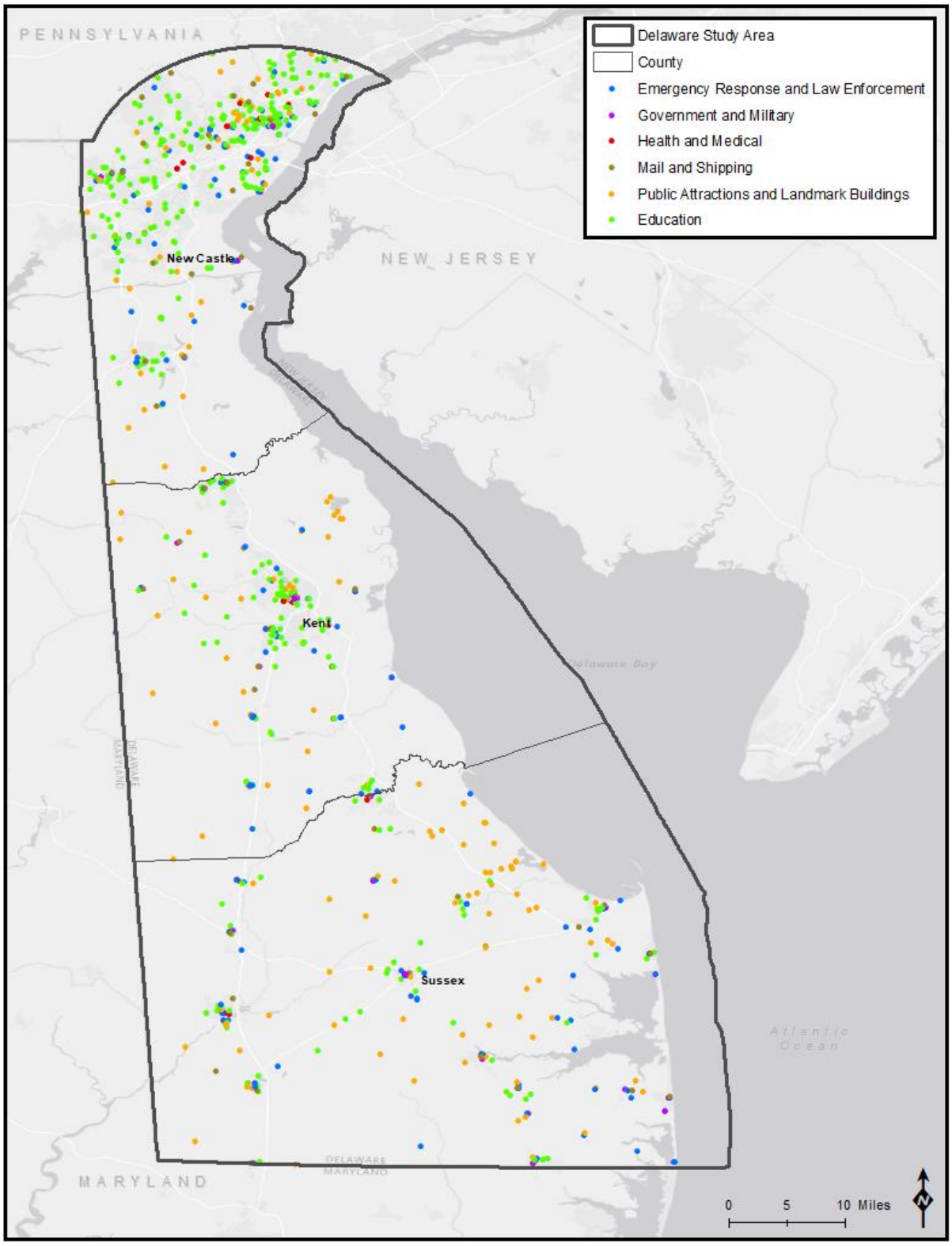
The land cover data provides an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 10-11 presents existing land uses at the broad scale of the Study Area (NLCD 2016a). Figure 10-12 shows impervious areas across the Study Area (NLCD 2016b). These figures show the relationship between land cover analysis which identified developed areas in Chapter 10.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

As determined in the land cover analysis in Chapter 10.3.1, overall land cover in the Study Area is primarily agricultural, with undeveloped areas a balance of forest, wetland, and cultivated land. Land use maps indicate that urban land use and impervious surfaces are highly correlated with major transportation corridors (NLCD 2016b, USGS 2016a). There are 14 designated heavy industrial areas located in New Castle County along the coast near Wilmington (Delaware DNREC 2019c).

The State of Delaware government guides land development at the county level using intergovernmental cooperation and coordination. In particular, they have established the Cabinet Committee on State Planning Issues, a cabinet with the following representatives (Delaware OSPC 2016):

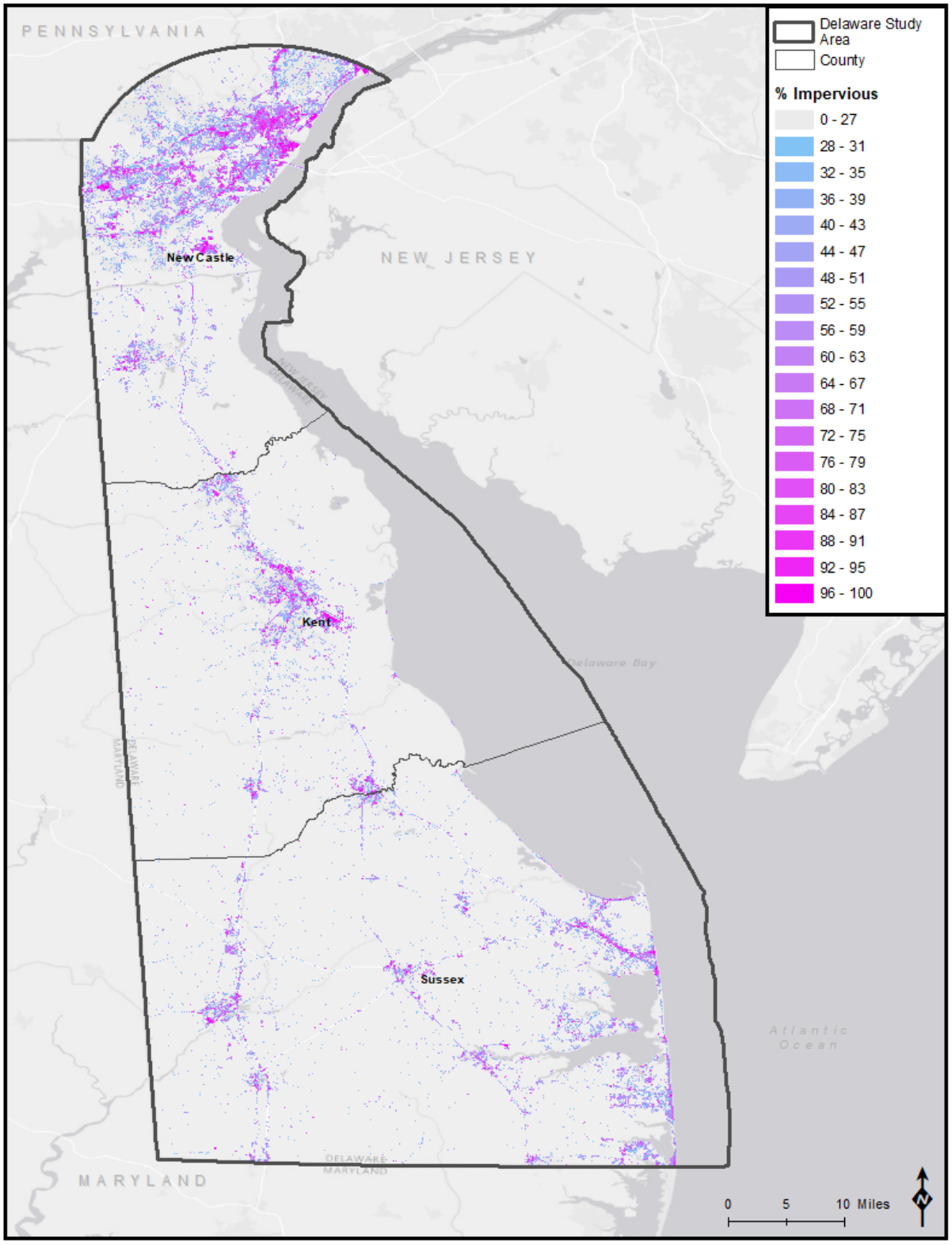
- Secretary of Agriculture
- Secretary of Natural Resources and Environmental Control
- Secretary of Transportation
- Director of the Economic Development Office
- Director of the Office of Management and Budget
- Secretary of Education
- Secretary of Finance
- Secretary of Health and Social Services
- Secretary of Safety and Homeland Security
- Director of the Delaware State Housing Authority
- Director of the Office of State Planning Coordination

The Committee is dedicated to two fundamental policies to guide the development of the strategies: (1) State spending should promote sustainable quality, efficiency, and compact growth; and (2) State policies should foster order and resource protection, not degradation. Significant land development issues are handled by the Office of State Planning Coordination (Delaware OSPC 2016).



Source: USGS 2017

Figure 10-11. Select Existing Land Uses within the Delaware Study Area



Source: NLCD 2016b

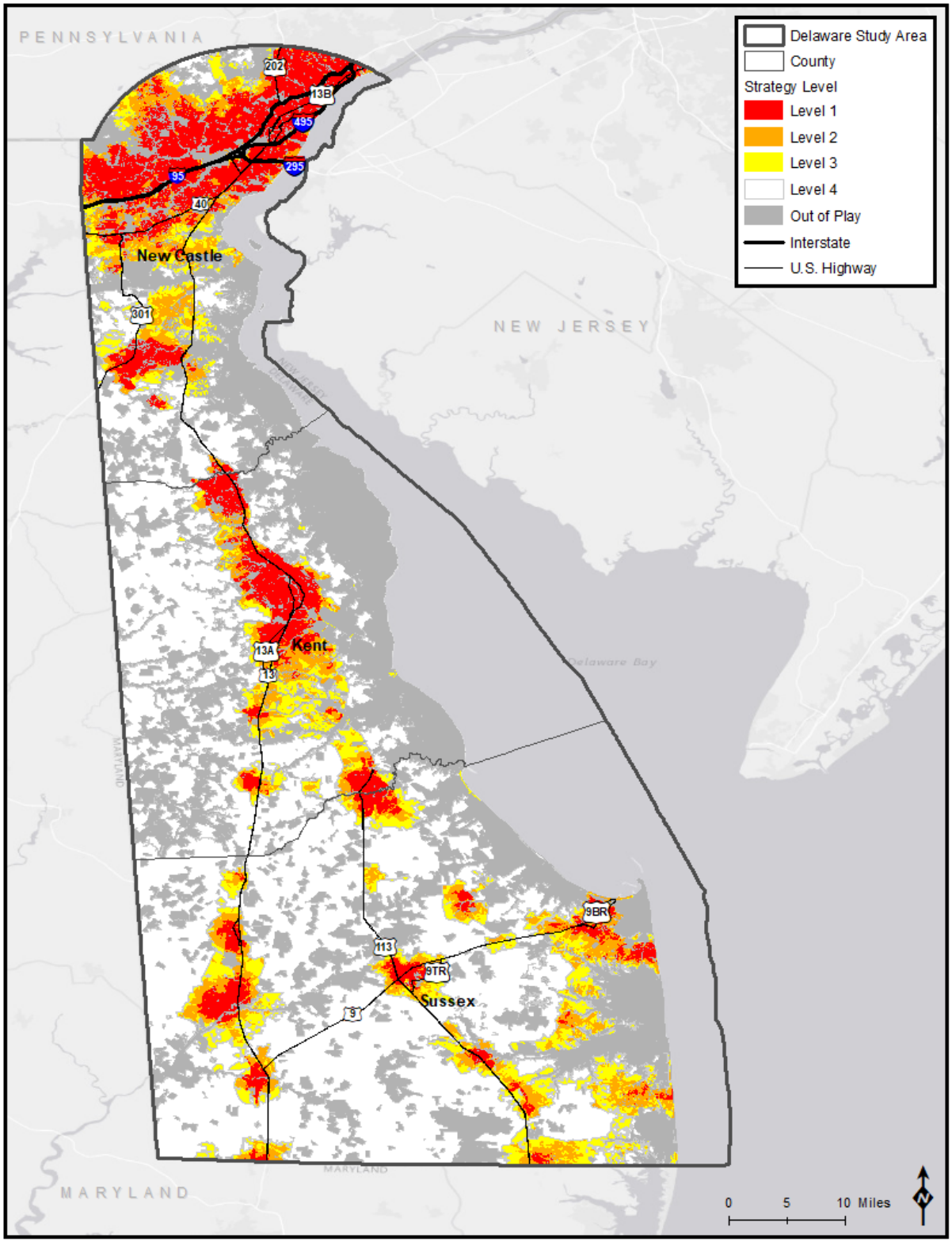
Figure 10-12. Impervious Surfaces within the Delaware Study Area

The State has delegated land-use planning and regulatory authority to Delaware municipal governments, who must develop and regularly update land use plans (Delaware OSPC 2016). Smaller cities and towns (those with a population under 2,000) are required to develop a municipal development strategy. Larger cities and towns are required to develop more detailed Comprehensive Land Use Plans (Delaware OSPC 2019a). These plans are reviewed by State Agencies through the Preliminary Land Use Service, a database that contains links to the final certified comprehensive plans from Delaware's 57 municipalities and three counties (Delaware OSPC 2016, Delaware OSPC 2019b).

Planning documents must be updated every five years and discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to show case future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps and variation of plan format, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents.

The State limits the spatial location of growth by investing State funding in accordance with the State Strategies Investment Levels map, which has five Investment Levels: 1, 2, 3, 4, and Out-of-play. Levels 1 through 3 are the areas in which State policies will support growth and economic development activities, while Level 4 areas are lands that are not available for development or for redevelopment (Delaware OSPC 2016). New and expansion projects are encouraged on facilities or sites located in Level 1 and Level 2 Areas. Development in Investment Level 3 areas is limited to certain activities such as agribusiness, forestry, and potentially visitor industry development, such as heritage, ethnic, and agri-tourism festivals and events. Development in Investment Level 4 Areas should emphasize only development that is compatible with and enhances agriculture, agribusiness, appropriate visitor activities, and similar economic activities (Delaware OSPC 2016). Similarly, growth-related infrastructure and transportation improvements will be directed towards Level 1 and 2 areas, while investment in Level 3 and 4 areas will focus on preserving and protecting open space, agriculture, and a rural legacy (DelDOT 2019a). Heavy industrial use within CZMA protected areas is limited to 14 designated areas located in New Castle County near Wilmington (Delaware DNREC 2019c). Figure 10-13 shows the Investment Level areas within the Study Area. Level 1 and 2 areas are located in major cities and towns and along major transportation routes. Areas classified as out-of-play are unavailable for investment for various legal reasons. This could include lands which are owned by the Federal government, where there are permanent easements, are private conservation lands, lands subject to permanent open-space protection, or other reasons (Delaware OSPC 2016).

Delaware is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. There are 25 Qualified Opportunity Zones designated in Delaware. A map of opportunity zones in Delaware is located online https://business.delaware.gov/opportunity-zones/ (Delaware.gov 2020).



Source: Delaware OSPC 2016

Figure 10-13. State Strategies Investment Levels in the Delaware Study Area

10.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

10.3.2.3 Industrial Incentives

A primary driver of the State's economy is as a corporate haven for most of the country's corporations, which started with passage of "An Act Providing a General Corporation Law" on March 13, 1899. This Law lowered corporate tax and made it easier to create businesses in Delaware. Other business-friendly corporation laws perpetuate the corporate haven atmosphere (Delaware OSPC 2016). As a result more than 1,114,000 legal entities are incorporated in Delaware, 65.6% of all Fortune 500 companies are incorporated in Delaware, and Delaware is the leading jurisdiction for publicly traded corporations listed on the U.S. stock exchanges (Delaware OSPC 2016).

The State of Delaware has adopted policy to attract new business and encourage the expansion of existing operations with key tax features including (DEDO 2017):

- No State or local general sales tax.
- No personal property or inventory taxes.
- Real property taxes are among the lowest in the country.
- Property tax relief for new construction and improvements of existing property.
- The exemption of certain investment and holding companies from corporate income tax.
- The adherence of the State tax structure to the Federal definition of corporate net income so that companies may take full advantage of any Federal tax law change, such as more rapid depreciation of newly purchased assets.
- Port of Wilmington foreign trade zone allows the deferment of import taxes.
- Public Utility Tax rebates of 50% on increased consumption for qualifying industries, and reduced rate for manufacturers and agricultural processors.

Wilmington Delaware contains general-purpose Foreign-Trade Zone No. 99, which consists of two sites located within the Wilmington area operated by the Delaware Economic Development Office. Foreign-trade zones are restricted-access sites that are considered outside the U.S. Customs territory and as such

can defer, reduce, or eliminate Customs duties on foreign products admitted into zones for storage, exhibition, assembly, manufacture, and processing (DEDO 2017).

Delaware's Division of Revenue administers tax credits against the corporate and personal income taxes, gross receipts tax, public utility tax for the following (DPP 2019a):

1. New Economy Jobs Tax Credit (Title 30, Ch. 20, S. 9; Form 2080DE) is eligible for employers who add at least 200 new jobs in the State with an annual salary averaging $70,000, or 50 new jobs with salaries of at least $100,000.
2. New Business Facility Tax Credits (Chapter 20, Title 30; Form 402AP 9901) is eligible for startup and investment into new business facilities that create 5 new jobs and provide a capital investment of $200,000 ($40,000 per employee).
    a. Brownfields Credit is eligible for businesses located on a former brownfield site within a targeted area.
    b. Clean Energy Technology Device Manufacturers' Credit is eligible for a manufacturer of solar power devices, fuel cells, wind power devices, or geothermal power devices if also eligible for the New Business Facility Tax Credit.
    c. Public Utility Tax Credit is eligible for a new facility or expansion of a facility if also eligible for the New Business Facility Tax Credit.
    d. Gross Receipts Tax Credit (Form 402LTR 9901) is eligible for new facilities in targeted areas if also eligible for the New Business Facility Tax Credit.
3. Angel Investor Job Creation and Innovation Tax Credit (Title 30, Ch. 20D) is a personal Income Tax credit for qualified investors in innovative, Delaware-based small businesses, to spur job creation and innovation. For eligible businesses in qualified high technology fields that are headquartered in Delaware.
4. Business Finder's Fee Tax Credit (Title 30, Ch. 20, S. 10) incentivizes existing companies to encourage customers, suppliers, and service providers to operate in Delaware.
5. Research and Development Tax Credits (Title 30, Ch. 20, S. 8; Form 2071AC0007) promotes new research and development by lowering payments on taxable expenses.
6. Historic Preservation Tax Credit (Form 1811AC 0905, Form 1811CC 0701) promotes the rehabilitation of historic properties and continued use of historic properties rather than demolition.
7. Land and Historic Resource Conservation Tax Credit (Form 1801AC 0009) gives credit for gifts of eligible land/properties to public agencies and certain non-profit organizations.
8. Neighborhood Assistance Tax Credit (Title 30, Ch. 20, S. 1; Form 2001AC 0104) encourages investment in impoverished to moderate income locations.
9. Individuals with Disabilities Tax Credit (Title 30, Ch. 20B) incentivizes Delaware employers to hire job candidates referred by vocational rehabilitation facilities.

The City of Wilmington, with the Delaware Economic Development Office, offers additional incentives to facilitate capital investment within the boundaries of Wilmington (City of Wilmington 2019).

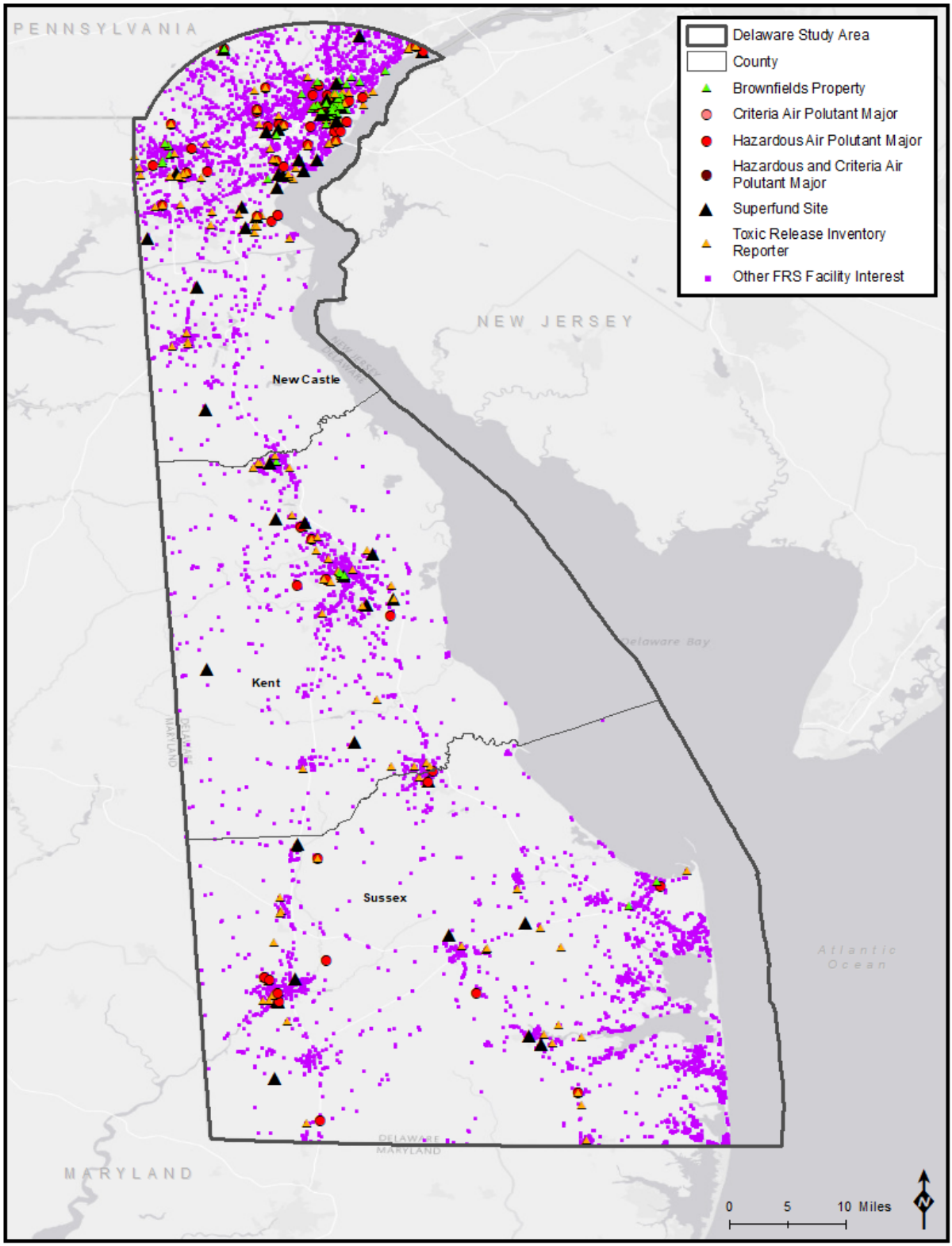
10.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 10-14 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties:* A hazardous substance, pollutant, or contaminant may be present which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major:* Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major:* Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major:* Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter:* Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site:* Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility:* Registry includes the facilities described in Chapter 1.5.2.4.

Based on facilities, sites, and places of interest that are subject to Federal regulation and tracked by USEPA, the location of registered USEPA facilities corresponds highly to the State Strategies Investment Levels map, which determine State funding for development as discussed in detail in Section 10.3.2.1. Areas of industrial development are also closely located with major transportation corridors.

A variety of industry is present throughout the Study Area. According to the USCB American Community Survey from 2017 and shown on Table 10-12 in Chapter 10.4.3, the top four industries based on the number of jobs provided in the Study Area are (1) educational services, and health care and social assistance; (2) retail trade; (3) professional, scientific, and management, and administrative and waste management services; and (4) finance and insurance, and real estate and rental and leasing. Educational services, and health care and social assistance is by far the largest employment sector, accounting for 23% of jobs in Delaware (USCB 2017p). Chapter 10.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 10-14. USEPA Facility Register Service Record for the Delaware Study Area

10.3.2.5 Protected Areas

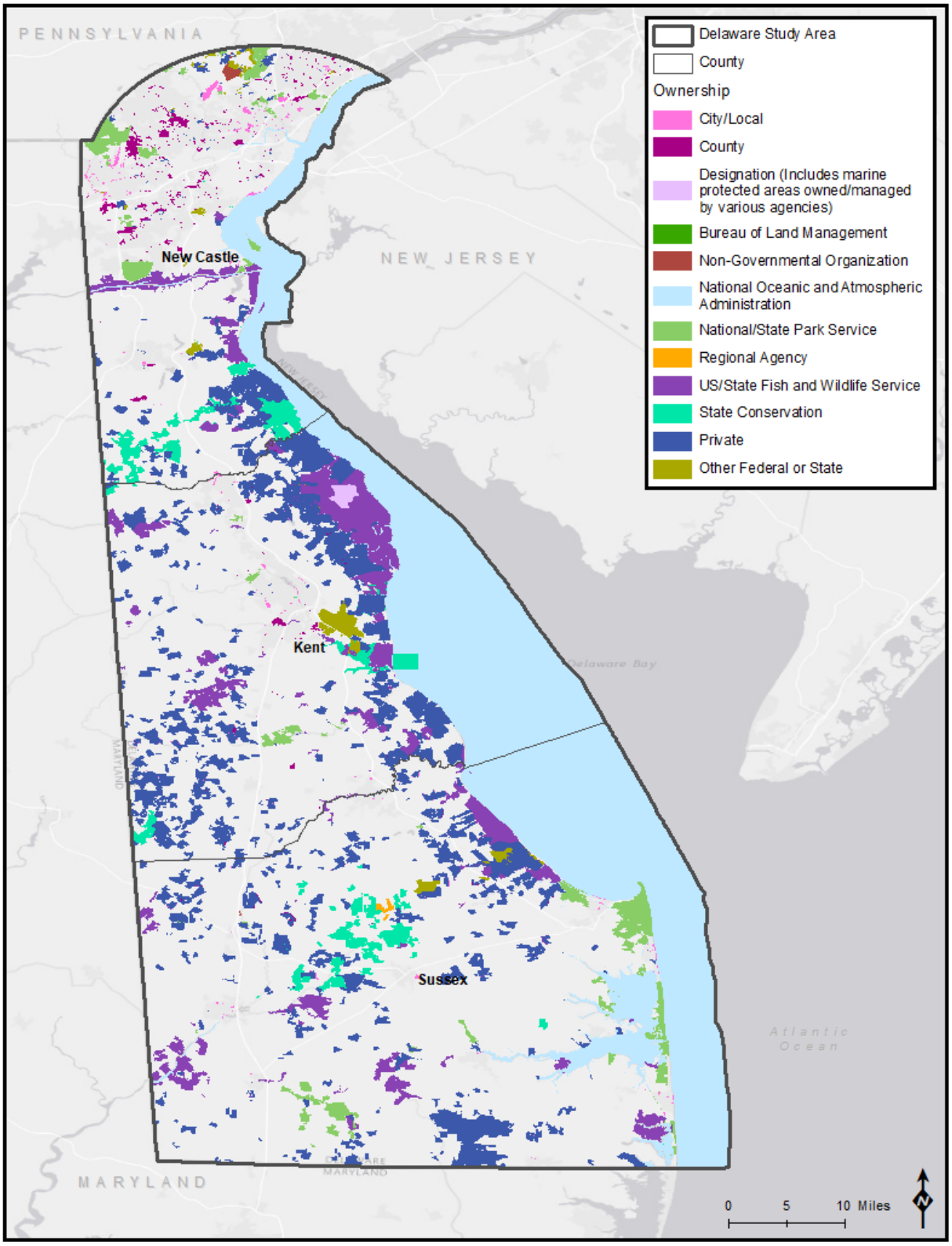
The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time. Figure 10-15 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS. Please note that some of these lands are protected by multiple organizations and there may be overlap among the different protection classifications. According to PAD-US data, there are 5,295 acres of Nature Preserves, 140,737 acres of County and local parks, 20,646 acres of State forests, 182,074 acres of natural areas, and 6,759 acres of conservation easements in Delaware. Protected areas in Delaware are located throughout the State but are concentrated outside major cities and transportation corridors.

There are three properties managed by the NPS in Delaware, the Captain John Smith Chesapeake National Historic Trail, First State National Historical Park, and Washington-Rochambeau Revolutionary Route National Historic Trail (NPS 2020e). There are two NWRs in Delaware. The Bombay Hook NWR has 15,978 acres in Smyrna and the Prime Hook NWR has 8,818 acres in Milton (DEDO 2017). Recreational opportunities offered at these protected areas are discussed in Chapter 10.3.2.8.

The Delaware Forest Service manages three State forests totaling more than 20,000 acres; Blackbird Forest near Smyrna, Taber Forest near Harrington, and Redden Forest near Georgetown. Blackbeard Forest is located on the border of New Castle and Kent Counties and covers over 6,000 acres. Taber State Forest lies in southwestern Kent County and is the smallest of Delaware's State Forests at 1,309 acres. Redden State Forest is the largest at more than 12,900 acres, is located in central Sussex County just north of Georgetown (DSF 2019).

Delaware has a number of programs and legislation designed to encourage the protection of natural areas. Delaware is creating a network of conservation and recreation lands through the Open Space Program, established by the Delaware Land Protection Act (7 Del. Code, Chapter 75). The program coordinates the acquisition of various State lands: parks, fish and wildlife management areas, forests, nature preserves, and cultural sites for protection (Delaware DNREC 2018). The goals of the Delaware Land Protection Act are:

> "to protect and conserve all forms of natural and cultural resources; to protect and conserve the biological diversity of plants and animals and their habitat; to protect existing or planned parks, forests, wildlife areas, nature preserves or other recreation, conservation or cultural sites by controlling the use of contiguous nearby lands; to preserve sites of special natural, cultural or geological interest; to connect existing open spaces into a cohesive system of [conservation] greenways and resource areas; to provide for public outdoor recreation; and to allow for water resource conservation" (Delaware DNREC 2018).



Source: USGS 2019f

Figure 10-15. Protected Areas within the Delaware Study Area

An appointed council dedicated to this cause, together with DNREC, and other State agencies handle the administration, implementation and financing of the program (Delaware DNREC 2018). A Nature Preserves Program, a collaboration among DNREC Division of Parks and Recreation, Division of Fish and Wildlife, State Historic Preservation Office, the Delaware Geological Survey, and other appropriate resource professionals, works to identify, evaluate, and permanently protect Delaware's natural, geologic, and archeological resources as State-recognized Natural Areas. Nature Preserves may remain private, be open for public use, or be included in Delaware's State Parks (Delaware DNREC 2018).

As discussed in Section 10.3.2.1, the State limits development by investing State funding in accordance with the State Strategies Investment Levels map, which has five Investment Levels: 1, 2, 3, 4, and Out-of-play. Development is limited to Levels 1 through 3, while Level 4 areas are lands that are not available for development or for redevelopment (Delaware OSPC 2016). Out-of-play areas are already protected from future development. Because of these restrictions, protected lands are generally located in areas outside Levels 1 and 2, which are primarily major cities, towns, and along major transportation routes.

10.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region now referred to as Delaware, resided in the area long before the era of European exploration. They arrived in the Delmarva Peninsula as nomadic bands of hunters and gatherers. Over time, the inhabitants settled in tribes of sedentary farmers throughout the area. In recorded history, Delaware was home to the Lenni-Lenape, Susquehanna, Nanticoke, and other American Indian tribes. The Lenni-Lenape, which translates to "Original People," are considered to be among the most ancient of the Northeastern Nations. Later called Delaware Indians by the European settlers, the Lenni-Lenape also inhabited New Jersey and Southern Pennsylvania (Alligood 2019, Nanticoke Lenni-Lenape Tribal Nation 2007a). Nanticoke tribes, called the Tidewater People, migrated from the Nanticoke River of the Eastern Shore of Maryland across the Delmarva Peninsula to reside along the Indian River in Southeastern Delaware in the 1600s (Nanticoke Lenni-Lenape Tribal Nation 2007a).

American Indians were present in the Delmarva Peninsula area when European settlers began to arrive. In 1631, the Dutch founded the first European settlement in Delaware at Lewes (Sussex County) and began trading beaver furs with the American Indians. However, the American Indians eventually raided and destroyed the settlement due to a disagreement between the two groups (Hoffecker and Munroe 2019). By 1638, the Swedes purchased land from the Lenape Tribe and the first permanent settlement of log cabins was established at Fort Christina, which is now Wilmington (New Castle County). The community was based on fur trading and farming. Land in this area was also claimed by the Dutch, causing tension between the Swedish and Dutch settlers. In 1655, the Dutch captured Fort Christina, but allowed the settlers to stay. The area became part of New Netherland. In 1664, the English took over this settlement and made it part of New York, but the Swedish settlement remained (Nelson 2020b, NPS 2018f). Fort Christina in Wilmington is now a National Historic Park.

Because of continuing conflict with European settlers encroaching upon Tribal lands, many of the Tribe's members were killed or removed from their homelands. Some were able to continue to live in the homeland and survived because they adapted to the dominant culture and became farmers and tradesmen (Nanticoke Lenni-Lenape Tribal Nation 2007b). By the 1800s, many Nanticoke were living along the banks and tributaries of the Delaware River and united with Lenni-Lenape Indians of New Jersey, creating the Nanticoke Lenni-Lenape tribe (Nanticoke Lenni-Lenape Tribal Nation 2007a).

Delaware was not considered a colony under British rule, as it eventually became part of the Pennsylvania colony in 1682 (Nelson 2020b). And although Delaware was officially part of Pennsylvania, the Delaware counties retained separate identities. A formal separation as a sovereign state did not occur until the outbreak of the Revolutionary War in 1776 (Clark and Schulz 2002). Leading up to the American Revolution, Delawareans were divided on issues concerning independence from the British. Although Delaware's leading politicians were outraged over the British taxes and restrictions passed in the 1760s, they did not support a complete separation from Great Britain. People in Kent and Sussex Counties were more likely to be loyal to Great Britain because of the region's rural and isolated nature, its proximity to British ships in the Delaware Bay, and the strong presence of the Church of England (Clark and Schulz 2002). Regardless of divided loyalties, Delaware played a primary role in the American Revolution (Clark and Schulz 2002). At the end of the war, Delaware earned the right to be called "The First State" due to its quick ratification of the U.S. Constitution, on December 7, 1787 (Hoffecker and Munroe 2019).

Following the American Revolution, industrial pursuits were more prominent in Delaware's growth. Although tobacco was a primary industry, the rivers and creeks of northern Delaware spurred water-powered industry such as grain mills, black powder, textiles, and paper mills. Wilmington's merchants and millers encouraged improvements in transportation, establishing turnpikes (tolled roads) that traveled inland and railroads that connected local industry and market towns in Delaware with northern markets (Delaware HCA 2018, Hoffecker and Munroe 2019). Waterways like the Delaware River were used as transportation and additional waterways were constructed or modified to improve transportation, including the 14-mile long Chesapeake & Delaware Canal that was completed in 1826. Steam-powered transportation provided the key to Wilmington's rapid industrialization in the mid-1800s. The city grew from about 5,500 in 1840 to approximately 77,000 by 1900, attracting immigrants from Ireland, England, and Germany. Its industries included the manufacture of railroad cars, steamboats, morocco leather, and carriages (Hoffecker and Munroe 2019).

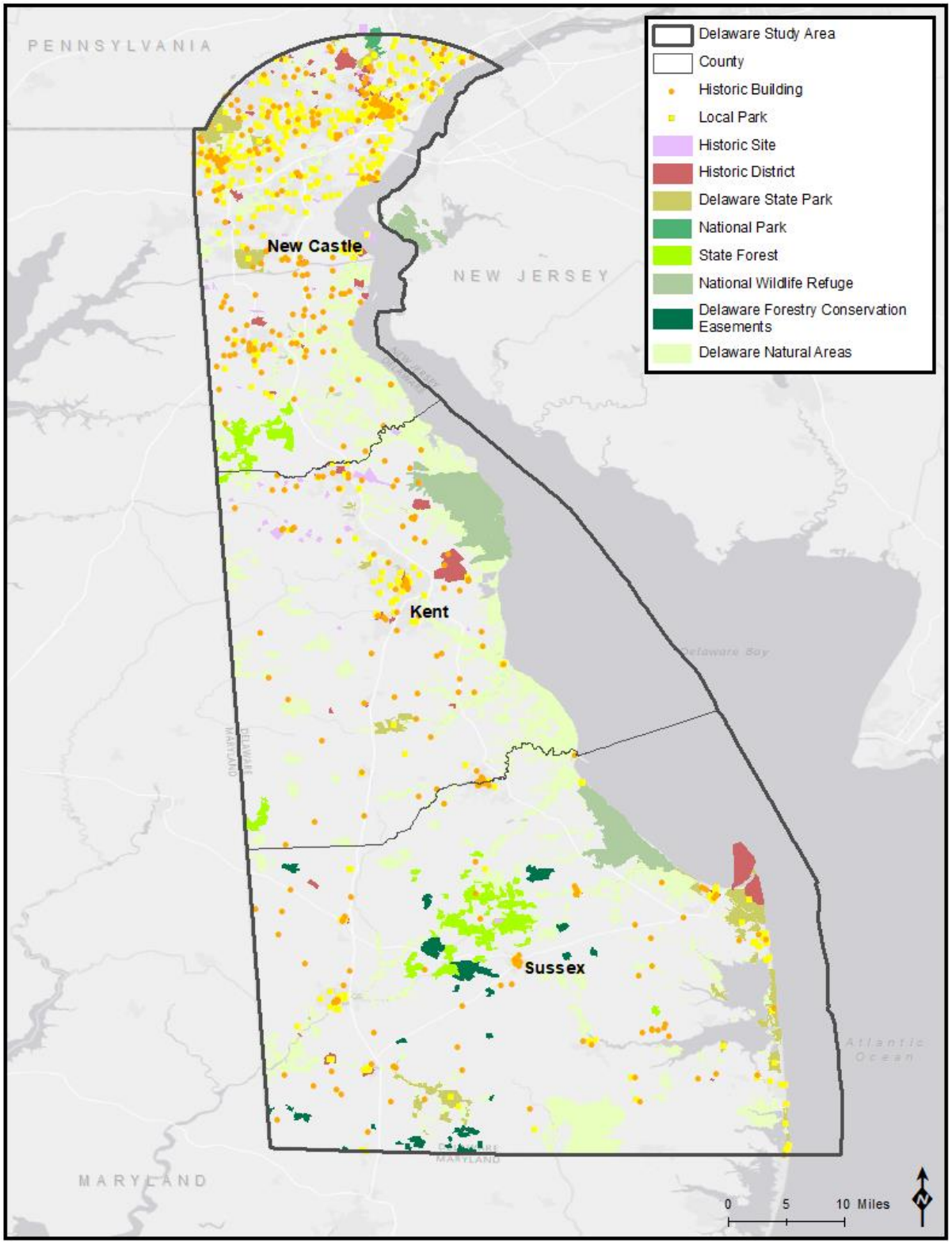
Leading up to the Civil War, Delawareans were increasingly divided over the issue of slavery . The area also served as a crossroads of the Underground Railroad where abolitionists assisted escaped slaves while other Delawareans engaged in the equally illegal capture of free blacks to be shipped southward into slavery. No battles were fought in Delaware, and Delawareans served in the armies of both sides of the Civil War. Race relations continued to be a divisive issue through Reconstruction and the Civil Rights Movement of the 1960s (Hoffecker and Munroe 2019).

Within the Delaware Study Area, cultural and historical resources have been recorded in the State's database for 45,000 individual properties, including 19,587 in New Castle County, 9,604 in Kent County, and 15,107 in Sussex County (Delaware HCA 2018, Delaware HCA 2019). Of these, 706 resources have been approved for Federal NRHP listing and 14 resources are designated National Historic Landmarks, including churches, dwellings, stores, agricultural complexes, and commercial historic districts. Despite the efforts of SHPO and its predecessors, many areas of the state have not been examined for archaeological sites, including areas threatened by accelerated erosion due to climate change and sea level rise (Delaware HCA 2018). Table 10-6, Figure 10-16, and Figure 10-17 present a summary of recorded cultural and historical resources, maritime sites, and shipwrecks in the Study Area. Historic resources, as designated by NRHP, are heavily concentrated in northern Delaware in New Castle County (NPS 2014).

Table 10-6. NRHP Designated Areas

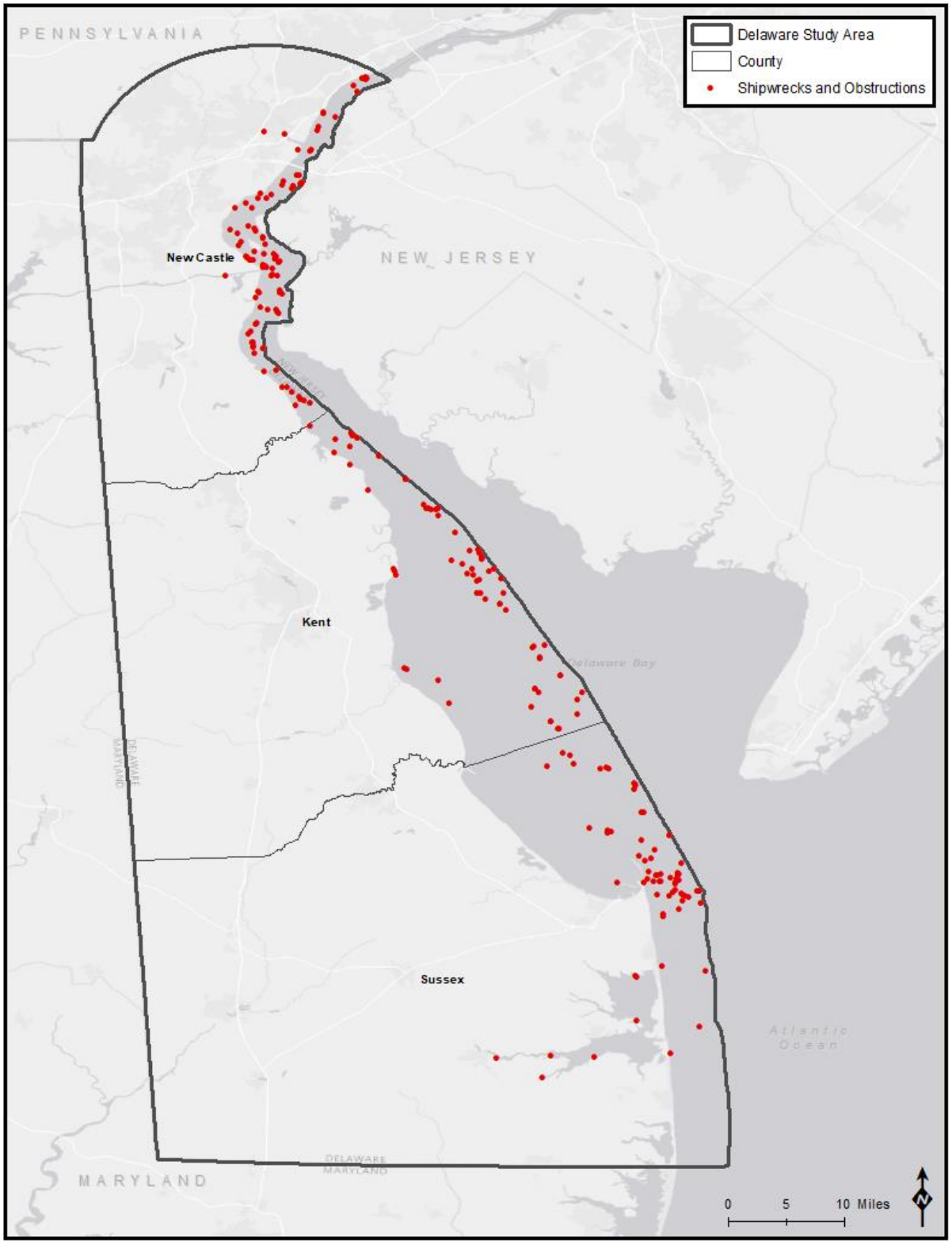
	Kent County	New Castle County	Sussex County	Total
Historic Districts	15	62	13	90
Historic Sites	20	39	4	63
Historic Buildings	93	276	102	471
Total	128	377	119	624

Source: NPS 2014



Source: NPS 2014

Figure 10-16. Cultural and Historic Sites within the Delaware Study Area



Source: NOAA 2016a

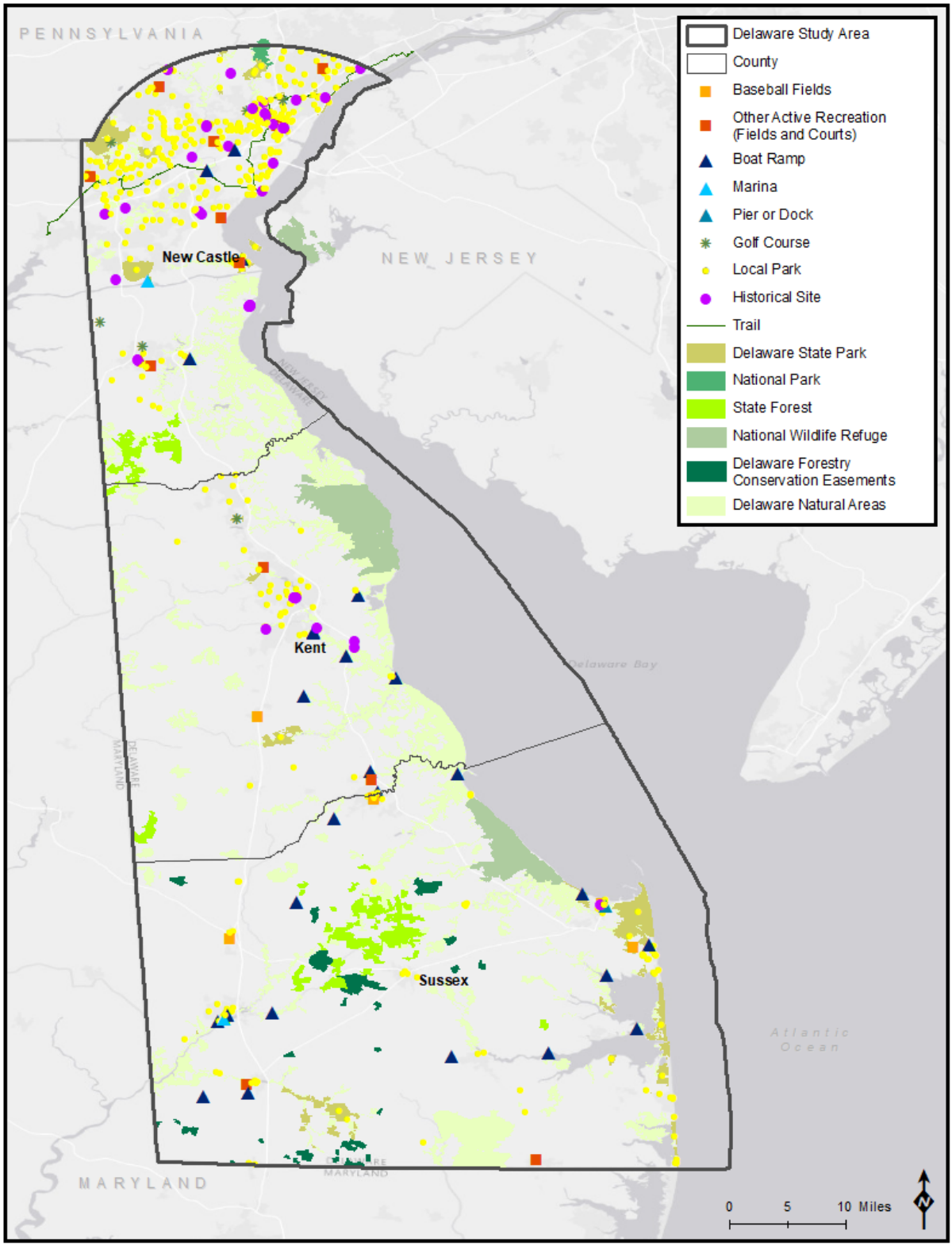
Figure 10-17. Shipwrecks and Obstructions within the Delaware Study Area

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Delaware) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 10-16 and Figure 10-17; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Delaware's cultural and historical resources, potential future projects will need to conduct detailed cultural resource surveys of proposed project sites (and their immediate vicinity) to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

10.3.2.7 Recreation

The Study Area has diverse recreational opportunities including beaches, state parks, state forests, historical and cultural resources, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 10-18. The cultural and historic resources shown in Figure 10-16 can also be considered potential recreational resources as can many of the protected areas shown in Figure 10-15. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 10.3.2.6), transportation (Chapter 10.3.2.8), tourism employment (included in Chapter 10.4.4), and rental housing (included in Chapter 10.4.3).



Sources: Mid Atlantic Data 2019, NPS 2014, USFS 2019b

Figure 10-18. Select Recreational Resources within the Delaware Study Area

Delaware Tourism

In 2018, there were over 9.2 million visitors to Delaware, generating $3.5 billion in total tourist spending, supporting over 44,000 jobs. Most of the tourists visited from surrounding states, primarily from Pennsylvania, Maryland, Washington DC, and New York (Visit Delaware 2020). Tourists spending was fairly equal in Newcastle County (45.3%) and Sussex County (43.1%) with only 11.6% of the spending occurring in Kent County. However, the tourism industry supported more jobs in Sussex County (16.1% of total county employment) than it did in New Castle County or Kent County (5.6% and 5.1% of county employment, respectively) (Visit Delaware 2020). This is in part due to the fact that the majority of the state's tourism economy is associated with the beaches and resort communities in the southern part of the state (DelDOT 2019b).

Delaware Cities

The largest cities in Delaware are Wilmington (New Castle County), the capital city of Dover (Kent County), and Newark (New Castle County). Recreational attractions in these cities include historic houses and gardens, churches, museums, theaters, country estates and farms, shipyards, mills, Amish markets, courthouses, plantations, water taxies and ferries, vineyards, raceways, and casinos. The town of Old New Castle is a restored colonial capital on the Delaware River with original cobblestone streets and guided historical tours. The entire town, including mansions, gardens, bed and breakfasts, restaurants, shops, and one of the oldest courthouses in America has been preserved into an authentic history site (DEDO 2017).

Delaware Beaches and State Parks

Delaware has almost 30 miles of coastline (in Sussex County) with an additional 350 miles of shoreline (including inlets, bays and river mouths) within the Delaware Bay that are used for recreational purposes (Eastern Beaches 2020). Delaware has several beaches that are a main tourist attraction and they are all in Sussex County. These popular beaches include Rehoboth Beach (with a one-mile boardwalk), Bethany Beach (with a 0.5-mile boardwalk), Dewy Beach, Lewes Beach, Broadkill Beach, and Slaughter Beach. Some popular beaches are within state parks (also in Sussex County), such as the beaches at Cape Henlopen State Park, Fenwick Island State Park, and Delaware Seashore State Park (Seavey 2020). Overall, Delaware has 17 State parks comprising over 22,000 acres (DEDO 2017). Of these State parks, 10 are located in New Castle County (of which 5 are in Wilmington), 5 are in Sussex County, and 1 is in Kent County. Information on State parks in the Delaware Study Area can be found on the Delaware Parks website (Delaware State Parks 2020). It was estimated that over 5.8 million people visited Delaware State parks in fiscal year 2019, spending $398 million, and supporting 6,700 full- and part-time jobs. The top parks in visitor spending were Delaware Seashore State Park, Cape Henlopen State Park, Fenwick Island State Park, and Lums Pond State Park (DNREC 2020; Kauffman and Homsey 2018).

Delaware State Forests and Wildlife Refuges

Delaware has three State forests that are managed by the Delaware Forest Service and offer a variety of recreational activities including hiking, horseback riding, catch-and-release fishing, and in-season hunting. Blackbird State Forest (6,000 acres) in southern New Castle County has 40 miles of trails for hiking, running, bicycling, horseback riding, and cross-country skiing. Taber State Forest in southwest Kent County is relatively small (only 1,300 acres) and managed for timber production and wildlife habitat but is popular for hunting. Redden State Forest has almost 13,000 acres and over 44 miles of trails and is popular for hiking, horseback riding, bicycling, camping, fishing, deer hunting, and bird watching (DSF 2019). Delaware also has Bombay Hook NWR in Kent County [16,251 acres], Prime Hook NWR in Sussex County [10,144 acres] and several other natural and wildlife areas and refuges along the coast, many of which can be used recreationally for hunting. The two NWRs contributed over $21 million to the Delaware economy due to the 390,000 visitors that supported over 200 jobs in 2017 (Kauffman and

Homsey 2018). About 3,500 acres of the Bombay Hook NWR is open to restricted public hunting for deer, waterfowl, and upland game. Prime Hook NWR has 25 waterfowl blinds and numerous areas designated for upland game hunting. Overall, there are approximately 56,920 acres of State wildlife areas and 15,100 acres of State forests open to public hunting (DEDO 2017). Fishing and crabbing are also popular in Delaware. Boat captains operate charter and head boat service between April and November in Lewes, Indian River Inlet, Slaughter Beach, or Bowers Beach. Crabbing is also popular on piers, bridges, and canals, while clams are found in many sections of the Indian River Bay, and Rehoboth Bay.

Delaware Events

There are also several fairs, festivals, parades, and craft shows in the Delaware Study Are. Some annual festivals in New Castle County include the Wilmington Grand Prix (May), Water Lantern Festival (July), Brandywine Festival of the Arts (September), Delaware Train Show (October). Annual festivals in Kent County include Dover Day Festival (May) to celebrate the capital city's history, Firefly Music Festival (June), Delaware State Fair (July), Harrington Heritage Days (August), NASCAR races at Dover International Speedway (May, October), and First State Heritage Park 18th Century Market Fair (November), (Delaware Today 2016). Annual festivals in Sussex County include the Oyster Eat and Shrimp Feast (February), Great Delaware Kite Festival (March), Horseshoe Crab and Shorebird Festival (May), Apple Scrapple Festival (October), Sea Witch Festival (October), and the Rehoboth Beach Jazz Festival (October).

In summary, there are several beaches, State and local parks, and wildlife refuges that are popular destinations for residents and tourists as well as historical and build attractions throughout the Delaware Study Area. The most popular tourist attractions are the beaches along the southern coast of the Delaware Study Area in Sussex County. Other activities in Sussex County include hiking, camping, and hunting in the State forest, wildlife preserves and easements, and State parks. Activities in the Northern Region (New Castle County) tend to be related to historical sites and State and local parks. Summer is the peak season for tourism to the Delaware Study Area because of the beaches and water-related activities. Therefore, travel costs will be higher during the summer months. Further, there are several annual festivals and events that occur through the Delaware Study Area, especially in Kent County, which is central to the State and includes the capital city of Dover. Because many of the recreational attractions are also protected lands, there will likely be limitations for development near these areas. Therefore, future developers should consider the potential impacts on these events and attractions during the planning phase and site selection process. Local information on additional attractions and events should also be considered by checking relevant city and county tourism websites and event pages.

10.3.2.8 Transportation Resources

The Delaware Department of Transportation (DelDOT) is responsible for planning, designing, building, maintaining and managing the transportation system throughout the State. Created in 1917 for managing highways, DelDOT now considers all transportation modes including marine, aeronautics, rail, transit, bicycle and pedestrians, as well as utilities, environmental features, and maintenance facilities. DelDOT is responsible for (DelDOT 2019a):

- 13,954 lane miles of highways
- 1,722 bridges and one ferry
- 54 toll lanes
- 4,814 miles of ditches, 1,790 miles of storm drains, 129,030 drainage structures (inlets and manholes), and 560 stormwater management facilities
- 41 Southeastern Pennsylvania Transportation Authority weekday trips in Delaware
- 247 Fixed Route buses
- 297 Paratransit buses

There are a variety of transportation resources throughout the Study Area, including roadways, airports, railroads, public infrastructure, and ports. Figure 10-19 shows the major transportation resources throughout the Study Area. These components are a part of Delaware's freight network, which provides critical connections for the movement of goods across the Delmarva Peninsula and nationwide. The movement of freight is a critical component of Delaware's economy (DelDOT 2019a).

10.3.2.8.1 Roadways

Delaware's roadway system consists of Interstates, primarily located in the greater Wilmington area in New Castle County, 13 U.S. Highways, and State Routes. There are 31 State Routes in New Castle County, 16 State Routes in Kent County, and 22 State Routes in Sussex County. State Routes are maintained by DelDOT, who's mission includes minimizing the impact of the State's transportation system on the environmental and using technology to inform the public and reduce traffic and accidents (DelDOT 2019a, DelDOT 2019b).

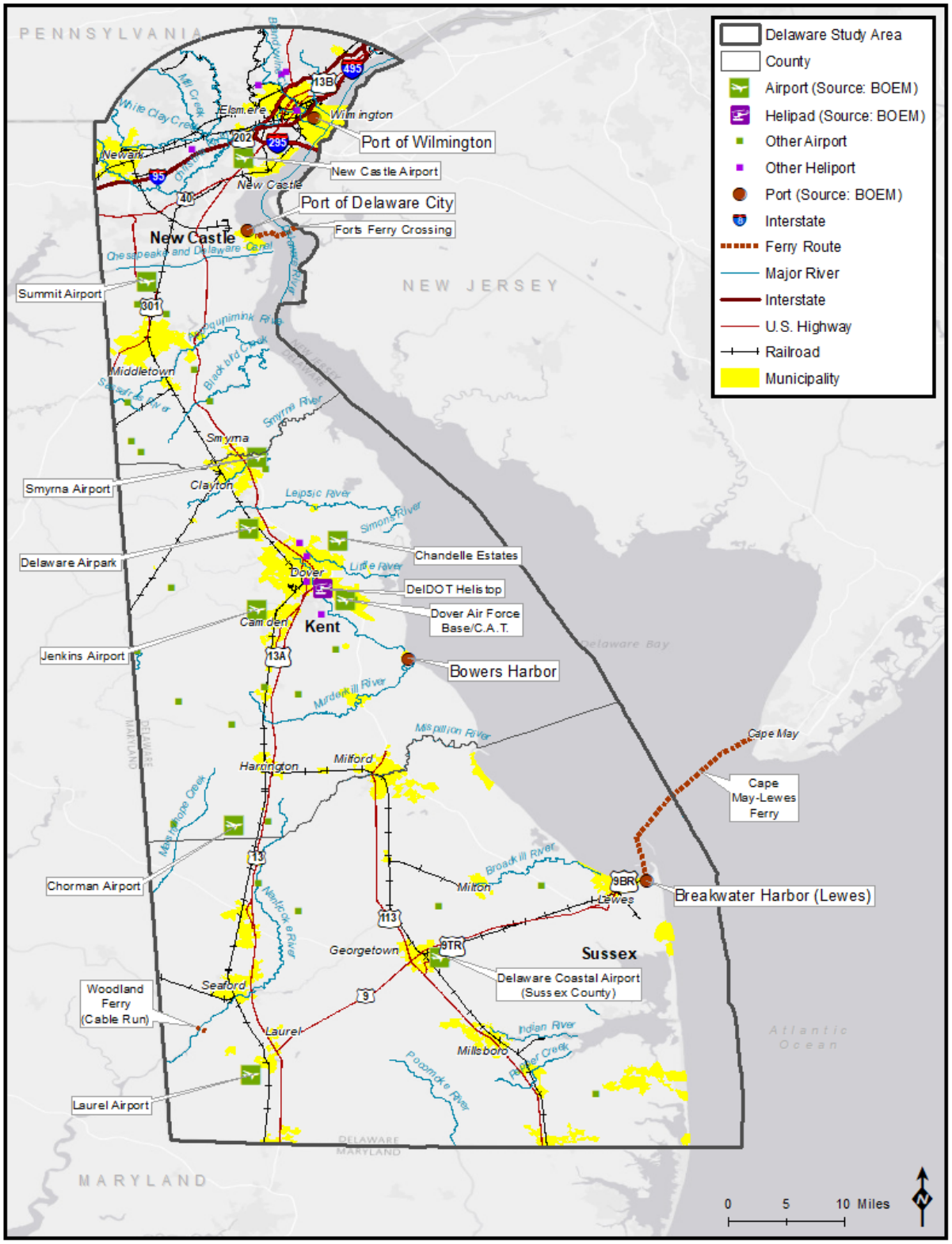
I-95, I-295, and I-495 connect Wilmington to Pennsylvania to the north, to New Jersey to the east, and to Maryland to the west, respectively (AA Roads 2019). I-95 is between four and eight lanes and includes the Wilmington Viaduct, a fixed high-level bridge that spans the Brandywine River and State Park, and the CSX Railroad bridge. I-495 serves as a bypass for Wilmington, primarily for through traffic to and from Philadelphia. I-495 includes a fixed high-level bridge across the Christina River (AA Roads 2018b).

Two major thoroughfares connect the Wilmington area to the southern counties, U.S. Highway 13 and State Route 1. U.S. Highway 13 travels from the south side of Wilmington through Dover, then along the west side of the State to Salisbury, Maryland. U.S. Highway 13 alternates between sections of rural highway and urban arterial throughout its course north through cities and towns including Laurel, Seaford, Bridgeville, Camden, Smyrna, and Odessa (AA Roads 2018a, AA Roads 2018b). State Route 1 is 103.02 miles in length and provides the primary route between the popular Delaware Beaches of Sussex County with the Wilmington metropolitan area through Dover (AA Roads 2018a). US 9 provides a major artery from Lewes in the east to the west side of lower Delaware in Sussex County and includes the Cape May-Lewes Ferry route across Delaware Bay to New Jersey (AA Roads 2018a).

Trucking, by way of the highway network, is the dominant means of freight transportation through the Delmarva Peninsula, accounting for approximately 80% of the overall goods by tonnage and 82% of the overall freight value transported (DelDOT 2019a).

10.3.2.8.2 Ports and Waterways

Ports and waterways are important components of the Delmarva Peninsula's economy and freight network. Various raw materials and manufactured products carried on the Peninsula's waterways include crude oil and petroleum products, chemicals, grains, fertilizers, vehicles, livestock, fresh fruit and fabricated metal products. International shipping activity occurs by way of the Delaware Bay and River and the C&D Canal, accessing facilities at the Port of Wilmington and nearby in New Castle and Delaware City (DelDOT 2019a). The C&D Canal is 14 miles long important shipping corridor that connects the Delaware Bay to the Upper Chesapeake Bay via the Elk River (ASCE 2019).



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 10-19. Transportation Resources within the Delaware Study Area

The Delaware Bay is located on the northern side of the State. There are 12 ports located along the Delaware River four of which are located in the Study Area (the others are in neighboring States) (WPS 2020b). Collectively, the ports in the tri-state area along the Delaware River make up the largest freshwater port in the world. The Study Area ports serve one of the greatest concentrations of heavy industry in the State including chemical, oil refining, and other industries. In 2017, over 90 tons of petroleum and petrochemical products, container cargo, forest products, and automobiles moved through Delaware River ports in the tri-state area. These ports are essential in the import of steel, paper, meat, cocoa beans, Chilean and other South American fruit, and bananas from Central America (DRBC 2020c).

Delaware' four ports are, Bowers Harbor, Port of Delaware City, Breakwater Harbor (Lewes), and the Port of Wilmington (WPS 2019a). Bowers Harbor is a small port in Bowers, Kent County. Located near Bowers Beach, a summer resort on the north side of the entrance to Murderkill River (US Harbors 2019). The Port of Delaware City is a small port at the east end of the Chesapeake and Delaware Canal (WPS 2019a). Breakwater Harbor is located on Cape Henlopen just east of Lewes, off Delaware Bay. Both the Port and Lewes are known for saltwater fishing (WPS 2019a).

The Port of Wilmington is located at the confluence of the Christina River, Brandywine Creek, and the Delaware River. It serves as Delaware and New Jersey's main port and financial, commercial, and industrial center. The Port of Wilmington is a deepwater port (11.6-meter depth) that serves more than 400 vessels and handles more than 4 million tons of cargo each year, importing petroleum products, bananas, and industrial salt, and exporting petroleum coke, paper and board, and new vehicles, among other commodities (DelDOT 2019a). Over half of the publicly-traded companies in the U.S., and more than 60% of the Fortune 500 companies in the U.S. have their headquarters in the Port of Wilmington, for industry including the credit card industry, insurance, banking, legal services, and auto manufacturing (WPS 2019a).

There are multiple ferry services in Delaware (DelDOT 2019a). The Cape May-Lewes Ferry system, operated by the Delaware River and Bay Authority, has three vessels that transport passengers and vehicles 17 miles across the Delaware Bay between Victorian Cape May, New Jersey and Lewes, Delaware, year round (DRBA 2019a). The Woodland Ferry, operated by DelDOT, transports vehicle and foot passengers across the Nanticoke River between Seaford and Laurel, Delaware (DelDOT 2019a). The Forts Ferry Crossing travels from the Port of Delaware City to Fort Mott, New Jersey and Fort Delaware on Pea Patch Island (DRBA 2019a).

10.3.2.8.3 Airports

DelDOT is responsible for planning, coordination and implementation of improvements to the public-use airport system within the State (DelDOT 2019a). Delaware's airport system consists of five Regional Service Paved Runways, two Local Service Paved Runways, three Local Service Turf Runways, and one Helistop (DelDOT 2010). There are currently nine public-use airports and one joint military/civilian use airport in Delaware, along with a public-use helipad located at DelDOT in Dover. Three of the public facilities are managed by DelDOT's aviation partner, the Delaware River and Bay Authority; Wilmington (ILG) New Castle Airport, Delaware Airpark, and Dover Air Force Base/Civil Air Terminal (DAFB 2019, DelDOT 2019b, DRBA 2019a, DRBA 2019b). Air freight transport airports in Delaware include the Dover Air Force Base (Civil Air Terminal), the Wilmington Airport, and Delaware Coastal Airport (DelDOT 2019a). Table 10-7 provides a list of Delaware's airports and their attributes.

Table 10-7. Delaware Airports

Airports	Address	County	Type	Use
Wilmington (ILG) New Castle Airport	151 N Dupont Hwy # 11, New Castle, DE 19720	New Castle	Regional Service Paved Runway	Public; Freight
Summit Airport (Summit Aviation)	4200 Summit Bridge Rd, Middletown, DE 19709	New Castle	Regional Service Paved Runway	Public
Delaware Airpark	127 Durham Ln, Dover, DE 19904	Kent	Regional Service Paved Runway	Public
Dover Air Force Base/ Civil Air Terminal	442 13th St, Dover, DE 19902	Kent	Regional Service Paved Runway	Joint Military/Civilian; Freight
Sussex County Airport (Delaware Coastal Airport)	21553 Rudder Lane, Georgetown, DE 19947	Sussex	Regional Service Paved Runway	Public; Freight
Chandelle Estates Airport (0N4)	114 Kruser Blvd, Dover, DE 19901	Kent	Local Service Paved Runway	Public
Chorman Airport	2057 Nine Foot Rd, Greenwood, DE 19950	Sussex	Local Service Paved Runway	Public
Smyrna Airport	305 Woodland Beach Rd, Smyrna, DE 19977	Kent	Local Service Turf Runway	Public
Jenkins Airport	9935 Westville Rd, Camden Wyoming, DE 19934	Kent	Local Service Turf Runway	Public
Laurel Airport	32502 Aero Dr, Laurel, DE 19956	Sussex	Local Service Turf Runway	Public
DelDOT Helistop	Dover, DE 19903	Kent	Helistop	Public

Sources: DAFB 2019, DelDOT 2019b, DRBA 2019a, DRBA 2019b

10.3.2.8.4 Public Transportation

Delaware has one public transportation system that operates throughout the State. The Delaware Transit Corporation, operating as DART First State which is a subsidiary of DelDOT, provides local and inter-county bus service throughout the State, subsidizes commuter rail service along Southeastern Pennsylvania Transportation Authority Regional Rail's Wilmington/Newark Line serving the northern part of the State, and operates statewide paratransit service for people with disabilities. Bus routes are offered primarily in Wilmington and Newark (New Castle County), there are also routes in Dover (Kent County), Georgetown (Sussex County), and seasonal routes connecting Rehoboth Beach and other beach towns in Sussex County and with Ocean City, Maryland (State of Delaware, 2019). Regional transit centers are located at Lewes, Newark, Claymont, and Wilmington (DelDOT 2019a). Public transit ridership in Delaware has declined 17% between 2015 and 2017, apparently due to a combination of convenience, reliability, decreasing gas prices, and weather (DelDOT 2019a).

10.3.2.8.5 Railways

DelDOT manages rail transportation through a State Rail Plan and partnership with the Consolidated Rail Corporation (Conrail), which supports State railroad system maintenance and expansion to bring more traffic to and through the State (DelDOT 2011). Railways are used to transport both freight and passenger traffic. The energy, agricultural, chemical and construction industries all rely heavily on rail-based transportation (DelDOT 2019a). Because freight rail transport helps to reduce the carbon footprint by emitting less carbon dioxide than road-based transport, increased freight rail transportation has been endorsed as a solution to meet the challenges of an increased demand for goods movement while maintaining environmental stewardship and managing highway congestion (DelDOT 2011).

Rail freight carriers in Delaware include Norfolk Southern (158 miles), CSX Transportation (23 miles), Maryland and Delaware Railroad (16), Wilmington and Western Railroad (10 miles), East Penn Railroad (10 miles), and Delaware Coastline Railroad (23 miles) (DelDOT 2019a). Passenger carriers include Amtrak, Southeastern Pennsylvania Transportation Authority Wilmington/Newark Line, Wilmington and Western Railroad, and Delaware Valley Rail Road (DelDOT 2019a).

10.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area varies greatly. Land cover equates closely with actual land use. Typically, as would be expected, the metropolitan areas are primarily comprised of developed land uses (developed open space, developed low intensity, developed medium intensity, or developed high intensity). The developed high-intensity areas are the urban downtown centers where there are higher concentrations of impervious surfaces, more buildings, more development, and more transportation resources (road, rail, air, and port). Populations with a larger population size also tend to have a larger surface area covered by developed land uses and tend to have more advanced transportation networks or serve as transportation hubs. There are higher concentrations of business, commercial, and industrial facilities near the metropolitan centers, as would be expected. Suburban areas may be a mix of developed and other land cover types.

The Study Area is primarily agricultural, with undeveloped areas a balance of forest, wetland, and cultivated land. Heaviest development is concentrated at the urban centers of Wilmington and Dover, and along the southern Atlantic Coast. In central Delaware, Kent County is a mix of agricultural land and wetlands. In southern Delaware, Sussex County is primarily agricultural land. Because of the City of Wilmington, New Castle County has a significant cover from developed urban land, primarily open space or low intensity development, indicating good potential for future growth. Urban development and impervious surfaces are highly correlated with major transportation corridors. In addition, there are 14 designated heavy industrial areas located in New Castle County along the coast near Wilmington.

The State of Delaware government guides land development at the county level using intergovernmental cooperation and coordination but has delegated land-use planning and regulatory authority to Delaware municipal governments, who must develop and regularly update land use plans and zoning ordinances. Significant land development issues are handled by the Office of State Planning Coordination. The State has delegated land-use planning and regulatory authority to Delaware municipal governments, who must develop and regularly update land use plans (Delaware OSPC 2016). The State will support economic development projects in major cities and towns and along major transportation routes. Similarly, the State limits the spatial location of growth by investing State funding in accordance with the State Strategies Investment Levels map, which supports growth and economic development activities in already developed areas while preserving and protecting open space, agriculture, and a rural legacy (DelDOT 2019a). Future Project Developers of onshore components associated with OCS-related projects will wish to consult the comprehensive plan (or equivalent) and zoning ordinances of each particular county or municipality within which they are interested in developing a new project as local requirements can vary. Counties and municipalities are more likely to support projects that fit within existing and planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the Project Developers in identifying any need for exceptions to the planning document/zoning ordinances as the process for approval of such exceptions may require additional steps or time.

Low corporate taxes and business-friendly corporation laws create a corporate haven atmosphere in Delaware (Delaware OSPC 2016). In addition to statewide incentive programs, individual county development offices may have additional incentives for projects that fit their individual plans. The City of Wilmington offers additional incentives to facilitate capital investment within the boundaries of

Wilmington (City of Wilmington 2019). The available incentives and tax credits may provide future OCS-related developers with a variety of opportunities within the State.

As described previously, industrial sites are frequently concentrated in industrial zones or near other industrial properties. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties that may be similar in nature or that may provide services relevant to the new site.

Delaware has a number of programs and various legislation designed to encourage the protection of natural areas. In accordance with the State Strategies Investment Levels map, development is limited to certain designated areas (Delaware OSPC 2016). Because of these restrictions, protected lands in Delaware are located throughout the State, but are concentrated outside major cities and transportation corridors. Preserves, parks, State forests, natural areas, NWRs, and conservation easements abound throughout the State and are protected in various ways. Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. Project development in and around protected areas will be strongly discouraged by the State.

Cultural and historical resources are also abundant throughout the State and are protected. Because of the importance of Delaware's cultural and historical resources, potential future projects will need to conduct detailed cultural resource surveys of proposed project sites and the immediate vicinity. Any historic or cultural resources found during survey would need to be evaluated under the NRHP criteria to determine if there would be any potential impacts from future projects.

The Study Area has diverse recreational opportunities including natural landscapes, freshwater and saltwater recreation, historical and cultural resources, and modern built experiences. Recreational resources in Delaware include parks, protected lands, greenways, forests, beaches, and waterways. The majority of the State's tourism economy is associated with the beaches and resort communities in the southern part of the State (DelDOT 2019a). Delaware also has a number of programs and legislation designed to encourage statewide recreation. Delaware is committed to expanding recreational areas and opportunities, especially with regard to trails (Delaware DNREC 2018). Given the importance of recreation to the State, future project developers will need to consider avoidance of current and planned recreational areas/uses or other mitigation measures when engaged in project site selection and planning.

DelDOT plans, designs, builds, maintains, and manages all transportation modes including marine, aeronautics, rail, transit, bicycle and pedestrians, as well as utilities, environmental features, and maintenance facilities (DelDOT 2019b). All of these components are a part of Delaware's transportation network, which provides critical connections for the movement of goods across the Delmarva Peninsula and nationwide (DelDOT 2019a). Trucking is the dominant means of freight transportation through the Delmarva Peninsula, accounting for more than 80% of freight transported; however, because freight rail transport helps to reduce the carbon footprint by emitting less carbon dioxide than road-based transport, increased freight rail transportation has been endorsed as a solution to meet the challenges of an increased demand for goods movement while maintaining environmental stewardship and managing highway congestion (DelDOT 2011, DelDOT 2019a). Delaware's largest port is the Port of Wilmington (DelDOT 2019a). Any potential future development will depend on the integrated transportation network during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways, or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations.

Therefore, an understanding of the integrated transportation network will be essential for future project development.

10.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

10.4.1 Population

Delaware has one of the lowest State populations in the entire U.S. According to 2018 estimates, the State ranked 44th most populous, less than Rhode Island (USCB 2019a). However, Delaware's population has been steadily increasing for decades. According to the USCB, Delaware's estimated population was 943,732 in 2017. As shown in Table 10-8, Delaware grew 5.1% since the 2010 Census, at a rate faster than the Nation, having added approximately 45,798 people. During the same time period, the population of the United States grew just 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). As estimated by the Delaware Population Consortium, Delaware grew faster than any of its bordering States (Maryland, New Jersey, and Pennsylvania) between 2010 and 2017 (Delaware Population Consortium 2019). These values are USCB estimates. As estimates, they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While Delaware is affected by the nationwide trend of aging population, it continues to grow due to natural increase and migration, both domestic and international. USCB 2018 estimates indicate that natural increase accounted for 13.9% of the State's population increase (USCB 2019b).

Nationally, migration remains at historic lows, as those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). However, Delaware is not part of this national trend, as it is a popular destination for relocation, especially for retirees (Kotkin 2016). According to USCB 2018 estimates, domestic migration accounted for 67.9% of population gain, with residents moving from Pennsylvania, New Jersey, Maryland, New York, Virginia and Florida (USCB 2019b). International migration accounted for 18% of population gain during the same period (USCB 2019c).

Table 10-8. 2010 and 2017 Total Population and Population Projections Through 2040 in the Delaware Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Kent	162,310	173,145	183,242	193,601	201,639	6.7	16.5
New Castle	538,479	555,036	571,165	596,221	606,346	3.1	9.2
Sussex	197,145	215,551	235,396	255,143	268,180	9.3	24.4
Study Area Total / Delaware	**897,934**	**943,732**	**989,803**	**1,044,965**	**1,076,165**	**5.1**	**14.0**
United States	**308,745,538**	**321,004,407**	**332,639,000[4]**	**355,101,000[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - Delaware Population Consortium 2019; 4 - USCB 2018b

10.4.1.1 Study Area Trends

There are three counties (Kent, New Castle and Sussex) in the entire State of Delaware, which also comprise the Study Area (Figure 10-1). In terms of population, Kent county is the smallest county; New Castle is the largest; and Sussex is the fastest-growing (Delaware Population Consortium 2019). The counties have not been delineated into regions for this State due to the size of the State.

Table 10-8 shows population growth in the Study Area counties. Between 2010 and 2017, all three counties experienced growth. Overall, the population of the Study Area grew 5.1%, faster than the Nation (4.0%). Sussex County had the highest growth with 9.3% increase (18,406 residents) since the 2010 count. Kent County increased by 6.7% (10,835 residents) while New Castle County had the lowest growth rate at 3.1% (16,557 residents). Population estimates are based on permanent residents (USCB 2017a, USCB 2017d, USCB 2018a).

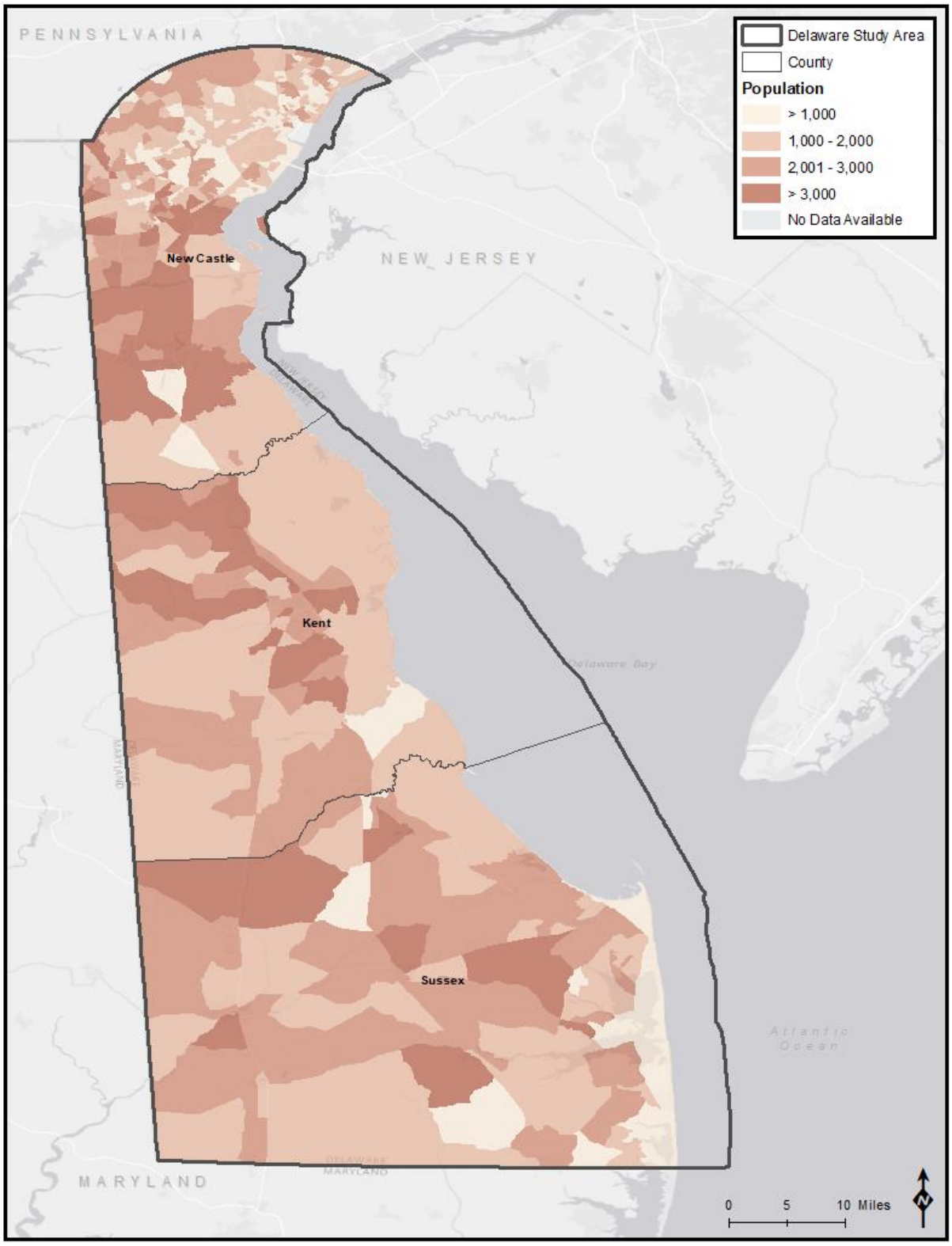
Figure 10-20 shows population counts in census block groups within the counties located in the Study Area. Figure 10-21 illustrates more higher density concentrations in urban areas that correspond to metropolitan statistical areas, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 10-21, the metropolitan statistical areas present in the Study Area are: Philadelphia-Camden-Wilmington, PA-NJ-DE-MD, Dover, DE and Salisbury, MD-DE (Data.gov 2017).

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties were home to 52% of the Nation's population in 2010, but accounted for less than 20% of the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). All counties included in the Delaware Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 10-9, the Delaware Study Area is 1,948.2 square miles and represents 100% of the State's total land area (USCB 2017d, USCB 2017c).

Table 10-9. 2017 and 2040 Population Density in the Delaware Study Area

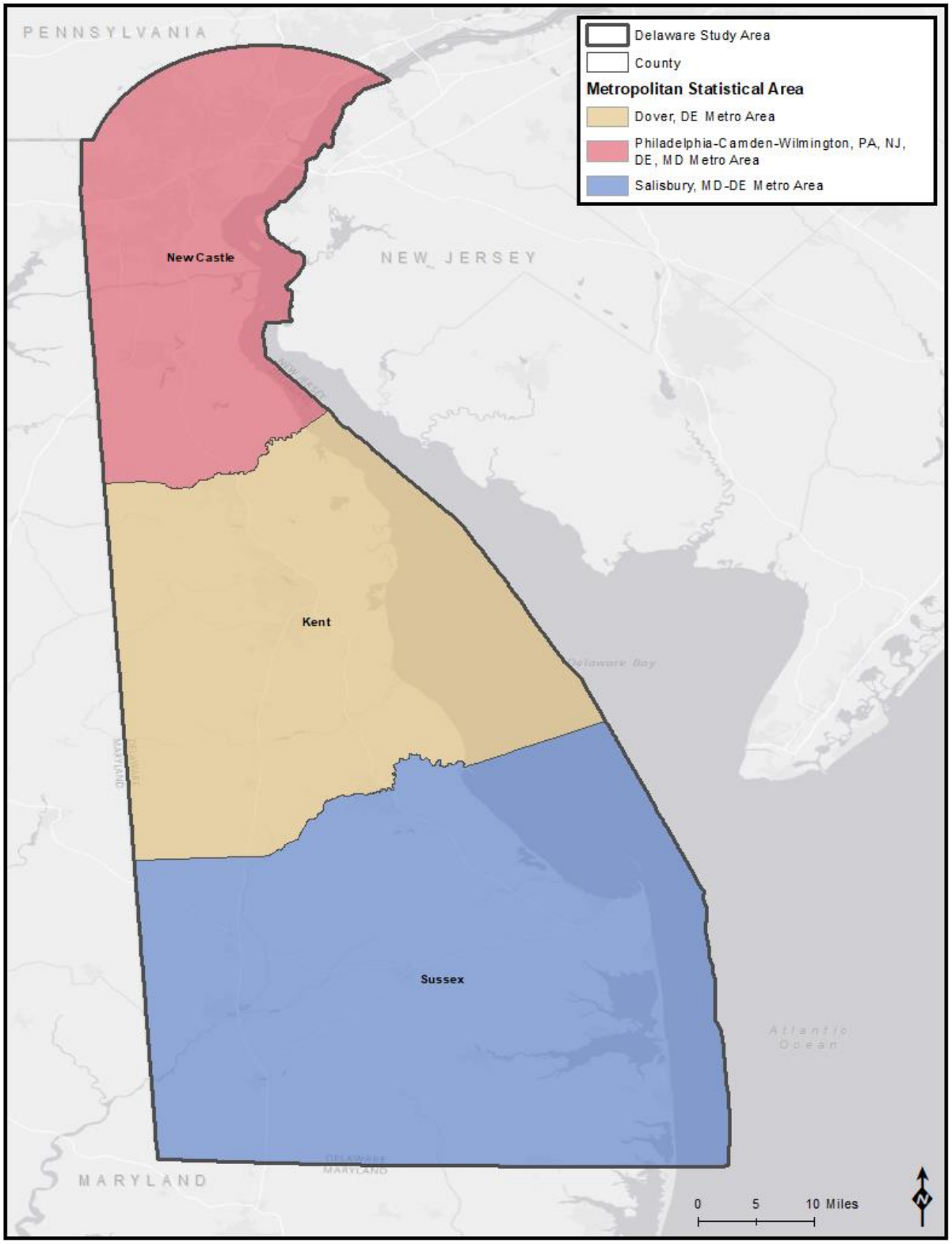
Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Kent	173,145	201,639	585.8	295.6	344.2
New Castle	555,036	606,346	426.3	1,301.9	1,422.3
Sussex	215,551	268,180	936.1	230.3	286.5
Study Area Total / Delaware	**943,732**	**1,076,165**	**1,948.2**	**484.4**	**552.5**
United States	**321,004,407**	**373,528,000**	**3,531,905.4**	***90.9***	**105.8**

Sources: Delaware Population Consortium 2019, USCB 2017a, USCB 2017d, USCB 2018b



Source: USCB 2017r

Figure 10-20. Population in the Delaware Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 10-21. Metropolitan Statistical Areas Located within the Delaware Study Area

According to NOAA, in 2010 approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA Fisheries 2013). This density pattern is evident in the Study Area, as illustrated by Figure 10-22, which shows population per square mile in the Study Area Population densities range from 230 persons per square mile in Sussex County to 1,301 persons per square mile in populous New Castle County (USCB 2017d, USCB 2017c).

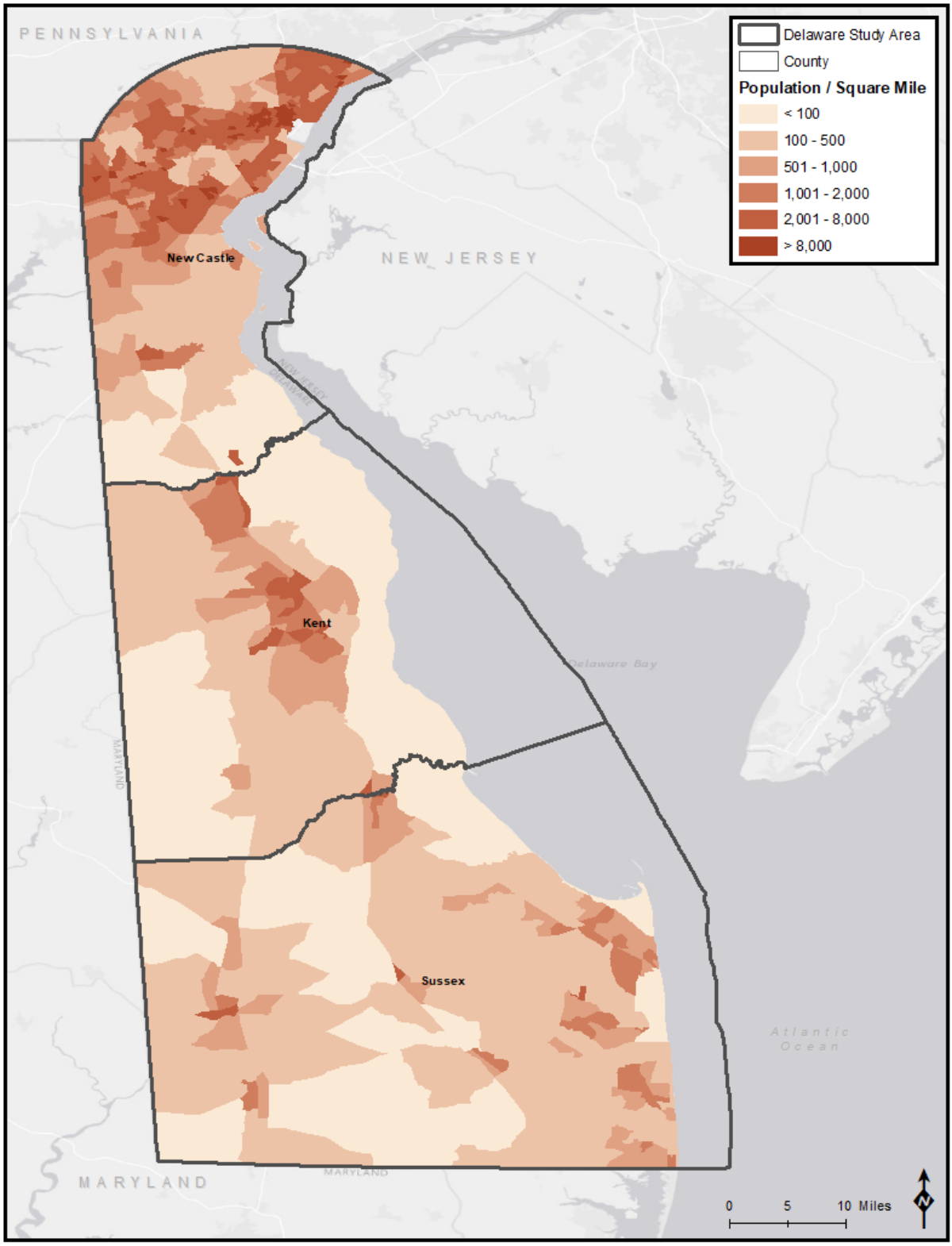
10.4.1.2 Population Projections

Table 10-8 provides details of the projected population for the U.S., the State, and Delaware counties from 2017 to 2040. As estimated by the Delaware Population Consortium, the population of Delaware (and the Study Area, which comprises the entire State) is projected to grow 14% by 2040. The Nation's population is projected to grow 16.4% (373.5 million), more than the State. Figure 10-23 shows the overall projected percent change in population in each county during the same period. Delaware's counties are expected to have continued growth. As shown in Table 10-8, rapid growth is projected in Sussex and Kent Counties (24.4% and 16.5%, respectively). Relatively lower population growth is projected in New Castle County (9.2%) (USCB 2017d, USCB 2018b, Delaware Population Consortium 2019).

Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future. This trend is reflected in the Study Area, as population density is projected to increase from 484 persons per square mile in 2017 to 552 persons per square mile in 2040. This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards (Delaware Population Consortium 2019, USCB 2017d).

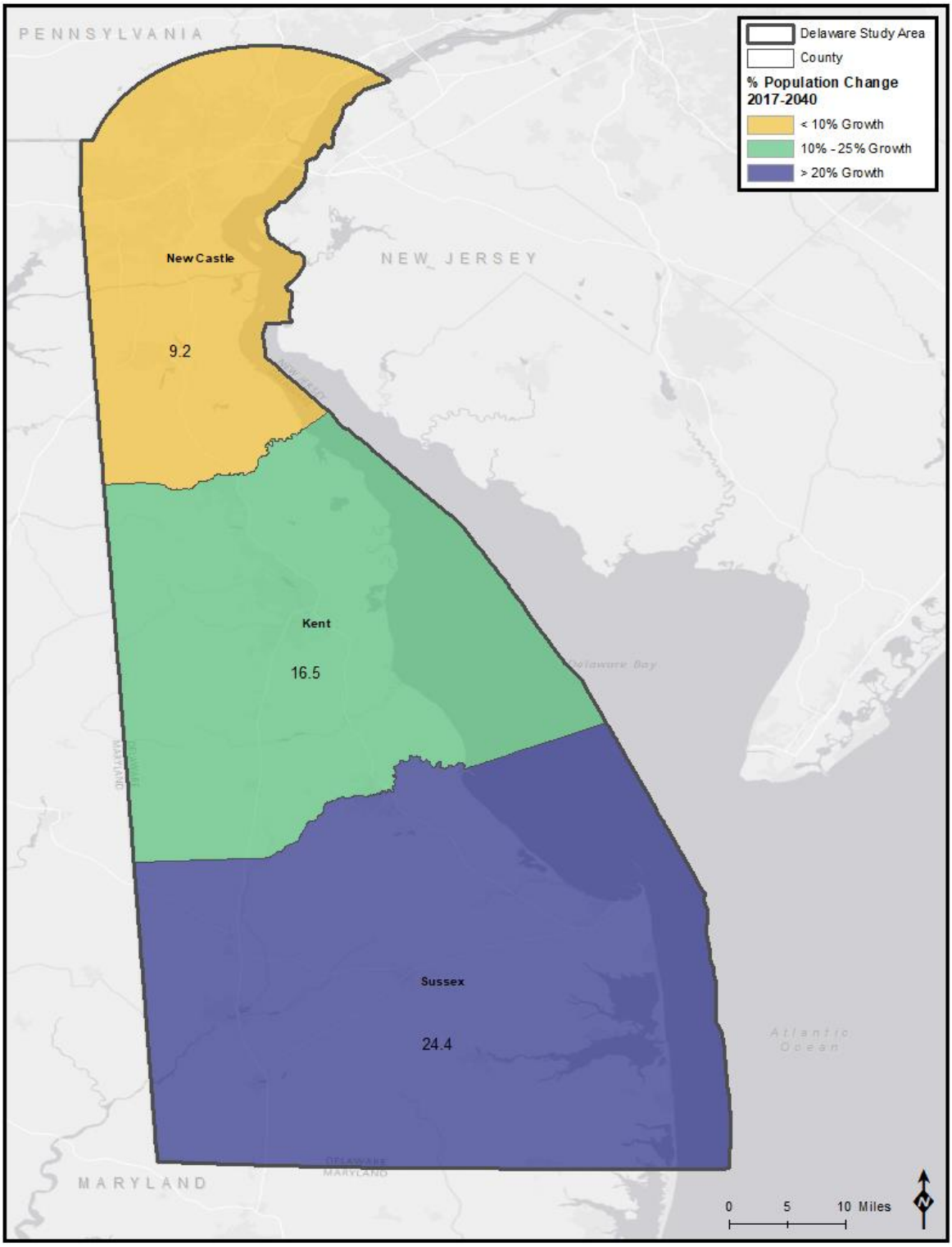
10.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Delaware and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 10-24 and Figure 10-25 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 10-26 and Figure 10-27 show the projected change in these groups by 2040. Table 10-10 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Delaware and the Study Area (USCB 2017b, Brookings Institute 2018, Delaware Population Consortium 2019).



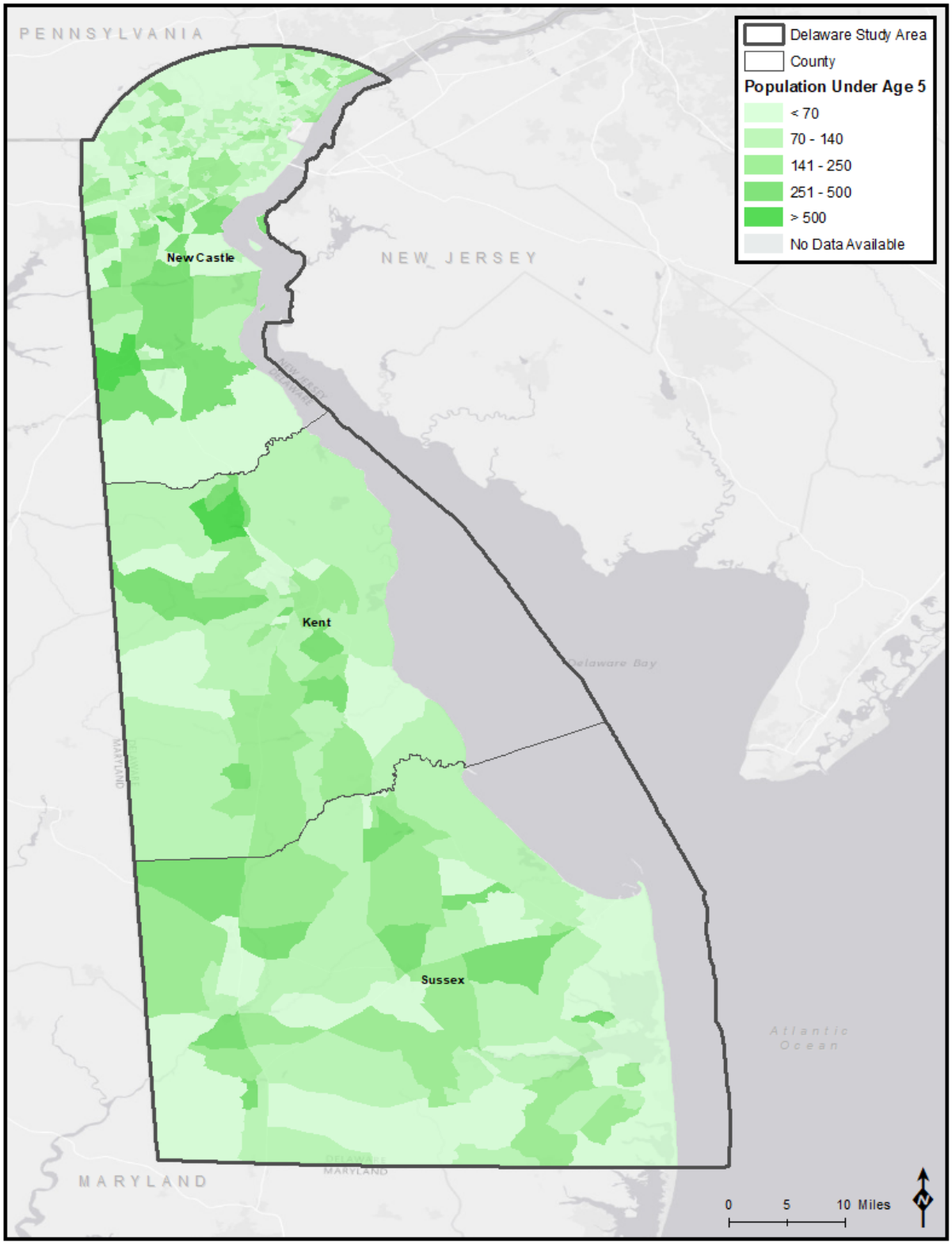
Source: USCB 2017r

Figure 10-22. Population Density in Delaware Study Area Counties by Census Block Group



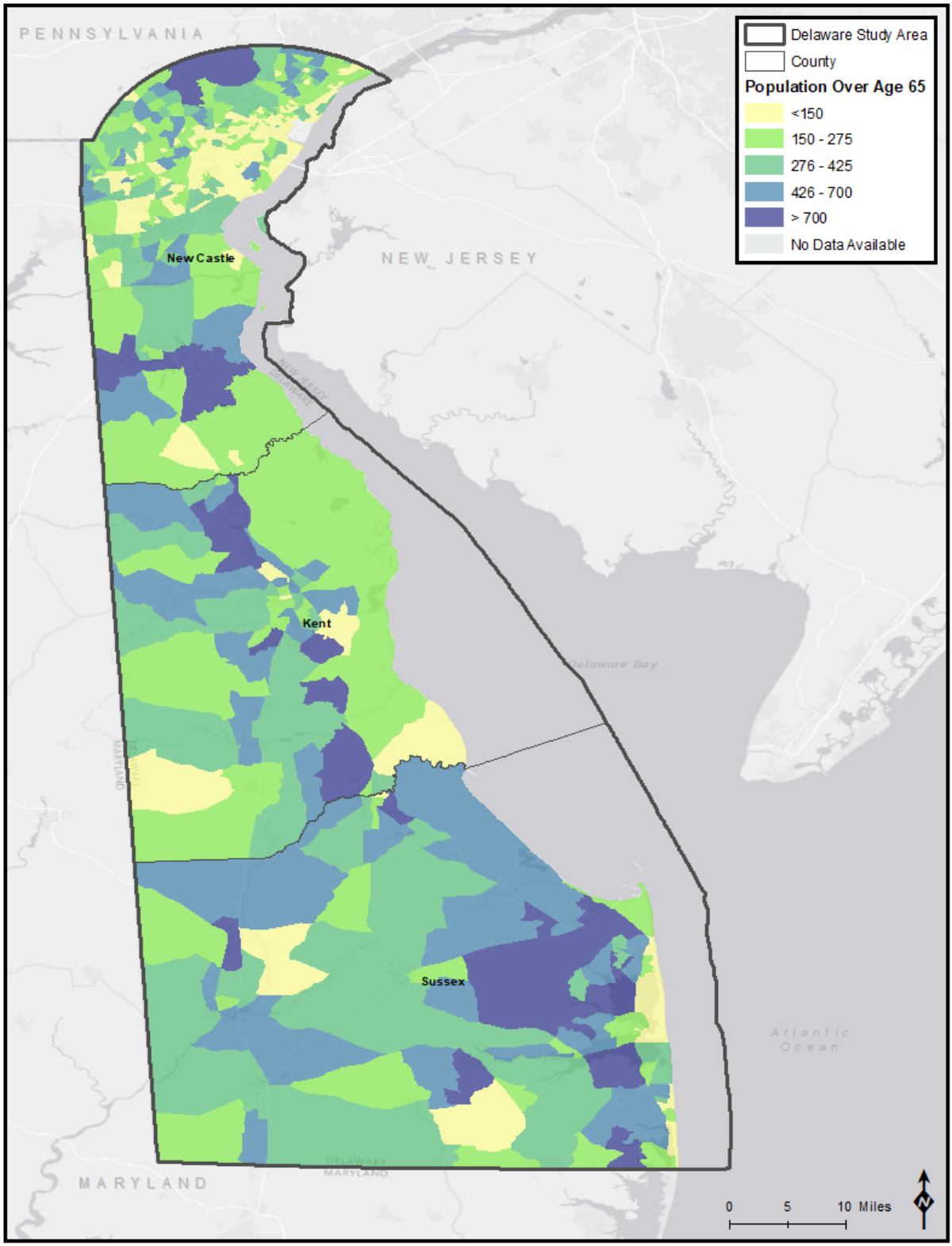
Source: Delaware Population Consortium 2019

Figure 10-23. Overall Projected Population Change from 2017-2040 in the Delaware Study Area by County



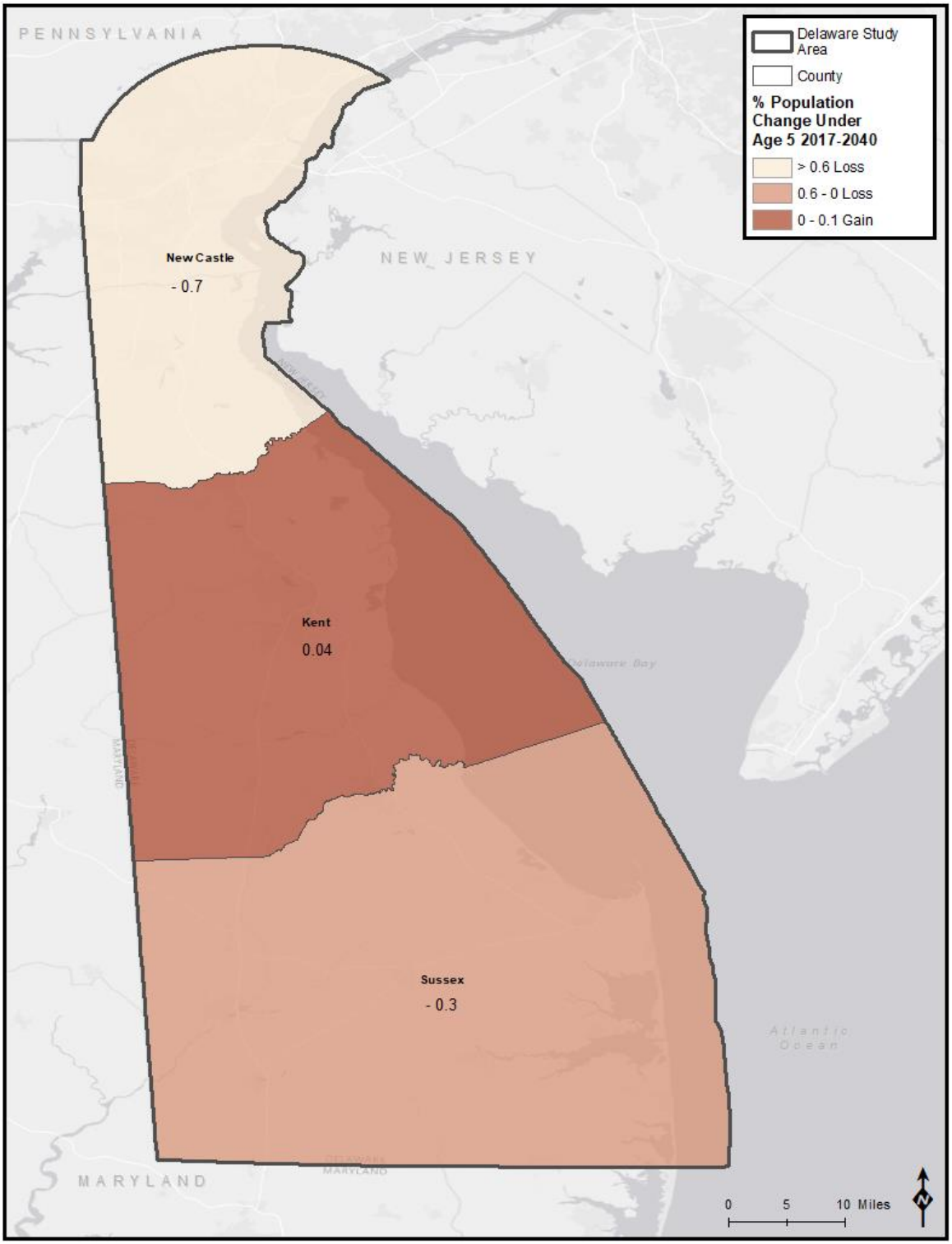
Source: USCB 2017r

Figure 10-24. Population Under Age 5 in the Delaware Study Area by Census Block Group



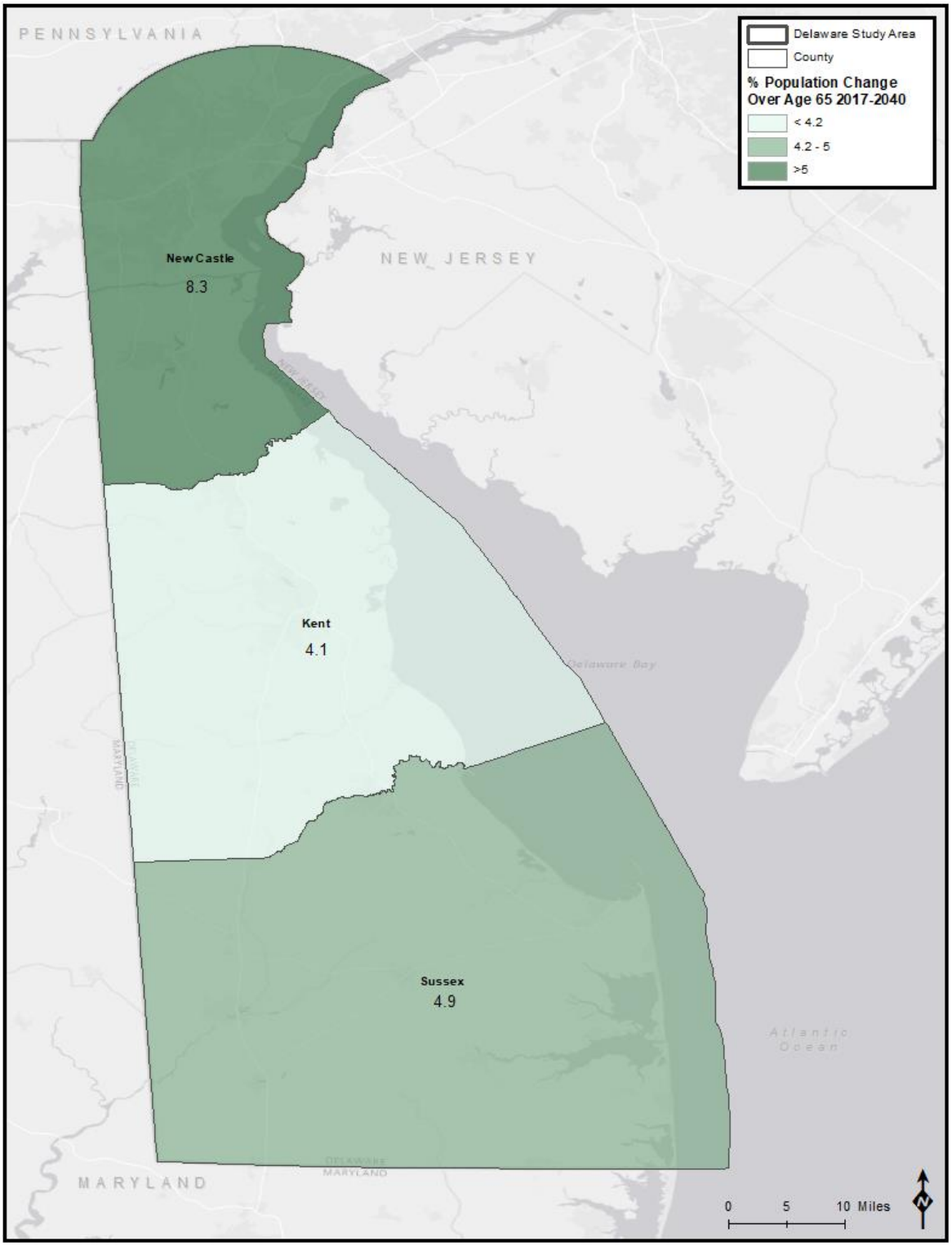
Source: USCB 2017r

Figure 10-25. Population Over Age 65 in the Delaware Study Area by Census Block Group



Source: Delaware Population Consortium 2019

Figure 10-26. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Delaware Study Area by 2040



Source: Delaware Population Consortium 2019

Figure 10-27. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Delaware Study Area by 2040

Table 10-10. Population Under Age 5 and Over Age 65 in the Delaware Study Area

Geographic Unit	2017 Estimates					Projected 2040				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Kent	173,145	10,991	6.3	27,333	15.8	201,639	12,879	6.4	40,284	20.0
New Castle	555,036	32,860	5.9	78,998	14.2	606,346	31,707	5.2	137,117	22.6
Sussex	215,551	11,431	5.3	54,234	25.2	268,180	13,371	5.0	80,831	30.1
Study Area Total / Delaware	**943,732**	**55,282**	**5.9**	**160,565**	**17.0**	**1,076,165**	**57,957**	**5.4**	**258,232**	**24.0**
United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: Delaware Population Consortium 2019, USCB 2017b, USCB 2018b

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. However, as described below, the Study Area had a smaller proportion of young children relative to the Study Area's overall population as compared to the Nation. The Study Area also had a larger proportion of elderly as compared to the Nation.

According to 2017 estimates shown in Table 10-10, the population of young children represented 6.2% of the U.S. population; and 5.9% in the Study Area. While the number of young children in the Study Area is projected to rise in 2040, the percentage of this group in comparison to the overall population is projected to decline, reflecting an aging of the population due to a lower natural increase (the difference between births and deaths). In other words, the projected larger increase in number of the elderly age group within the overall population will cause the decline in the proportion of young children relative to the general population (Delaware Population Consortium 2019, USCB 2017b, USCB 2018b).

Projections by the year 2040 indicates the population under age 5 will decline to 5.7 in the Nation, and to 5.4% in the Study Area. In fast-growing Sussex County, the number of young children is projected to increase from 11,431 in 2017 to 13,371 in 2040, but the percentage of this group in comparison to the overall population is projected to decline 0.3% due to the aging of the general population. In populous New Castle County, both the number and proportion of the group is projected to decrease from 32,860 (5.9%) in 2017 to 31,707 (5.2%) in 2040. However, the opposite trend is projected in Kent County, as both the population and proportion of the group is projected to increase from 10,991 (6.3%) in 2017 to 12,879 (6.4%) in 2040 (USCB 2017b, USCB 2018b, Delaware Population Consortium 2019).

According to 2017 estimates shown in Table 10-10, the elderly represented 14.9% of the U.S. population; and 17.0% in the Study Area. Delaware's higher percentage of the elderly indicates the presence of many aging baby boomers choosing to age in place rather than migrate to popular retirement destinations (Vuocolo 2018). By 2040, the population of the elderly is projected to rise due to aging in place elderly and domestic in-migration. As a result, the percentage of this group in comparison to the overall population is also projected to rise. Projections by the year 2040 indicate this group's increase to 21.6% in the Nation, and to 24.0% of the Study Area. Within each county, the numbers of elderly, and its proportion to the general population are projected to increase. In fast-growing Sussex County, the elderly population is projected to increase from 54,254 (25.2%) in 2017 to 80,831 (30.1%) in 2040. In populous New Castle County, the population is projected to increase from 78,998 (14.2%) to 137,117 (22.6%) over the same period. In Kent County, the population is projected to increase 27,333 (15.8%) to 40,284 (20.0%) over the same period. For the study area, this is an overall increase of 7.0% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, Delaware Population Consortium 2019).

10.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 10-11.

As shown in Table 10-11, in 2017 homeownership in Delaware was 71.3%, higher than the Nation (63.8%). Renters comprised approximately 28.7% of the State population in 2017, less than the national rate of 36.2% (USCB 2017m).

Table 10-11. Housing Utilization and Vacancy Rates in the Delaware Study

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Kent	69,506	63,381	6,125	8.8	44,132	69.6	19,249	30.4	$205,800	$1,030
New Castle	221,003	202,654	18,349	8.3	138,618	68.4	64,036	31.6	$248,100	$1,104
Sussex	132,980	86,322	46,658	35.1	68,348	79.2	17,974	20.8	$242,900	$992
Study Area Total / Delaware	**423,489**	**352,357**	**71,132**	**16.8**	**251,098**	**71.3**	**101,259**	**28.7**	**$238,600**	**$1,076**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m

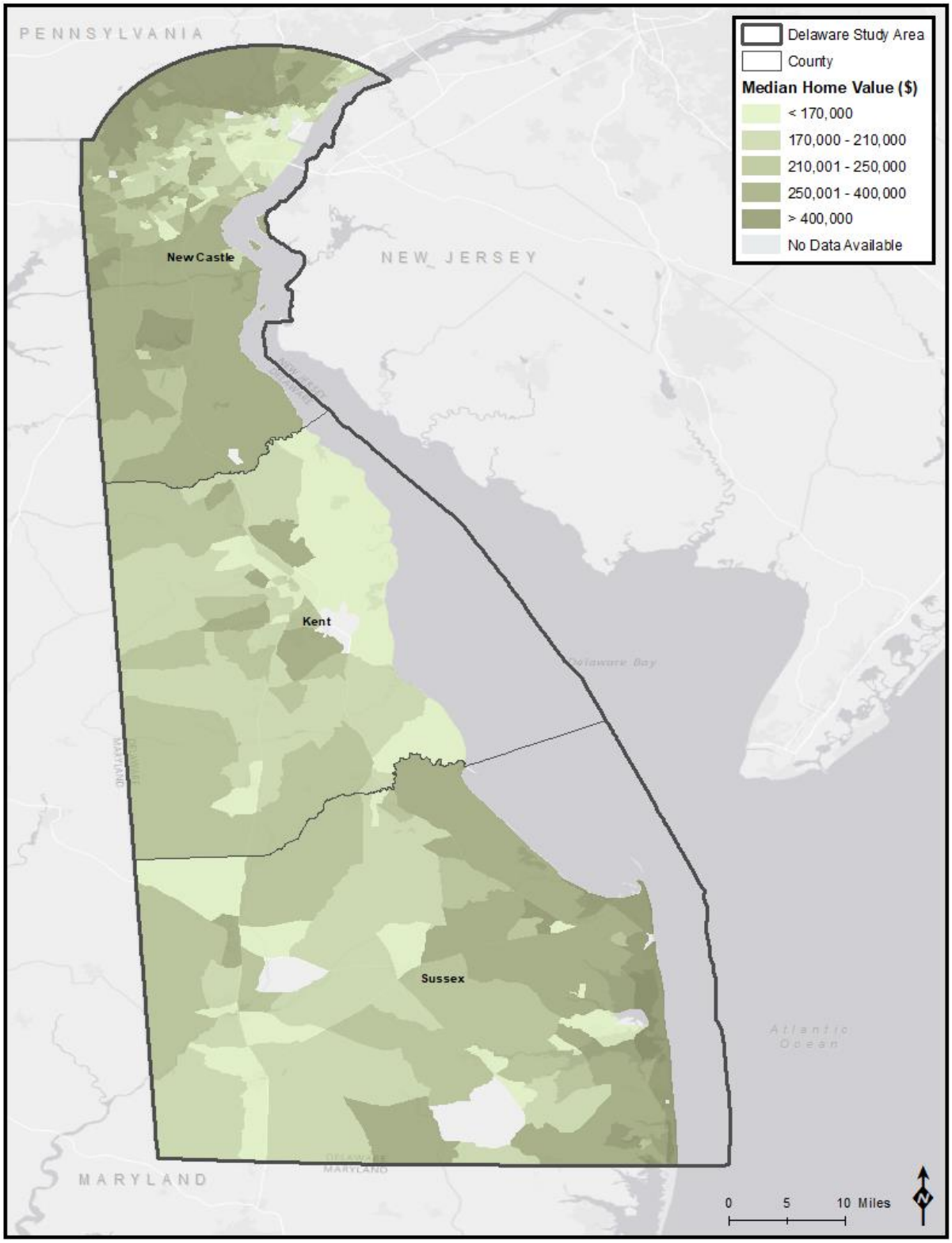
Figure 10-28 illustrates median home values in the Study Area. Home prices are most expensive throughout New Castle County, and coastal areas of Sussex County. As shown in Table 10-11, New Castle County had the highest median home value ($248,100). According to Zillow, an online real estate database company that provides information about housing market trends, the "market temperature" of the area is categorized as "very hot" which indicates market conditions favorable to sellers. According to Zillow, Delaware home values have gone up 0.9% during the 12-month period ending October 2019 (USCB 2017l, Zillow.com 2019aa). According to the Delaware Business Times, baby boomers own approximately 32% of Delaware's homes; many are choosing to age in place instead of downsizing. As a result, the inventory of homes for sale is in short supply for Generation X and Millennial home shoppers (Vuocolo 2018).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

The Delaware State Housing Authority provides a number of programs to help Delawareans obtain housing. In order to enable more homeownership, the Delaware State Housing Authority helped 963 home buyers with more than $221 million in mortgage assistance in 2018. For those in the rental market, 1,405 low-income households were assisted with public housing units or vouchers and 230 new affordable rental units were created or preserved in 2018. To more broadly address community revitalization, the Delaware State Housing Authority administers both the Strong Neighborhoods Housing Fund and the Downtown Development District rebate program (Delaware OSPC 2018).

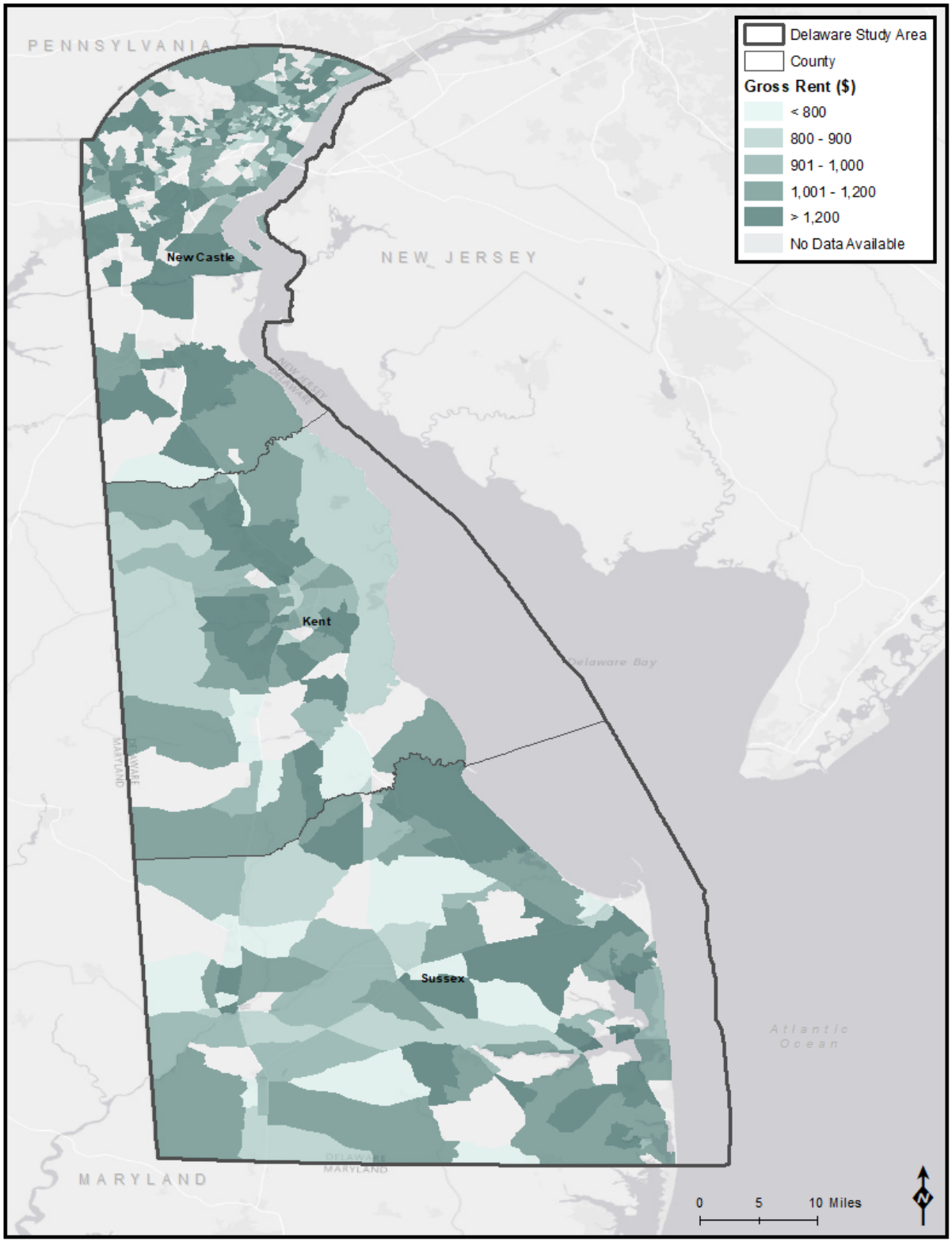
Figure 10-29 illustrates median gross rent, indicating the lack of affordable rental housing in the Study Area. Data from the National Low Income Housing Coalition tabulated from 2017 American Community Survey data show that 27% of renter households in Delaware are considered extremely low income (household income below $24,600 for a 4-person household). The largest demographic types within this category include persons in the labor force, seniors, and disabled persons, a large portion of which are on a fixed income. The Coalition estimates that there is a shortage of over 17,000 affordable rental units across the State and that 70% of extremely low-income households have a severe cost burden due to rental prices and availability. A minimum wage worker would have to work approximately two or more full time jobs in order to afford a two-bedroom fair market rate home (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

As shown in Table 10-11, home vacancy rates in Delaware (16.8%) in 2017 were higher than the Nation's vacancy rates (12.2%) (USCB 2017g). Figure 10-30 shows vacancy rates in the Study Area by census block group. High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. The owners of such properties may have a primary residence in another State, and use the home seasonally leaving it unused most of the year. Homes counted as "vacant" by the USCB may be rented out on a short-term basis via online platforms such as Airbnb and VRBO (previously known as Vacation Rentals by Owner). The large number of seasonal vacation homes in Sussex County contributes to the housing vacancy rate (Delaware OSPC 2018). The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019).



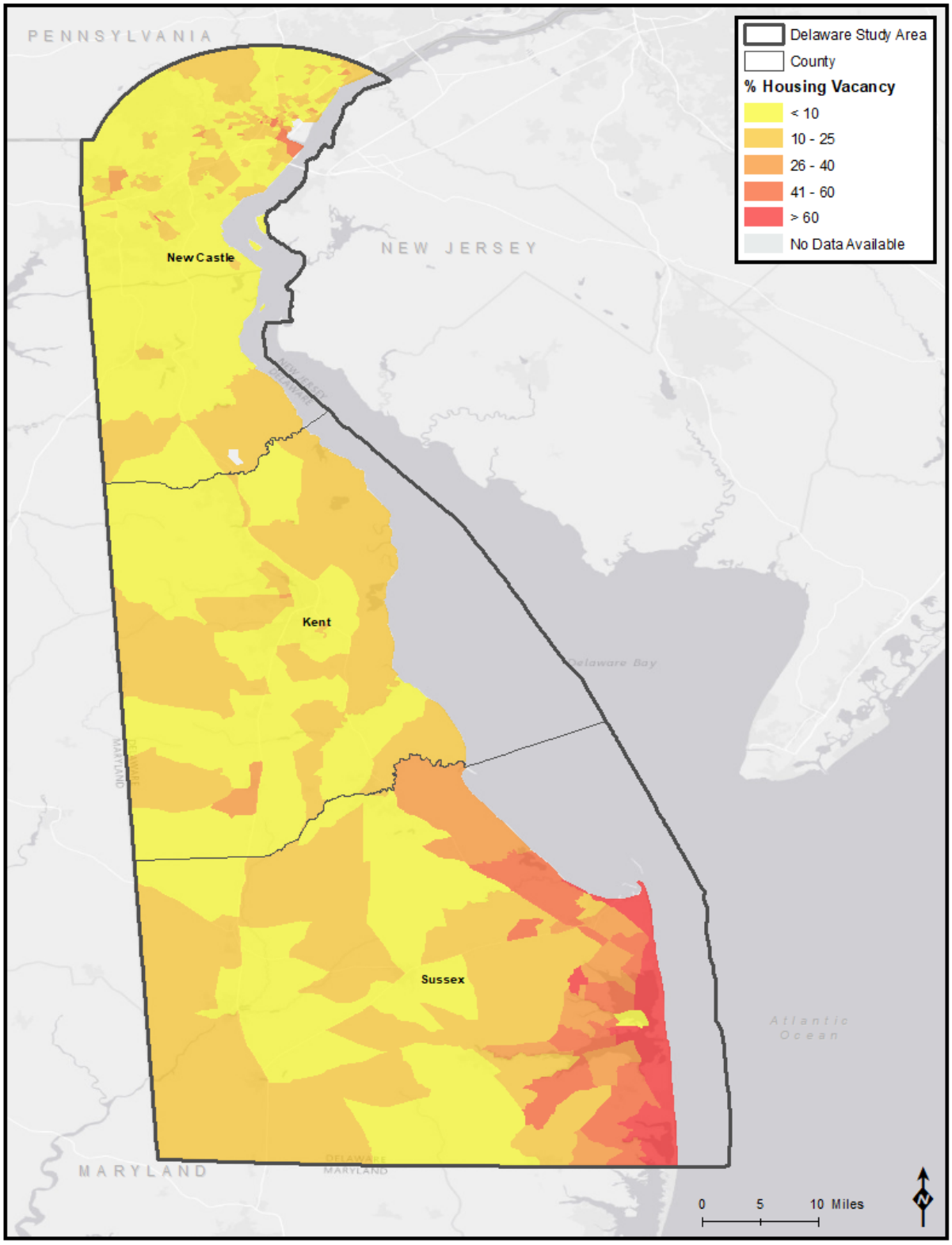
Source: USCB 2017r

Figure 10-28. Median Home Value in the Delaware Study Area by Census Block Group



Source: USCB 2017r

Figure 10-29. Median Gross Rent in the Delaware Study Area by Census Block Group



Source: USCB 2017r

Figure 10-30. Housing Vacancy Rates in the Delaware Study Area by Census Block Group

Short-term rental businesses are growing in Delaware, particularly in Sussex County. According to an Airbnb press release, Delaware Airbnb hosts earned a combined $14.2 million in supplemental income while welcoming approximately 63,800 guests between Memorial Day and Labor Day in 2019. The top five destinations during Summer 2019 were Rehoboth Beach, Bethany Beach, Lewes, Ocean View and Dewey Beach (Delaware Business Now 2019).

10.4.4 Employment

10.4.4.1 Employment Types

Employment data by industry sector are presented in Table 10-12. In 2017, Delaware (and the Study Area) had a total employment of 441,513 million jobs, which represented 0.3% of the total jobs in the U.S. (USCB 2017p).

Delaware's 2018 Annual Gross Domestic Product was 73.4 billion, which represented 0.4% of the Nation's gross domestic product (BEA 2019).

Table 10-12. Census Bureau Labor and Industry Statistics for the U.S., Delaware and the Delaware Study Area (number of jobs)

Industry	United States	Percent (%)	Delaware/ Study Area)	Percent (%)
TOTAL	**150,599,165**		**441,513**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	4,025	0.9
Construction	9,564,541	6.4	28,166	6.4
Manufacturing	15,477,389	10.3	36,940	8.4
Wholesale trade	4,042,867	2.7	8,385	1.9
Retail trade	17,167,000	11.4	54,014	12.2
Transportation and warehousing, and utilities	7,681,579	5.1	21,988	5.0
Information	3,173,300	2.1	6,270	1.4
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	43,077	9.8
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	43,920	9.9
Educational services, and health care and social assistance	34,781,348	23.1	110,028	24.9
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	40,864	9.3
Other services, except public administration	7,371,226	4.9	19,167	4.3
Public administration	7,025,870	4.7	24,669	5.6

Source: USCB 2017p

Table 10-12 and Figure 10-31 show the number of jobs in each major industry sector for the U.S., and the Study Area. Census Bureau data lists the dominant industry sectors in the Study Area as educational services, and health care and social assistance (24.9%), retail trade (12.2%), professional, scientific, and management, and administrative and waste management (9.9%), and finance and insurance, and real estate and rental and leasing (9.8%). Delaware has a smaller percentage of manufacturing jobs (8.4%) than the Nation (10.3%) but a greater percentage of finance and insurance, and real estate and rental and leasing jobs (9.8%) than the Nation (6.6%) (USCB 2017p).

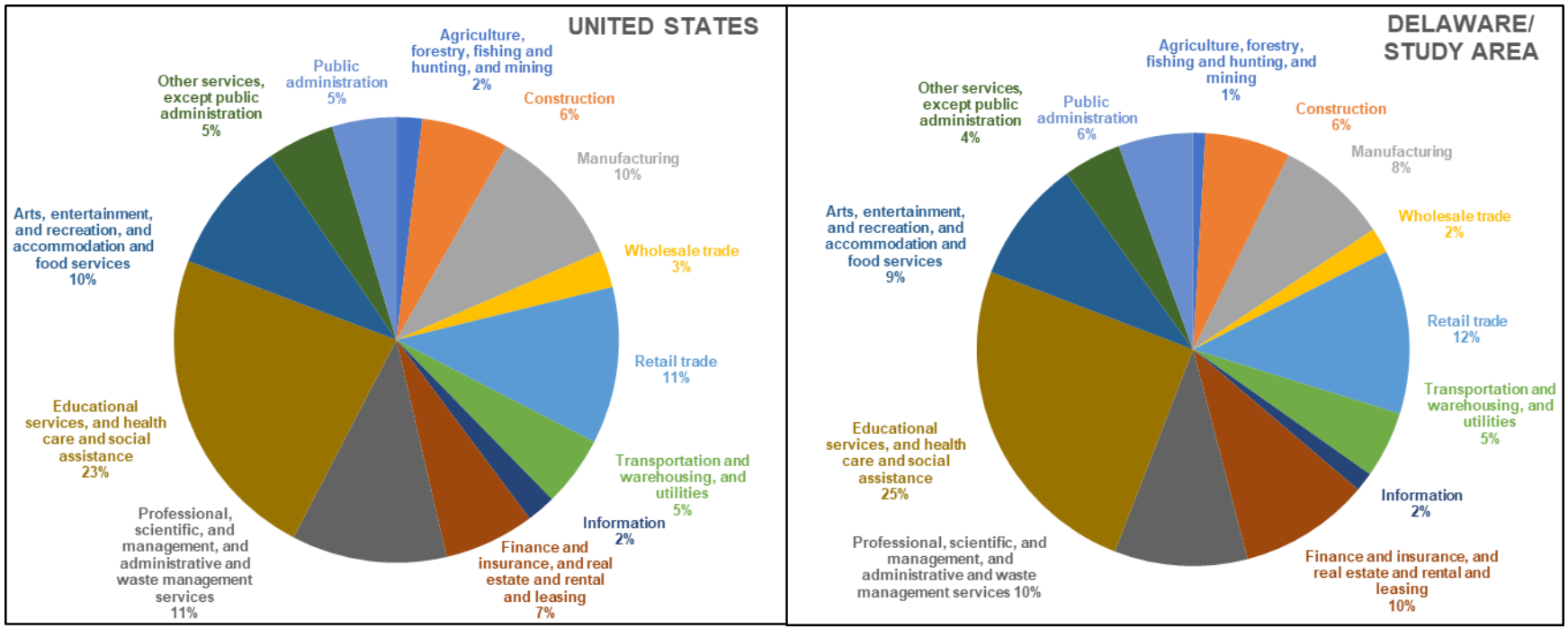
According to the Delaware Prosperity Partnership, the State of Delaware is particularly known for its chemical industry; successful chemical companies have been operating since 1802, when Du Pont established a gunpowder mill near Wilmington (DPP 2019b, Delaware OSPC 2016). Delaware's technological advances also include pharmaceuticals, industrial and agricultural chemicals, medical devices, and computer services, (DPP 2019b). Delaware is global hub for leading financial institutions including JPMorgan Chase, Capital One, M&T Bank, WSFS Bank and Citibank Delaware, who benefit from the location, internationally trusted business law system, experienced workforce, and uncomplicated business climate. Agriculture plays a significant role in the State's economy, especially for broiler chickens, potatoes, soybeans, corn, and dairy products (Delaware OSPC 2016). Its proximity to the Atlantic Ocean has resulted in the growth of a fishing industry that produces crabs, clams, and oysters (Delaware OSPC 2016). Delaware ranks second in the Nation for agricultural value sold per acre (DPP 2019b). Delaware's manufacturing sector includes production of chemicals, bioscience materials, vulcanized fiber, textiles, paper, medical supplies, metal products, machinery, and machine tools (DPP 2019b, Delaware OSPC 2016). Delaware is also home to strong education and healthcare industry clusters including universities, researchers, and hospitals as well as the workforce that supports them (DPP 2019b).

Figure 10-32 shows the location of jobs within the Study Area. The greater portion of jobs are located in high-density New Castle County, located within the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metro Area (Data.gov 2017). Population density increases the demand for all goods, services, space and workers.

Delaware's Ocean Economy

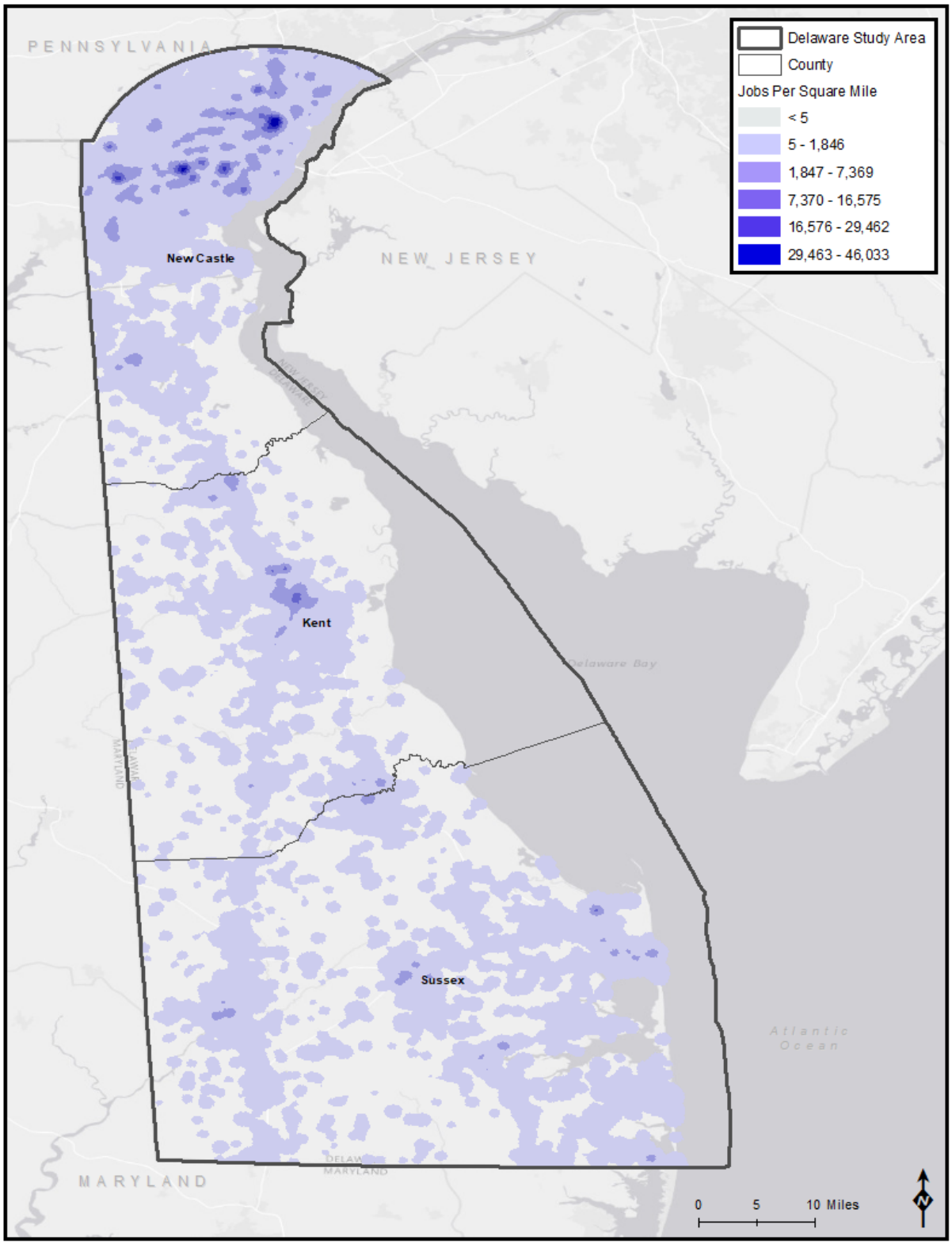
Overall, Delaware's ocean economy ranked 27th in employment among the 30 states included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 10-13, Delaware's ocean economy accounted for 28,875 maritime jobs in 2016. Within the State, 76.7% of maritime jobs were in the tourism and recreation sector. The sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums. The marine transportation sector, which includes deep-sea freight, marine passenger transportation, pipeline transportation, marine transportation services, search and navigation equipment, and warehousing, accounted for 21.9% of maritime jobs (NOAA 2016b).

Figure 10-33 shows the percent of maritime related jobs to total jobs in each county in the Study Area. The highest percentage of maritime jobs to overall county jobs were in Sussex County (14.8%) (USCB 2017i, NOAA 2016b).



Source: USCB 2017p

Figure 10-31. Number of Jobs by Industry Sector for the U.S. and the Delaware Study Area



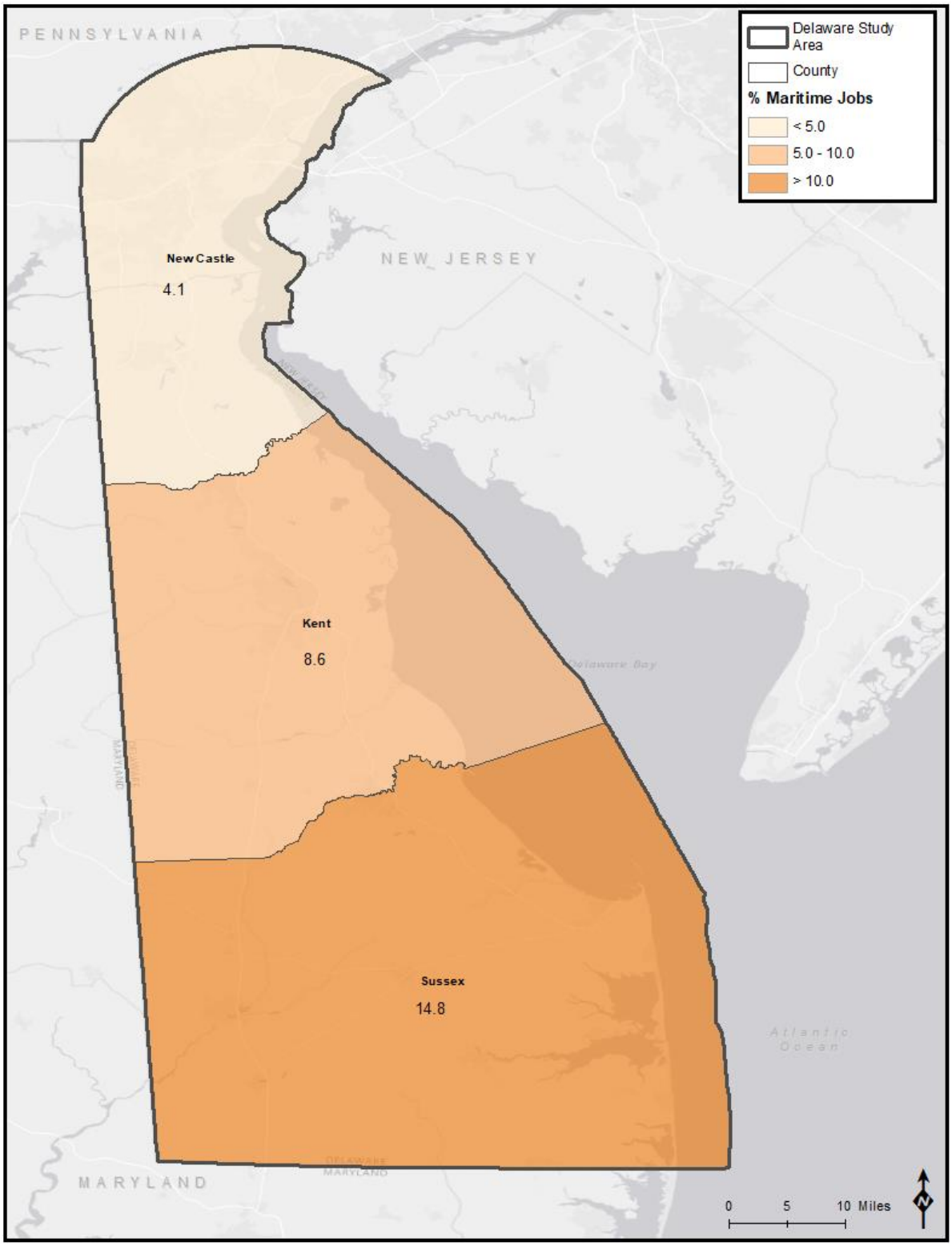
Source: USCB 2017r

Figure 10-32. Jobs Per Square Mile in the Delaware Study Area by Census Block Group

Table 10-13. Employment Data in the Delaware Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (of total jobs) (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Kent	86,035	83,641	78,078	5,563	6.7	65,758	5,685	8.6	$57,647	$27,420
New Castle	288,209	287,732	269,164	18,568	6.5	297,912	12,317	4.1	$68,336	$34,541
Sussex	100,530	100,385	94,271	6,114	6.1	73,577	10,872	14.8	$57,901	$31,874
Study Area Total / Delaware	**474,774**	**471,758**	**441,513**	**30,245**	**6.4**	**437,247**	**28,874**	**6.6**	**$61,295**	**$31,278**
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n
Note: Job data are based on the geographic location of the employer. Labor force data are based on the residential location of workers. As a result, labor force and job data numbers do not match as workers may live in one county or State yet be employed in another county or State



Source: USCB 2017b

Figure 10-33. Maritime Jobs in the Delaware Study Area by County

10.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income can be a wealth measurement of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 10-13, Delaware (and the Study Area) had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, Delaware had a median income of $63,036 (9.3% higher than the Nation's median income) and a per capita income of $32,625 (4.6% higher than the Nation's per capita income) (USCB 2017k, USCB 2017n).

As shown in Table 10-13, in 2017 median household income in the regions comprising the Study Area ranged from an average of $57,647 (Kent County) to an average of $68,336 (New Castle County). In 2017, per capita income ranged from an average of $27,420 (Kent County) to an average of $34,541 (New Castle County). Figure 10-34 shows median household income in the Study Area. Figure 10-35 shows per capita Income in the Study Area. The figures portray that incomes are highest near Delaware's high-density metropolitan areas; lower paying jobs are in less populated areas (USCB 2017k, USCB 2017n).

10.4.4.3 Unemployment Rates

Figure 10-36 shows the 2017 unemployment rates in the counties of the Study Area by census block group. Unemployment rates ranged from 6.1% in Sussex County to 6.7% in Kent County. The average unemployment rate in the Study Area was 6.4%, less than the Nation (6.6%). Table 10-13 presents unemployment rates for each county in the Study Area grouped (USCB 2017h, USCB 2017p).

10.4.4.4 Educational Attainment

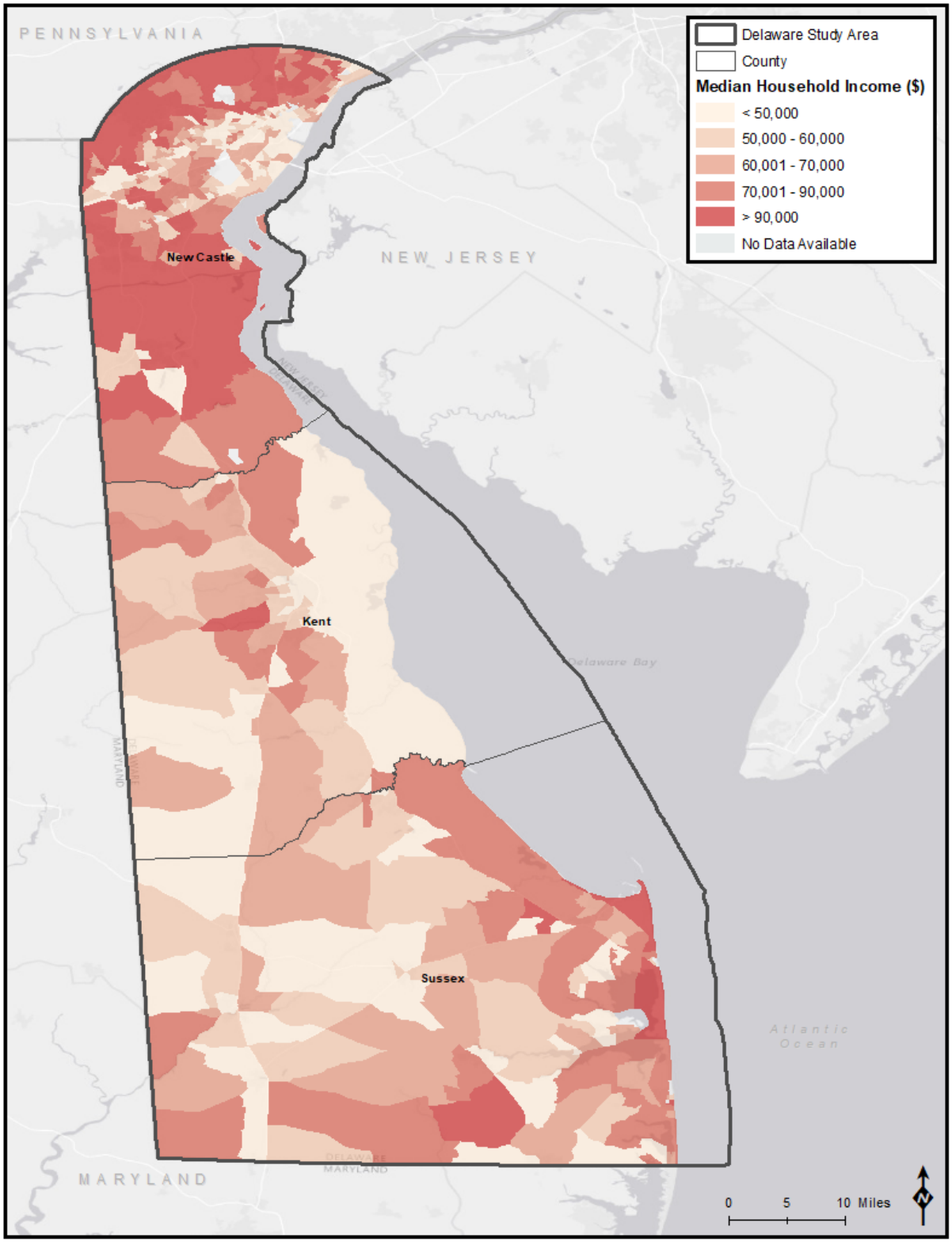
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 10-14 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in counties comprising the Study Area and the Nation (USCB 2017t).

Figure 10-37 shows the percentage of the working-age population who earned only a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation and the counties comprising the Study Area (USCB 2017q).

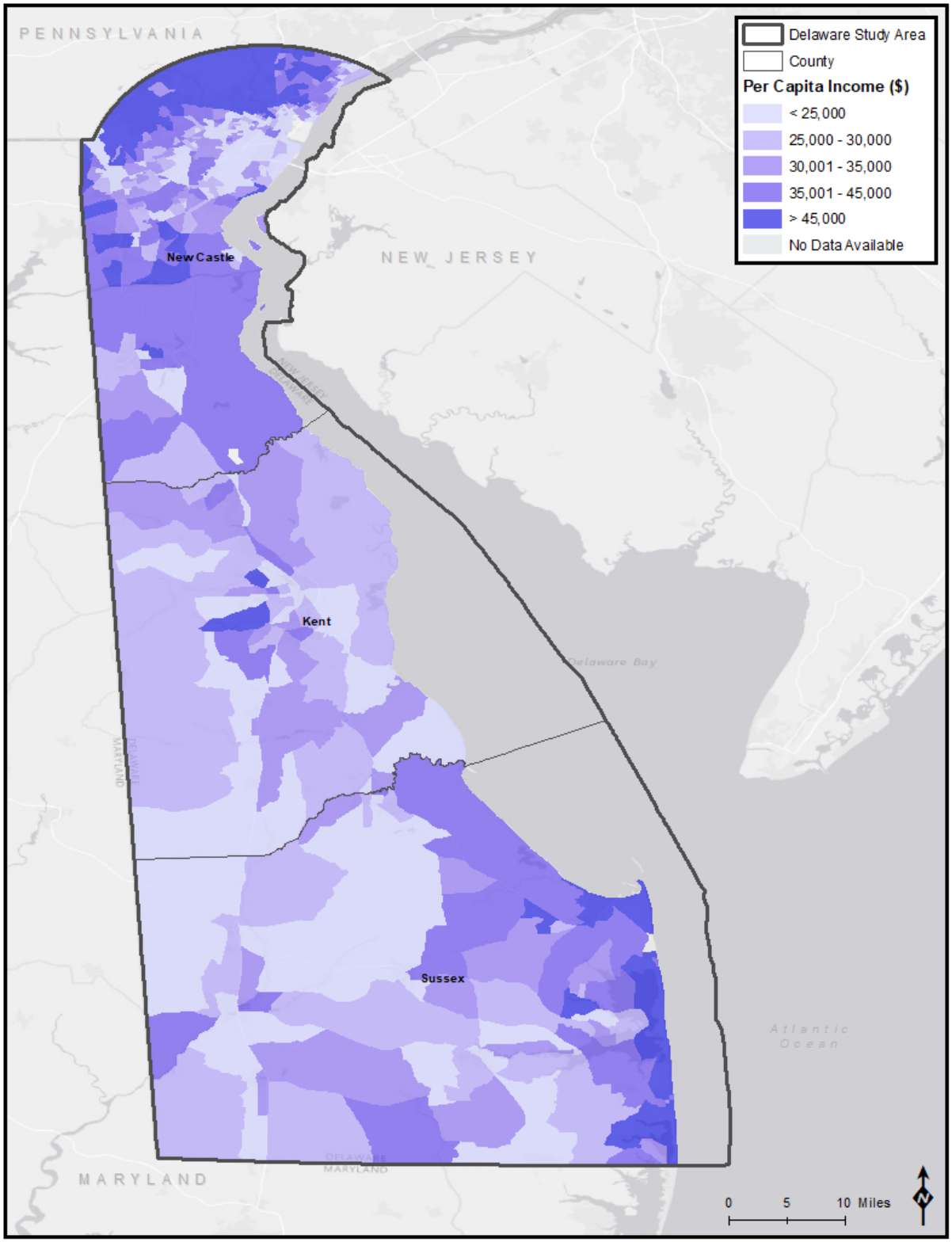
- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In the Study Area, 31.4% of the working-age population earned only a high school diploma; 35.4% earned a college or advanced degree.

Figure 10-38 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q). Percentages of educational attainment for workers in Delaware overall are fairly consistent with national percentages.



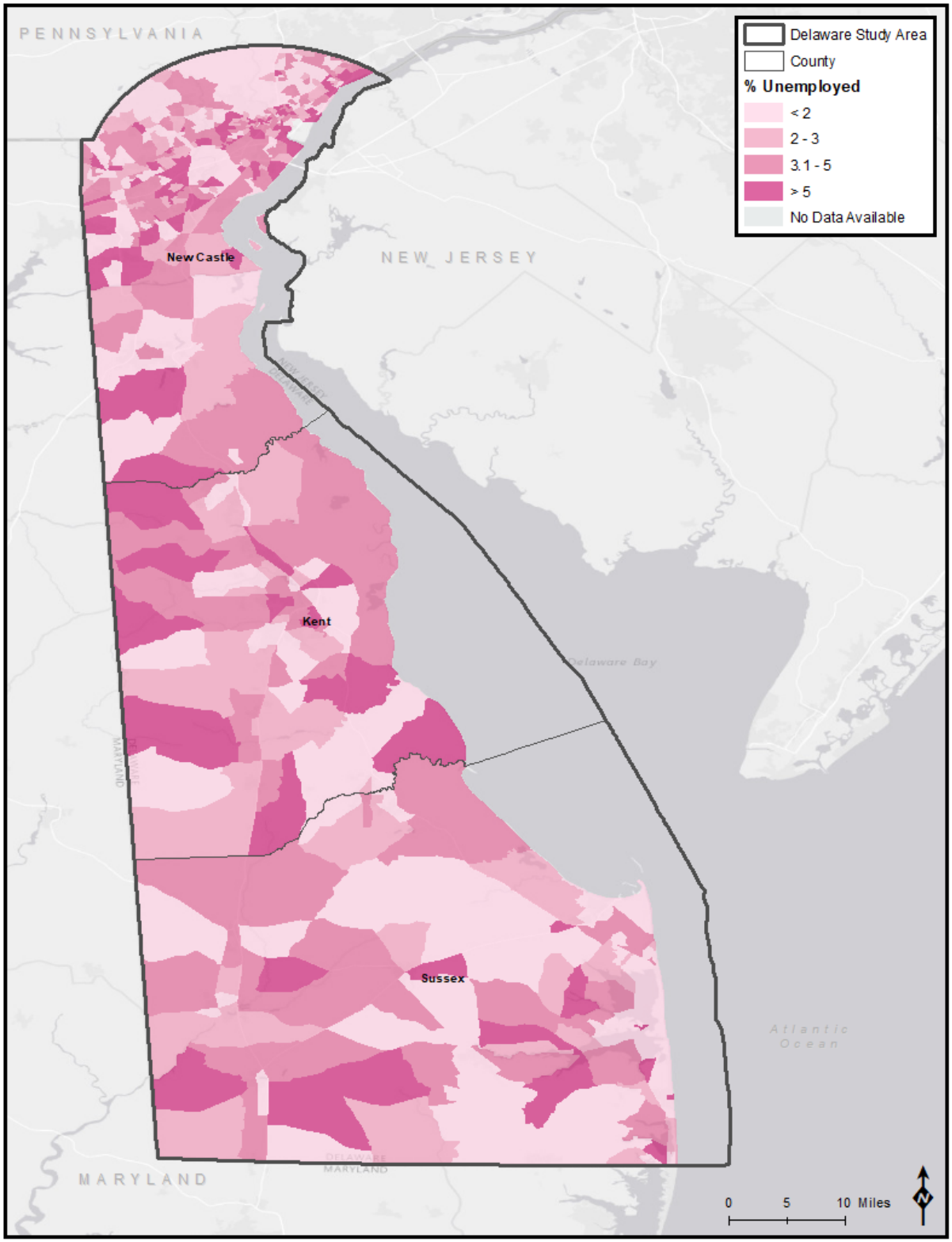
Source: USCB 2017r

Figure 10-34. Median Household Income in the Delaware Study Area by Census Block Group



Source: USCB 2017r

Figure 10-35. Per Capita Income in the Delaware Study Area by Census Block Group



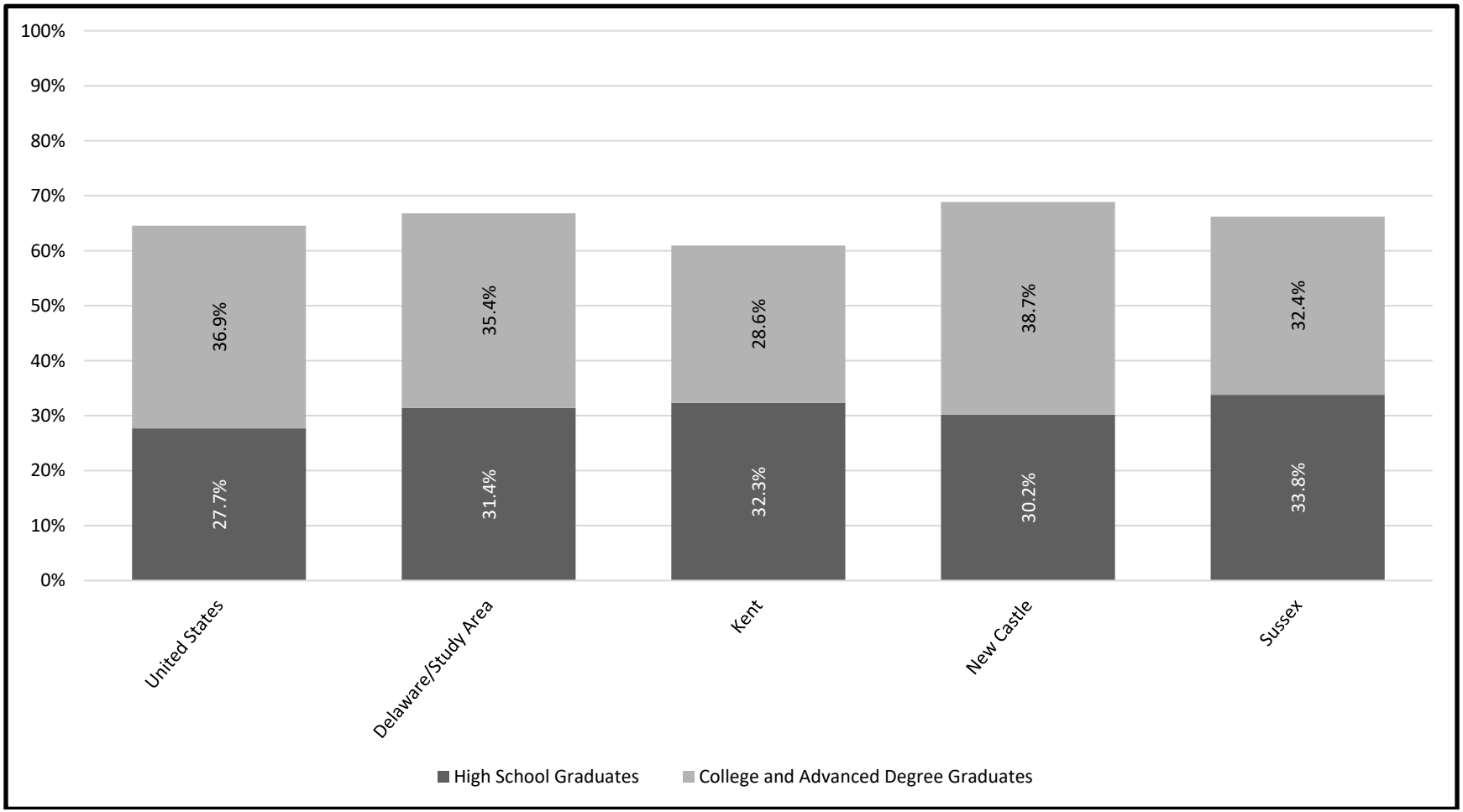
Source: USCB 2017r

Figure 10-36. Unemployment Rates in the Delaware Study Area by Census Block Group

Table 10-14. Educational Attainment in the Delaware Study Area

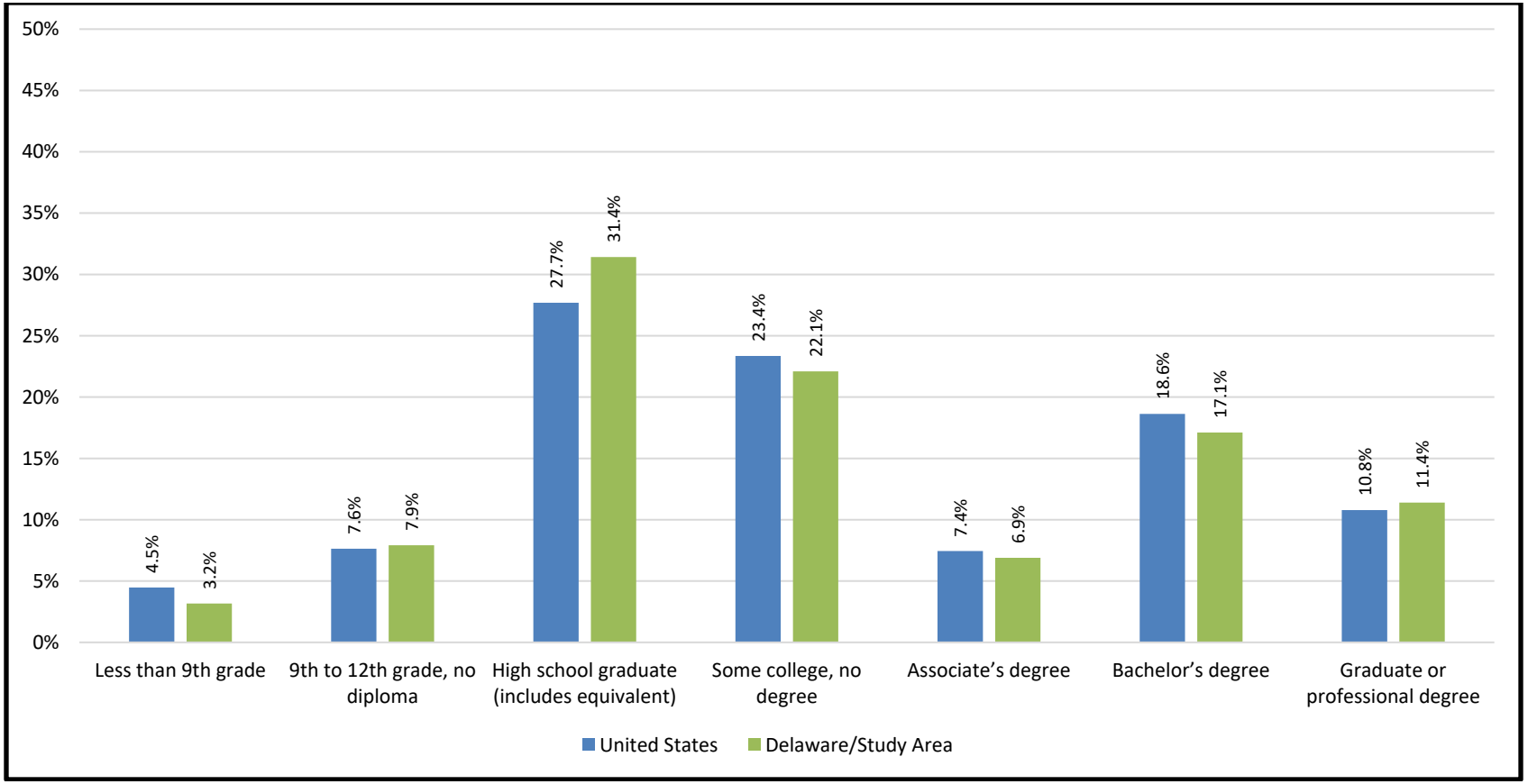
Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Kent	4,689	12,485	42,856	34,615	9,690	17,931	10,328	132,594	3.5	9.4	32.3	26.1	7.3	13.5	7.8
New Castle	11,668	29,526	130,685	93,622	26,155	84,368	57,022	433,046	2.7	6.8	30.2	21.6	6.0	19.5	13.2
Sussex	7,059	16,568	58,820	35,203	15,183	24,265	16,941	174,039	4.1	9.5	33.8	20.2	8.7	13.9	9.7
Study Area Total / Delaware	**23,416**	**58,579**	**232,361**	**163,440**	**51,028**	**126,564**	**84,291**	**739,679**	**3.2**	**7.9**	**31.4**	**22.1**	**6.9**	**17.1**	**11.4**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q
Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 10-37. High School, College, and Advanced Degree Graduate Rates in the Delaware Study Area



Source: USCB 2017q

Figure 10-38. Educational Attainment in the Delaware Study Area

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

10.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with development on the OCS. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" are necessary.

Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice,
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

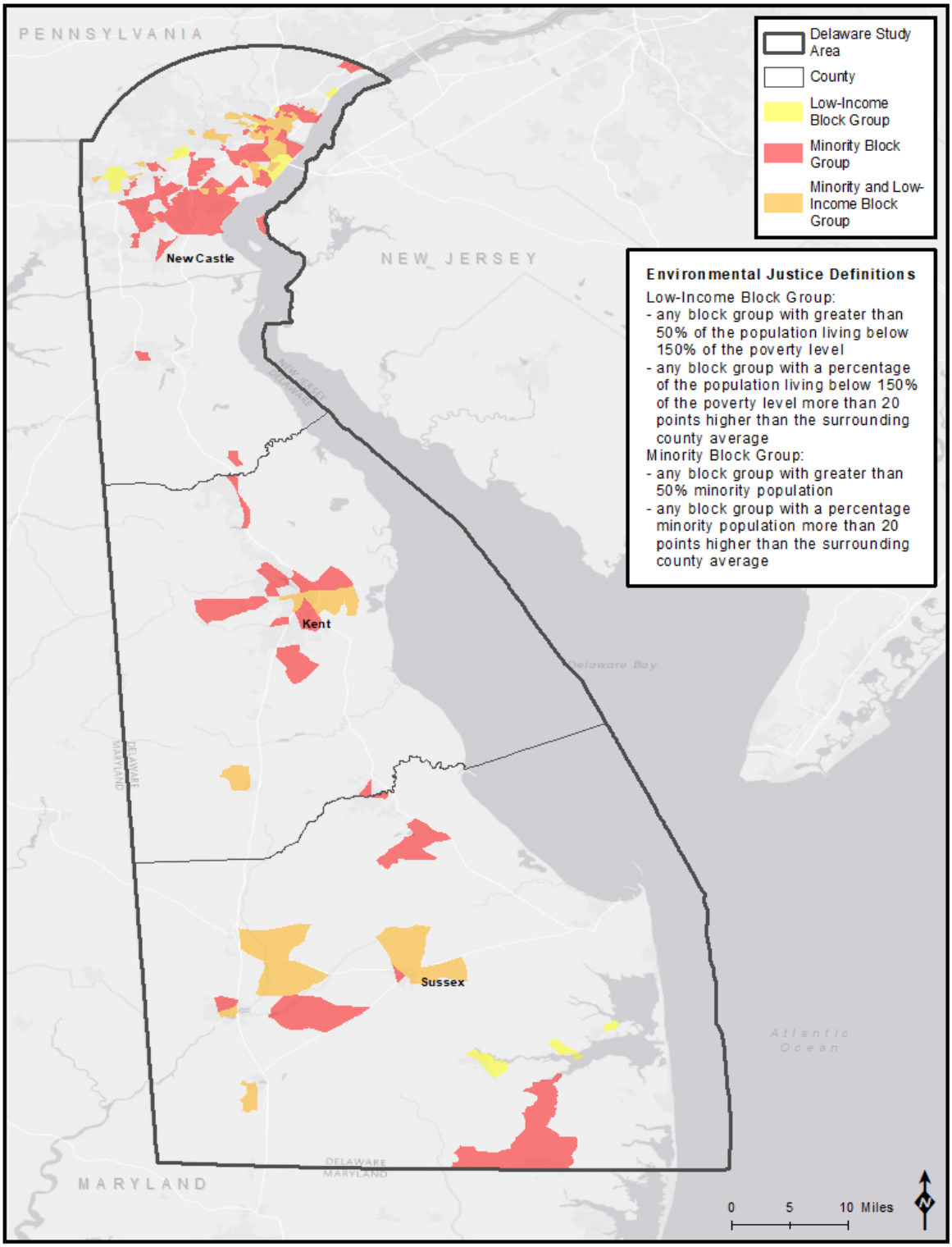
10.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 10-39 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.

10.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 10-15 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 943,732 people living in the Study Area, approximately 348,821 (37.0%) are minority. This is similar to the minority population of the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 573 census block groups in the Study Area, approximately 27.4% (157 census block groups) are considered minority populations (USCB 2017f).



Source: USCB 2017r

Figure 10-39. Minority and Low-Income Population in the Delaware Study Area by Census Block Group

Table 10-15. Low-Income and Minority Populations in the Delaware Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Census Block Groups	Number of Low-Income Census Block Groups	Percent of Low-Income Census Block Groups (%)	Number of Minority Census Block Groups	Percent of Minority Census Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Income Less than 150% of the Poverty Level	Percent Population with Income Less than 150% of the Poverty Level (%)
Kent	173,145	108,627	64,518	37.3	72	4	5.6	17	23.6	167,750	38,222	22.8
New Castle	555,036	324,937	230,099	41.5	368	67	18.2	126	34.2	538,117	97,819	18.2
Sussex	215,551	161,347	54,204	25.1	133	10	7.5	14	10.5	212,233	43,530	20.5
Study Area Total / Delaware	**943,732**	**594,911**	**348,821**	**37.0**	**573**	**81**	**14.1**	**157**	**27.4**	**918,100**	**179,571**	**19.6**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

In New Castle County, 34.2% of census block groups contain minority populations. Kent and Sussex counties have 23.6% and 10.2% minority census block groups, respectively. The majority of the minority population are Black or African American and Hispanic or Latino (USCB 2017f).

10.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 10-15 presents population and environmental justice -related characteristics for the Study Area regarding low-income populations. Of the population of 918,100 people for whom poverty status is determined living in the Study Area, approximately 179,571 (19.6%) have incomes less than 150% of the poverty level. This is lower than the national low-income population (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 573 census block groups in the Study Area, approximately 14.1% (81 census block groups) are considered low-income populations (USCB 2017o).

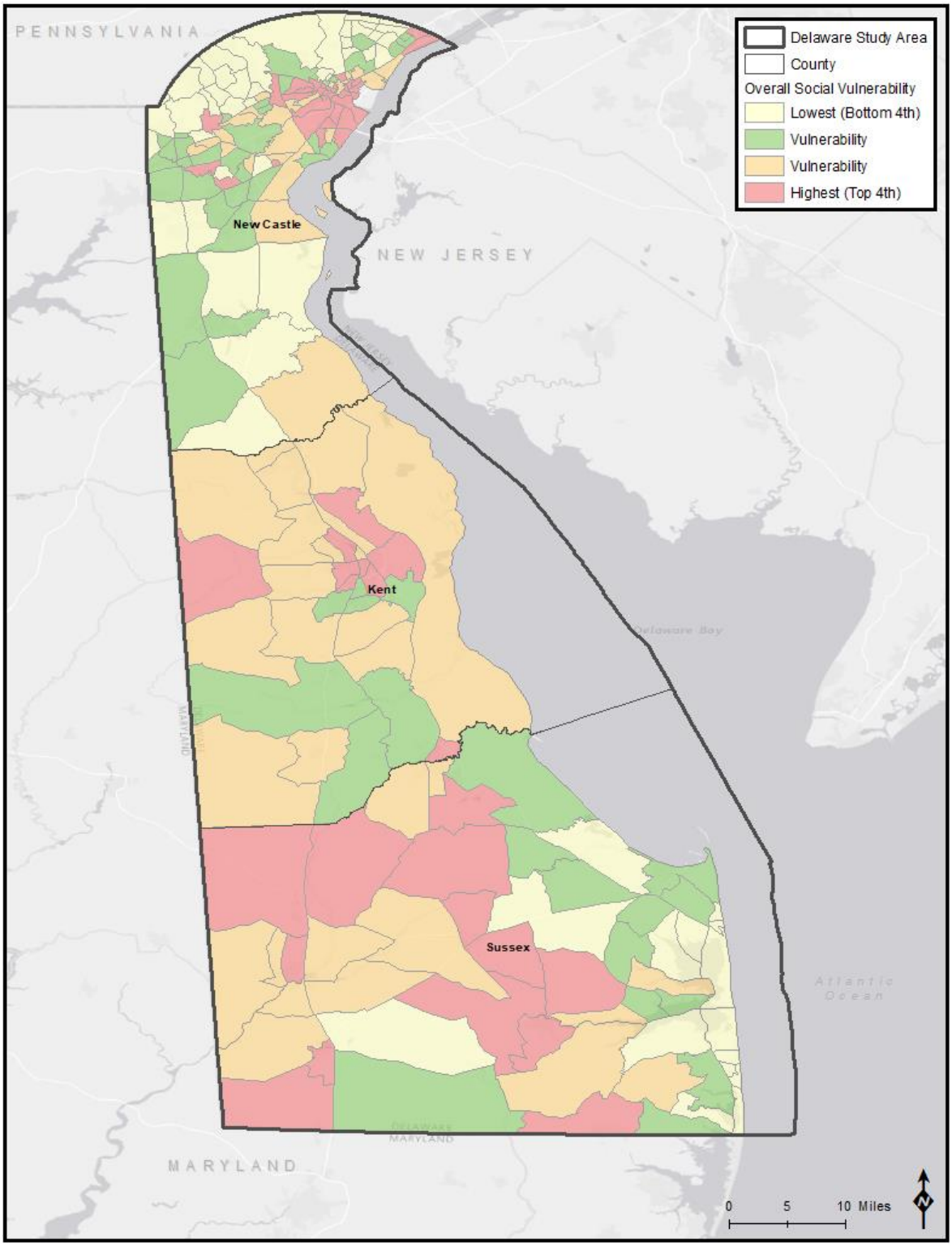
In New Castle County, 18.2% of census block groups contain low-income populations. Sussex and Kent counties have 7.5% and 5.6% of low-income census block groups, respectively (USCB 2017o).

10.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this chapter, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and discussed in detail in Fishing Communities (Chapter 10.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community’s overall social vulnerability, as illustrated by census tract in Figure 10-40 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 10-40, each county in the Study Area has populations deemed vulnerable to varying degrees, including the highest category of “greater than 75%” overall social vulnerability (CDC 2016).



Source: CDC 2016

Figure 10-40. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Delaware Study Area by Census Tract

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 10-41 combines the CDC SoVI index as shown in Figure 10-40 with minority and low-income populations as shown in Figure 10-39 (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent.

Figure 10-42 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 10-42 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 10.2.2.2 above), are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

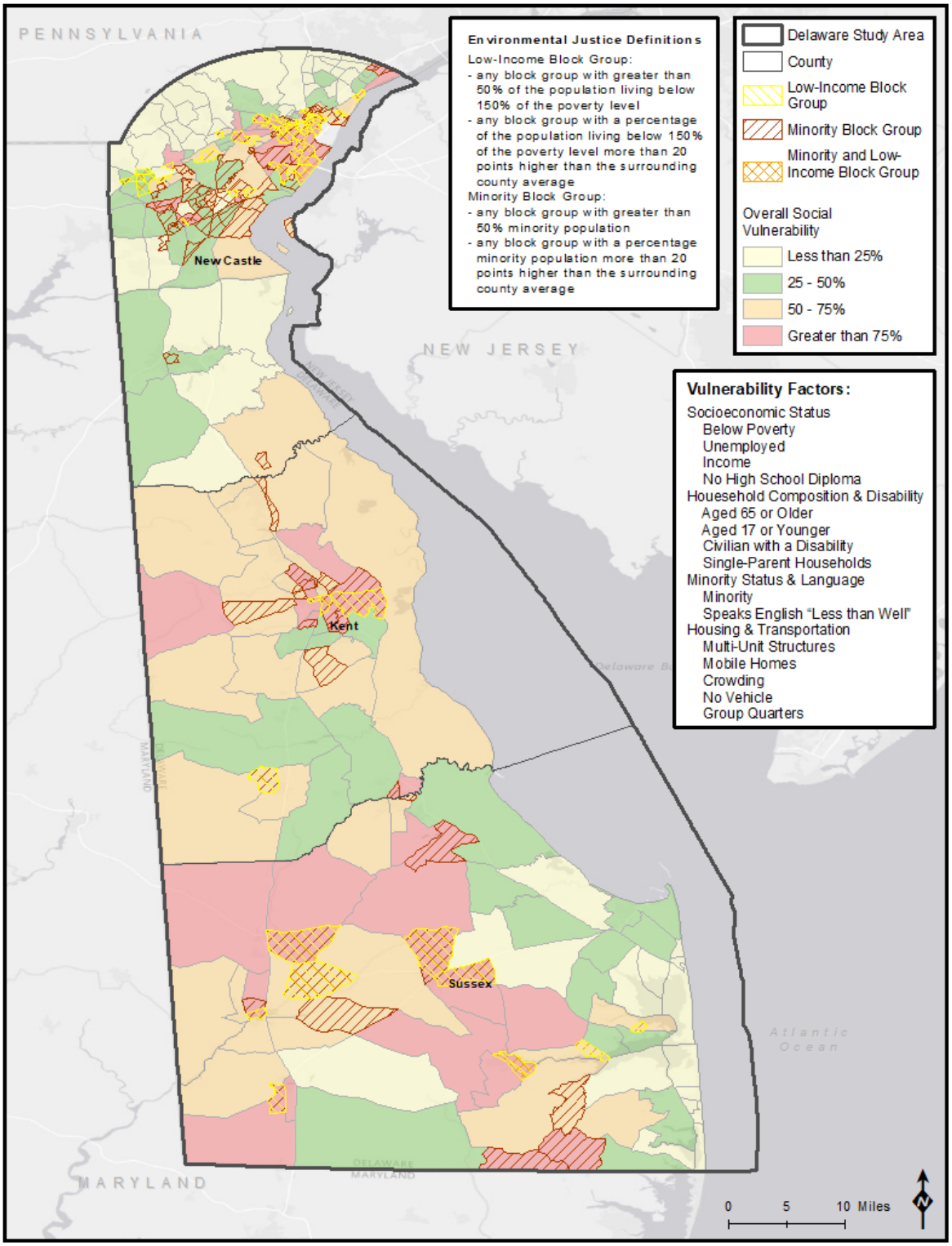
As discussed in Chapter 10.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

10.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources “from the land” rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area the resource-dependent populations include fishing communities, subsistence populations, and religious populations.

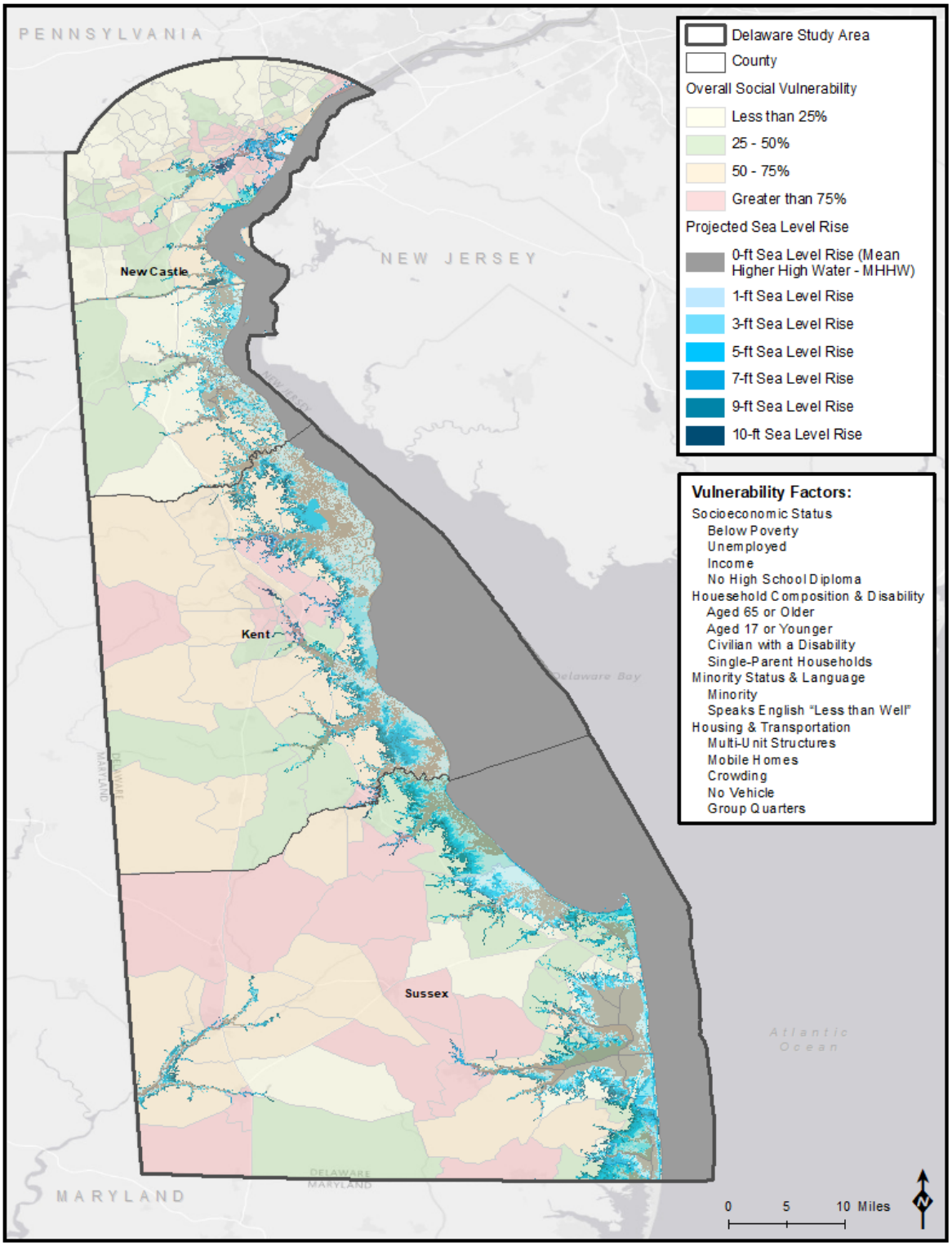
10.4.5.3.1 Fishing Communities

Communities that are dependent on commercial fishing can be more socially vulnerable than other communities. A full discussion on the relevance and implications of fishing communities is discussed in detail in Chapter 1.6.5.3.1. OCS-related projects should consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website (NOAA Fisheries 2019d).



Sources: CDC 2016, USCB 2017r

Figure 10-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Delaware Study Area



Sources: CDC 2016, NOAA 2018a

Figure 10-42. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Delaware Study Area by Census Tract

Figure 10-43 shows the fishing communities located in the Study Area, which are (NOAA Fisheries 2019d):

- Bowers Beach, Kent County
- Indian River, Sussex County
- Lewes, Sussex County
- Port Mahon / Little Creek, Kent County
- Milford, Sussex County
- Smyrna, Kent County

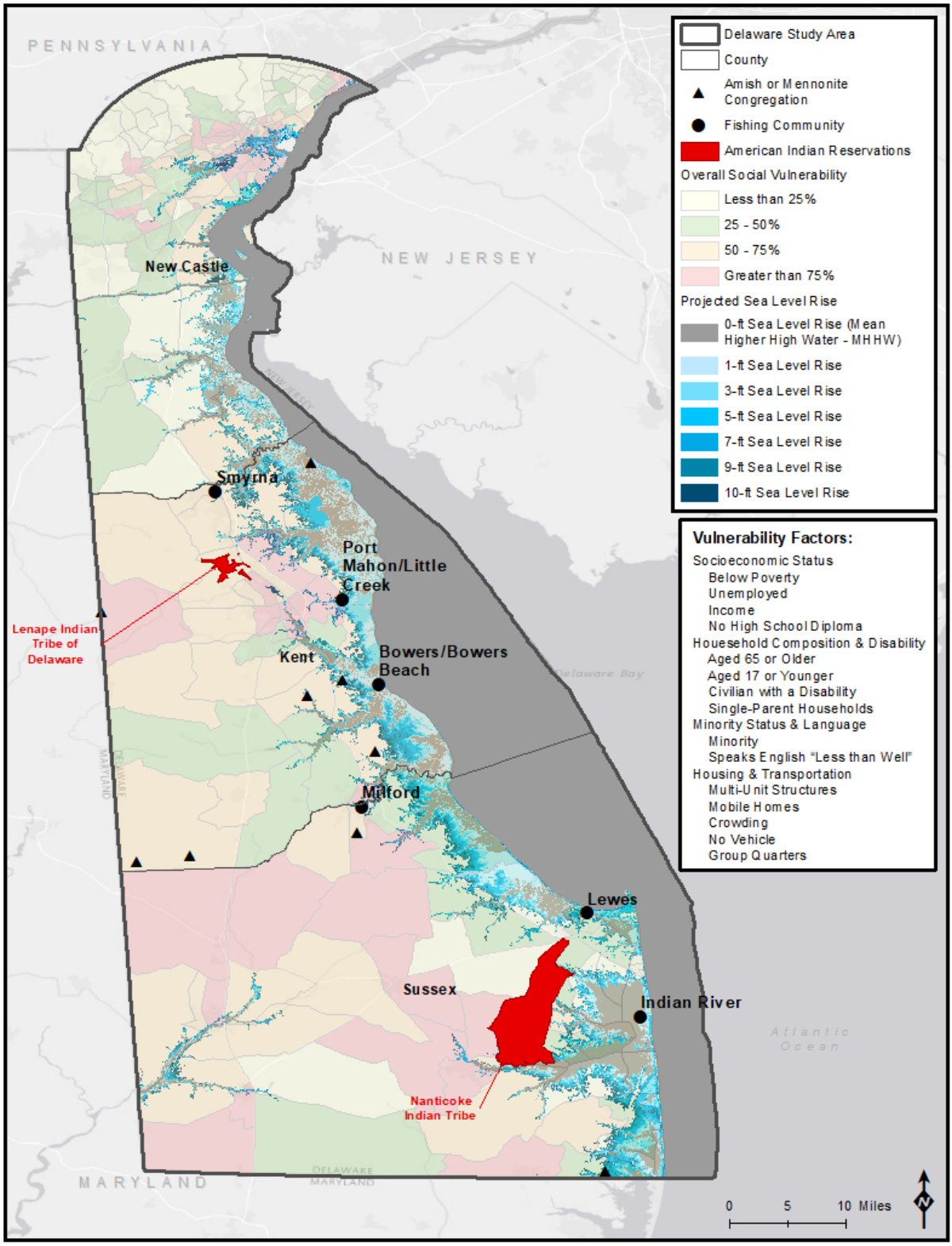
As can be seen in Figure 10-43, all six of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. Gentrification pressures resulting from increased tourism and development on the Delmarva Peninsula contributes to vulnerability. (NOAA Fisheries 2008).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

10.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the *Council on Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence lifestyles in the Study Area, although the landscape certainly provides enough for subsistence living. Historically, the marshes surrounding the Port of Delaware City provided a living for residents who hunted and trapped muskrat (WPS 2019a). There are currently hunting and trapping restrictions for seasonal hunting from December through March for muskrats, mink, otter, beaver, raccoons, opossum, groundhogs, nutria, red foxes, coyotes, and rabbits (DHT 2019). Locally owned restaurants serving traditional Delawarean fare include on their menus muskrat, deer, duck, geese, beaver and raccoon, along with oysters on the half shell, frog legs, shrimp, fish, clams, and crab (Delaware online 2019).



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 10-43. Potential Vulnerable Communities in the Delaware Study Area by Census Tract

NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 10-43). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

10.4.5.3.3 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3. Amish and Mennonites have been separate groups within the Anabaptist family since 1693. They migrated separately to North America but often settled in the same areas. Both migrated in several waves, first in the 1700s and 1800s. They established settlements in Pennsylvania, Ohio, and Indiana, and eventually spread to other States (Young Center 2013).

The 2019 estimated population of the Amish in North America is 341,900. North American Amish communities are located in 31 States and four Canadian provinces with approximately 63% of the population living in Ohio, Pennsylvania, and Indiana. Amish population is fast growing and doubles about every 20 years. Since 2018, approximately 22 new settlements were established (Young Center 2019a). According to the Young Center for Anabaptist and Pietist Studies, there are numerous Mennonite groups in North America. In general, Mennonites are more assimilated into mainstream culture and are more likely to live in urban and suburban settings (Young Center 2013).

The Amish are known for their separatist values, and 300-year-old traditions that include a plain lifestyle, simple and period traditional clothing, and horse-and-buggy mode of transportation. Many Amish live in rural areas and often use manual labor to grow and produce their own food to feed their typically large families. They avoid using technology in any way that may damage their community or threaten their way of life (Scottsdale 2019). These characteristics may be perceived by the general population as indicative of a subsistence way of life that seem incompatible with the modern world (Barta 2017).

Traditional practices include farming, hunting, fishing and gardening. Amish maintain a large garden for their own use, which may constitute a significant part of their fresh food supply. They also buy many other items from traditional stores. Thus, gardening is a supplement to their food source. The Amish hunt with guns as well as bow and arrow and may travel out of State to find the best hunting grounds. Because gardening is a supplement to their food source, and because traveling is considered a recreational approach to hunting, these groups are better classified as having a "self-sufficiency" philosophy instead of "subsistence" behavior (Barta 2017). Therefore, Amish are not considered vulnerable due to subsistence behaviors, but may still have other characteristics of vulnerable populations, such as difficulties accessing health care, social pressures against accessing social services due to a self-reliance within their

community and congregation, aversion to current technologies that may interfere with traditional communications in an emergency, low-income and linguistic isolation. Mennonite populations are more assimilated into mainstream culture, and therefore may not share in potential vulnerabilities.

Kent County is home to an Amish settlement founded in 1915 near the State's capitol in Dover (Amish America 2019). Figure 10-43 shows the locations of Amish and Mennonite congregations/places of worship in the Study Area. Amish populations tend to rely largely on horse and buggy transportation; therefore, it can be assumed that most people live in the vicinity of these places of worship. As of 2011, there were between 1,200 and 1,500 Amish living in between 250 and 300 households with affiliations to nine Amish church districts in the Study Area. Due to permanent pressures from living near the expanding City of Dover, the community is losing population as members migrate to settlements in other States where land is cheaper and roads less crowded (Amish America 2011a). Mennonite churches are present in Greenwood, Bridgeville, Harrington, Dover, and Wilmington (DMHS 2019). Six of the Amish and Mennonite congregations/places of worship identified in Figure 10-43 are located along the coast in areas potentially vulnerable to sea level rise, and thus to the corresponding storm surge impacts.

Proximity of unique religions populations to prospective sites for future OCS-related development should be considered in analysis. For example, in the Study Area, it is unlikely industrial areas, supporting services, or a local workforce would be located within an Amish or Mennonite community. These communities also may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources.

10.4.5.4 Tribes

There are two federally recognized tribes and two State-recognized tribes that have historical ties to the Study Area, which is the entire state of Delaware. The two State-recognized tribes (Lenape Indian Tribe of Delaware and Nanticoke Indian Tribe) reside in the State (DGA 2016, DSN 2016, HUD 2019b) while the two federally recognized tribes live in Oklahoma. Table 10-16 lists the federally and State-recognized tribes in Delaware. Figure 10-43 shows the locations of recognized American Indian reservations in the Study Area.

Table 10-16. Federally and State-Recognized Tribes with Historical Ties to Delaware

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes within the Study Area			
Lenape Indian Tribe of Delaware	State	Yes	Tribal members in Delaware live in Kent County.
Nanticoke Indian Tribe	State	Yes	Tribal members in Delaware currently reside in Sussex County.
Federally Recognized Tribes Outside the Study Area			
Delaware Nation, Oklahoma	Federal	Yes	Tribal members currently reside outside Delaware (primarily in Oklahoma) but have historical ties to the Study Area.
Delaware Tribe of Indians	Federal	Yes	Tribal members currently reside outside Delaware (primarily in Oklahoma) but have historical ties to the Study Area.

Sources: DGA 2016, DSN 2016, HUD 2019b

There are no federally recognized tribes residing within the State of Delaware (Delaware HCA 2018). The State-recognized tribes represent tribal members who integrated with European settlers and maintain their native homeland in Delaware. At the time of European exploration and colonization, the Delaware people (originally the Lenape or Lenni-Lenape) were living in an area that is now known as Delaware, New York, New Jersey, and Pennsylvania. They were considered one of the two most powerful American Indian groups in North America. As discussed in Chapter 10.3.2.6, Nanticoke tribes united with Lenni-Lenape Indians and all tribes were called Delaware Indians by the European settlers (Nanticoke Lenni-Lenape Tribal Nation 2007a). Over time, the Delaware people slowly got pushed south and west, splitting into two modern groups (the Delaware Nation of Oklahoma and the Delaware Tribe of Indians). Eventually, both groups settled into Oklahoma (Monck 2015). Therefore, it is likely that all four tribes with historical ties to Delaware, described in Table 10-16 were descendants of the same tribe. The federally recognized Delaware Tribe of Indians represent those tribal members who were relocated out of Delaware. The Lenape Indian Tribe of Delaware in Kent County formed a Tribal Government in 2010, as a member of the Confederation of Sovereign Nentego-Lenape tribes, a union between their tribe and the Nanticoke Lenni-Lenape Indian Tribe (Lenape Indian Tribe of Delaware 2015). The Nanticoke Tribe was recognized as a legal entity in 1881, and today, there are nearly 500 tribe members living in Sussex County, with other members living in nearby states (Nanticoke Indian Association 2011).

In 2016, Delaware recognized the Nanticoke Indian Tribe (Nanticoke) and the Lenape Indian Tribe of Delaware (Lenape) within the State (Delaware HCA 2018). Under House Bill 345, the Delaware General Assembly formally recognized the Lenape as an American Indian tribe (DGA 2016). A companion piece of legislation gave formal State recognition to the Nanticoke Indian Tribe retroactive to 1881 (DSN 2016). Both State designated tribes are qualified as State Designated Tribal Statistical Area (SDTSA), which are statistical entities for State-recognized American Indian tribes that do not have a State-recognized land base (reservation) but are identified and delineated within compact and contiguous areas with concentrated populations of individuals in which there is structured or organized tribal activity. The 1,426-acre SDTSA of the Lenape is located near Dover in Kent County. The 17,723-acre SDTSA of the Nanticoke is located in Millsboro in Sussex County (DEDO 2017). State law requires consultation with a Committee that includes tribal representatives when American Indian burials are discovered (Delaware HCA 2018).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 10-43. Overall social vulnerability for Kent and Sussex Counties is mixed and ranges from 25% to greater than 75%; however, there are a few regions in Sussex County that are less than 25% (CDC 2016). Also shown in Figure 10-43 is NOAA sea level rise data, indicating that both counties in which tribal populations are present are subject to inundation risk from potential sea level rise.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

10.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 10-17 provides an analysis people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 12.8% of the population do not speak English at home. Spanish is the language spoken by the majority (60,881 people or 6.9%) of the Study Area population. Indo European languages were spoken by 2.7% (24,405 people) of the Study Area population (USCB 2017e).

Figure 10-44 illustrates the percent of people who speak a language other than English at home in the Study Area; coastal areas contain many contiguous areas containing non-English speaking populations. New Castle had the highest percentage (8.6% or 76,024 people) of non-English speakers at home. New Castle also had the highest percentages of Spanish speaking (4.2% or 37,577 people) and Indo-European speaking (1.7% or 15,174 people) households in the Study Area (USCB 2017e). As shown in Figures 10-40 and 10-42, Delaware's coastline in Kent and New Castle Counties have areas where block groups contain populations rated as 50% vulnerable and will experience sea level rise impacts (CDC 2016, NOAA 2018a).

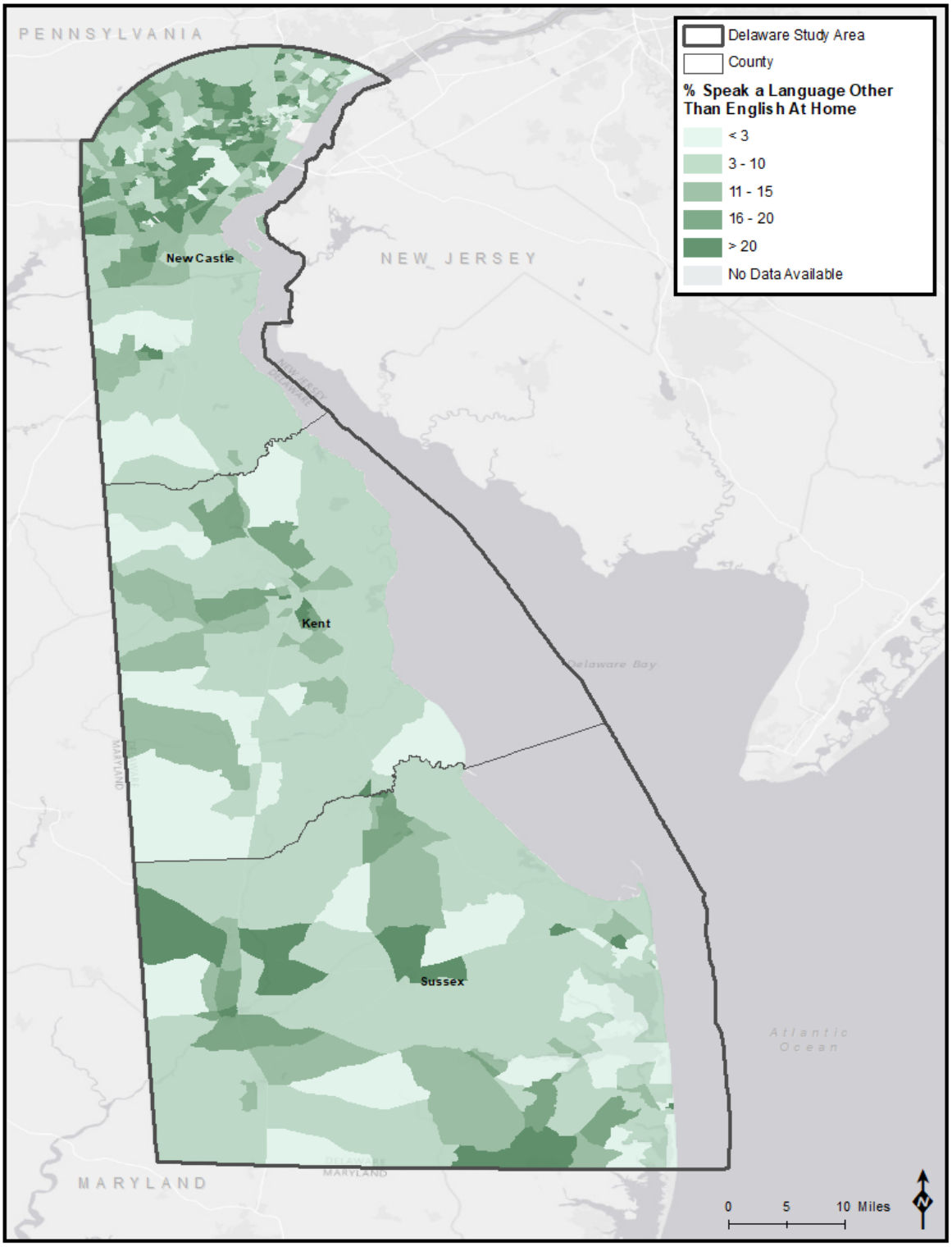
There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

Table 10-17. People who Speak a Language Other than English at Home in the Delaware Study Area by Census Block Group

Geographical Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Kent	162,154	16,283	10.0	7,843	4,657	2,479	1,304
New Castle	522,176	76,024	14.6	37,577	15,174	16,526	6,747
Sussex	204,120	21,855	10.7	15,461	4,574	1,683	137
Study Area Total / Delaware	**888,450**	**114,162**	**12.8**	**60,881**	**24,405**	**20,688**	**8,188**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017e, USCB 2017r

Figure 10-44. Percent of People Who Speak a Language Other than English at Home in the Delaware Study Area by Census Block Group

10.4.6 Summary – Demographics and Socioeconomics

Delaware's population grew 5.1% between 2010 and 2017 to approximately 943,732 residents, faster than the national rate (4.0%) during the same period (USCB 2017a, USCB 2017d). Population continues to grow due to domestic in-migration from other States as well as international migration. Projections indicate the population growth of 14% by 2020, less than the national rate (16.4%) during the same period. Rapid growth is projected in Sussex and Kent Counties (24.4% and 16.5, respectively); relatively lower population growth is projected in New Castle County (9.2%) (USCB 2017a, USCB 2017b, USCB 2017d, USCB 2018b, Delaware Population Consortium 2019).

Population density of the Study Area is 484 persons per square mile. Population densities range from 230.3 in Sussex County to 1,301.9 in populous New Castle County. Density is projected to increase to 552 persons per square mile in 2040, exposing increasing numbers of people (as the population grows) and infrastructure (as development continues) to coastal hazards. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on development in general and available housing for residents. Mounting threats from climate change and sea level rise may compound the housing affordability crisis over time, and shift growth to inland areas (Delaware Population Consortium 2019, USCB 2017d, USCB 2017c).

Overall current population trends and forecasts in the Study Area indicate an aging population. Sensitive populations of people Under Age 5 (young children) and Over Age 65 (elderly) were present in the Study Area in 2017. proportion of young children relative to the overall population was less in the Study Area (5.9%) as compared to the Nation (6.2%); however, the Study Area had a higher proportion of elderly (17.0%) as compared to the Nation (14.9%). This trend that is projected to continue through 2040 (USCB 2017b, USCB 2018b, Delaware Population Consortium 2019).

The aging population may indicate future social and economic challenges, such as demand for education, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

Population distribution will be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

Homeownership in the Study Area (71.3%) is higher than the Nation (63.8%). Home values have been rising and are projected to continue to rise in the Nation and in Delaware. Home prices are most expensive throughout New Castle County, and coastal areas of Sussex County. New Castle County had the highest median home value ($248,100). Baby boomers own approximately 32% of Delaware's homes; many are choosing to age in place instead of downsizing. As a result, the inventory of homes for sale is in short supply for Generation X and Millennials home shoppers (Vuocolo 2018, USCB 2017l).

There is a shortage of over 17,000 affordable rental units across the State. It is estimated that 70.0% of extremely low-income households have a severe cost burden due to rental prices and availability (National Low Income Housing Coalition 2019a). These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions. Housing affordability for low- and moderate-income workers is a problem in Delaware. Housing utilization is an important consideration for potential future projects to determine if a region can support the proposed project workforce. Often during the construction stage, workers need to migrate temporarily into the area, either from nearby locations or from outside of the

region. These individuals typically occupy hotels or rental properties. Employees that are part of the operational workforce may either purchase or rent homes. Therefore, understanding the current, and future projected changes in housing utilization and vacancy rates can assist during OCS-related project planning stages.

Home vacancy rates in Delaware (16.8%) in 2017 were higher than the Nation's vacancy rates (12.2%) indicative of the presence of vacation homes and/or investment properties used as short-term rentals. The large number of seasonal vacation homes in Sussex County contributes to the housing vacancy rate (USCB 2017m, Delaware OSPC 2018).

The Study Area has a total employment of 441,513 million jobs, of which 6.5% are maritime related. The majority of the maritime jobs are located in Sussex County; the majority of the non-maritime jobs are located in high-density New Castle County, located within the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metro Area (Data.gov 2017). Types of employment vary across the Study Area. The dominant employment categories in the Study Area are educational services, and health care and social assistance (24.9%), retail trade (12.2%) (USCB 2017p).

The Study Area had higher median household income and per capita income than the Nation in 2017 (USCB 2017k, USCB 2017n).

The average unemployment rate in the Study Area was 6.4%, less than the Nation (6.6%). Unemployment rates ranged from 6.1% in Sussex County to 6.7% in Kent County (USCB 2017h, USCB 2017p). In the Study Area, 31.4% and 35.4% of working-age population earned only a high school diploma and bachelor's degree, respectively (USCB 2017t).

Minority and low-income status are two of several factors that the CDC and NOAA use to calculate potentially vulnerable populations. The Study Area contains low-income and minority populations. Of the 5,875 census block groups in the Study Area, approximately 15.3% (899 census block groups) are considered low-income populations; approximately 51.0% (2,966 census block groups) are considered minority populations (USCB 2017f, USCB 2017o).

Low-income and minority populations are subject to consideration under NEPA, as they have the potential to be "Environmental Justice communities of concern." These communities may have other attributes of vulnerability such as limited English proficiency and lack of access to a personal vehicle. In New Castle County, 34.2% of census block groups contain minority populations. Kent and Sussex Counties have 23.6% and 10.2% minority census block groups, respectively. In New Castle County, 18.2% of census block groups contain low-income populations. Sussex and Kent Counties have 7.5% and 5.6% of low-income census block groups, respectively. There are several areas in each county that contain census block groups with both low-income and minority populations (USCB 2017f, USCB 2017o).

Based on the CDC social vulnerability index, there are a variety of locations throughout the Study Area that are considered potentially vulnerable. All counties have some populations deemed vulnerable to varying degrees; however, several large contiguous areas of census tracts with high overall social vulnerability are in Sussex County (USCB 2017f, USCB 2017o).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. In the Study Area, these groups include fishing communities, tribes, limited-English speaking populations, and subsistence populations. Six fishing communities are present in the Study Area; each are dependent on the Atlantic Ocean and river systems for their jobs and at least a portion of their food consumption (NOAA Fisheries 2019i). These communities are particularly susceptible to projected sea level rise and storm surge changes. These

communities also correlate closely with the CDC vulnerability rankings and minority and low-income populations. Fishing communities may constitute a subsistence population; however, subsistence populations can be difficult to identify. Other than the fishing communities, no subsistence populations were identified during this analysis of the Study Area.

Delaware has two federally recognized tribes that reside outside Delaware and two State-recognized tribes residing in the State (DGA 2016, DSN 2016, HUD 2019b). The 1,426-acre SDTSA of the Lenape is located near Dover in Kent County. The 17,723-acre SDTSA of the Nanticoke is located in Millsboro in Sussex County (DEDO 2017). The interrelationship of socially vulnerable populations and physical vulnerability is important because socially vulnerable populations are particularly susceptible to impacts from physical threats like sea level rise. The Lenape SDTSA is rated as a relatively high socially vulnerability area (Figure 10-43) but is not at immediate risk from sea level rise (Figure 10-43). The Nanticoke SDTSA is rated as a highly socially vulnerable and areas approaching the Indian River are at immediate risk from sea level rise (Figure 10-43).

Another unique subset of the population includes religious subpopulations. Amish and Mennonite religious groups are present within the Study Area. Kent County is home to an Amish settlement near the State's capitol in Dover. Amish and Mennonite are distinct groups but share similar characteristics such as use of manual labor and non-technological methods of farming, hunting, fishing and gardening, and have a "self-sufficiency" philosophy that includes a dependence on agriculture and hunting. Although not considered a subsistence population, the unique characteristics of these communities, including religions and cultural practices, and agriculturally-focused lifestyle can result in a vulnerability classification. Community members may encounter social pressures against accessing social services due to a self-reliance within their community and congregation. An aversion to current technologies or a language barrier may interfere with traditional communications in an emergency. Mennonite populations are more assimilated into mainstream culture, and therefore may not share in potential vulnerabilities. Several communities are located nears areas at risk of sea level rise and changes in storm surge, which increases vulnerability and risk. Amish establish new settlements frequently, and the possible presence of new communities should be evaluated in the Study Area (Barta 2017).

Limited-English populations are present throughout the Study Area. These are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public. Within the Study Area, 12.8% of the population do not speak English at home, with Spanish being the language spoken by the majority (60,881 people or 6.9%) of the Study Area population. Indo European languages were spoken by 2.7% (24,405 people) of the Study Area population (USCB 2017e).

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and populations with particular vulnerabilities, those who depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

10.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

10.5.1 Regional Observations

The entire State of Delaware lies within the Study Area and all three counties in Delaware are coastal counties. Thus, all are subject to physical vulnerability from projected sea level rise and storm surge changes. Some of the communities within these counties are also socially vulnerable, thus increasing the potential for future social and economic impacts as a result of severe weather, rising sea level, and changing climate.

Low corporate taxes and business-friendly corporation laws create a corporate haven atmosphere in Delaware. In addition to statewide incentive programs, individual county development offices may have additional incentives for projects that fit their individual plans. The City of Wilmington offers additional incentives to facilitate capital investment within the boundaries of Wilmington. Tax credits are also available through the Delaware Division of Revenue, which may facilitate certain types of development in certain areas. The available incentives and tax credits may provide future OCS-related developers with a variety of opportunities within the State.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. The entire State is classified for certain levels of development, or as areas where development is to be avoided. Future OCS-related project developers would need to carefully assess the nature of sites that are potentially impacted and consider alternatives that avoid various protected areas.

Delaware's population is aging in concert with much of the rest of the Nation. The aging population may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

Population growth in the Study Area is concentrated in a few urban areas while much of the rest of the State has an agricultural base.

10.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent BOEM's views.

- Land subsidence is occurring throughout the State of Delaware. This can enhance effects from sea level rise and storm surge. Future projects may benefit from considering geotechnical studies during site selection.
- Sea level rise projections in combination with storm surge projections could influence future land use planning and population distribution. Future projects in the area will need to take into account both sea level rise and storm surge for site selection planning.
- Projects will likely need to comply with existing and future land use plans and zoning ordinances that are unique to respective communities. Project developers would benefit from early coordination with economic development organizations and local and State governments during the early planning and site selection process.
- Future projects will need to consider the State Strategies Investment Levels map to determine areas that are suitable for development with respect to individual projects. Development that affects out-of-play or otherwise protected areas will be strongly discouraged if not forbidden by the State. Protections are also likely for designated recreation areas.

- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Delaware has a variety of tax incentives, including no state or local general sales tax, no personal property or inventory tax, and real property taxes among the lowest in the country that make the State very appealing for a variety of industries and businesses.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- Among the potentially vulnerable communities in the area, fishing communities could experience the greatest impacts associated with proposed future projects. In addition, many of these fishing communities (as well as several Amish/Mennonite congregations and the Nanticoke Indian Tribe reservation) are located in areas particularly susceptible to sea level rise and storm surge effects.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the State Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 11

MARYLAND

11 Maryland

11.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Maryland to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, National, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

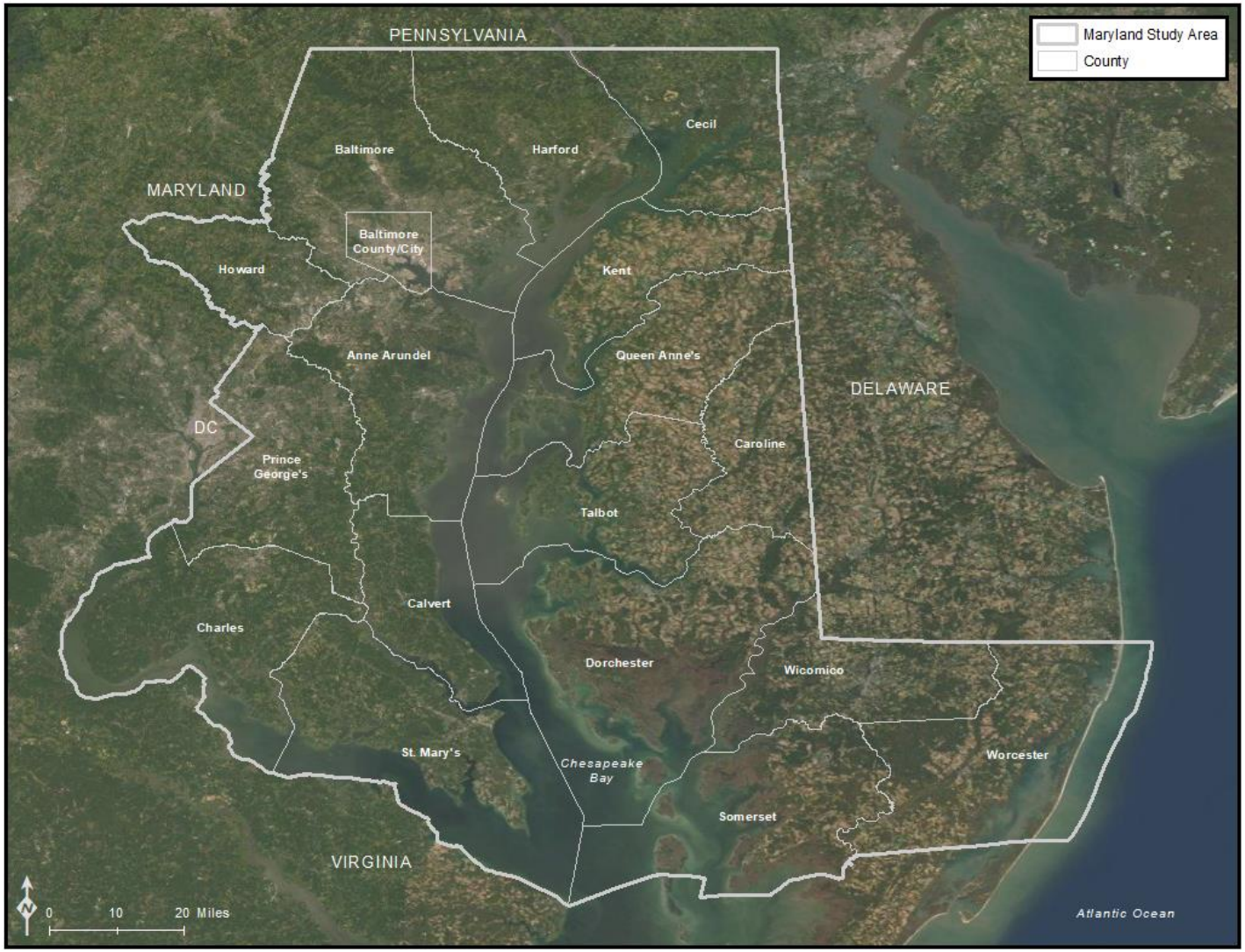
Maryland is located near the Mid-Atlantic planning area. A total of 18 counties and county-equivalents are located within the Maryland Study Area (Study Area) along the Maryland coastline. Counties range in population size from around 19,666 in Kent County to 905,161 in Prince George's. There is only one city in the Study Area with a population over 250,000; it is Baltimore with a population of 620,488. The next most populous city in the Study Area is Columbia with a population of 105,673. There are no other cities with populations over 100,000 (ESRI 2019a). Maryland cities and counties include highly diverse populations regarding demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Maryland's location in the mid-Atlantic has geographical commonalities with many of the other Atlantic States with open coastlines along the Atlantic Ocean below Delaware, and more sheltered coastlines along the Chesapeake Bay. The Maryland coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes 18 counties located within the State of Maryland. The Study Area is shown in Figure 11-1 and Figure 11-2 and includes the following counties and independent city (Baltimore City):

- Anne Arundel
- Baltimore
- Baltimore City
- Calvert
- Caroline
- Cecil
- Charles
- Dorchester
- Harford
- Howard
- Kent
- Prince George's
- Queen Anne's
- Somerset
- St. Mary's
- Talbot
- Wicomico
- Worcester

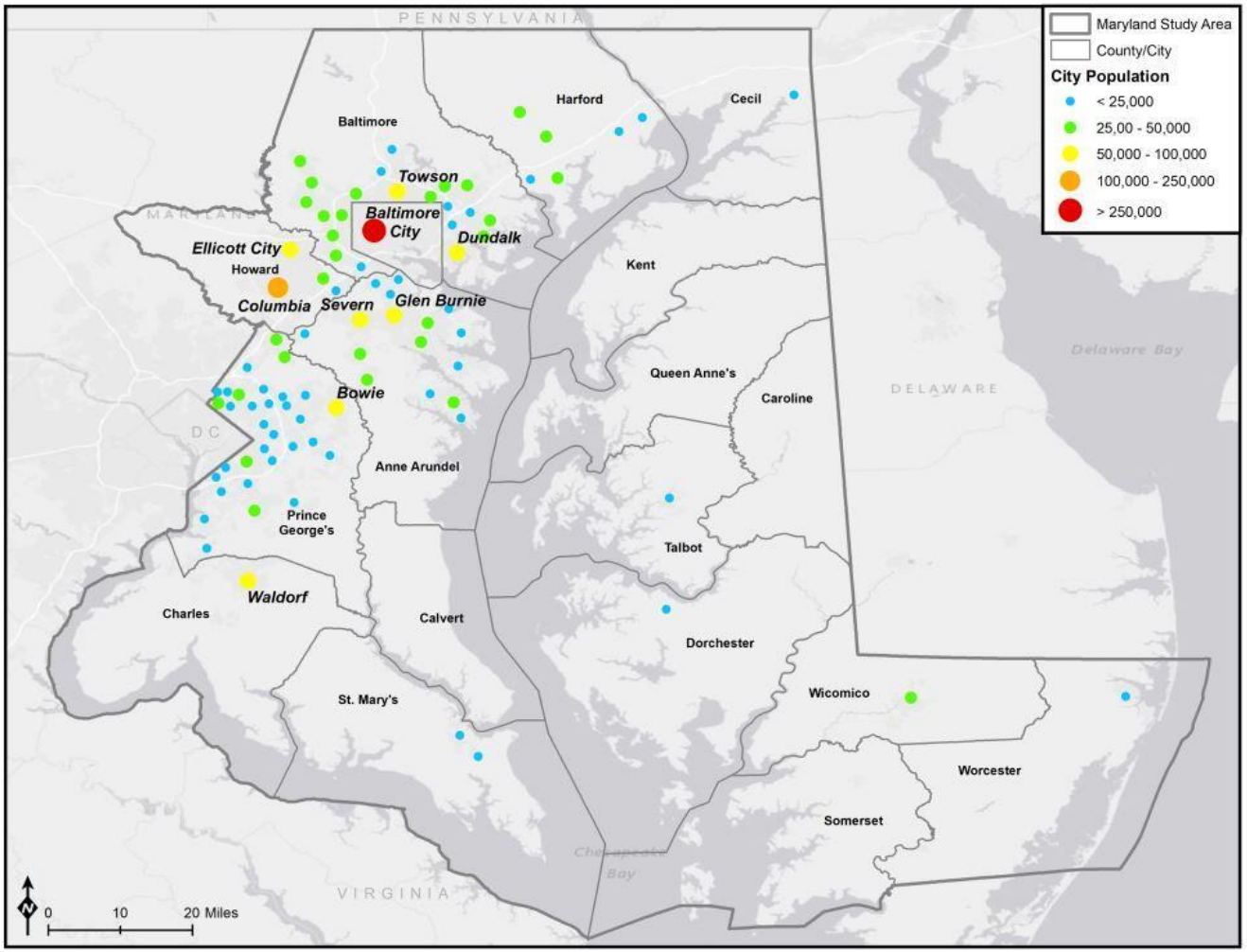
11.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Maryland are described below.



Source: ESRI 2019a

Figure 11-1. State of Maryland Study Area



Source: ESRI 2019a

Figure 11-2. Cities in the Maryland Study Area

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- Maryland's Mapping and Geographic Information System Data Portal
- Maryland Department of Information Technology
- Maryland Department of Natural Resources
- Maryland's Sports Commission
- Maryland Transit Administration
- Maryland Department of Agriculture

The metadata database for Maryland specific State, county, and local data sources is included in Appendix A.

11.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

11.2.1 Water Resources

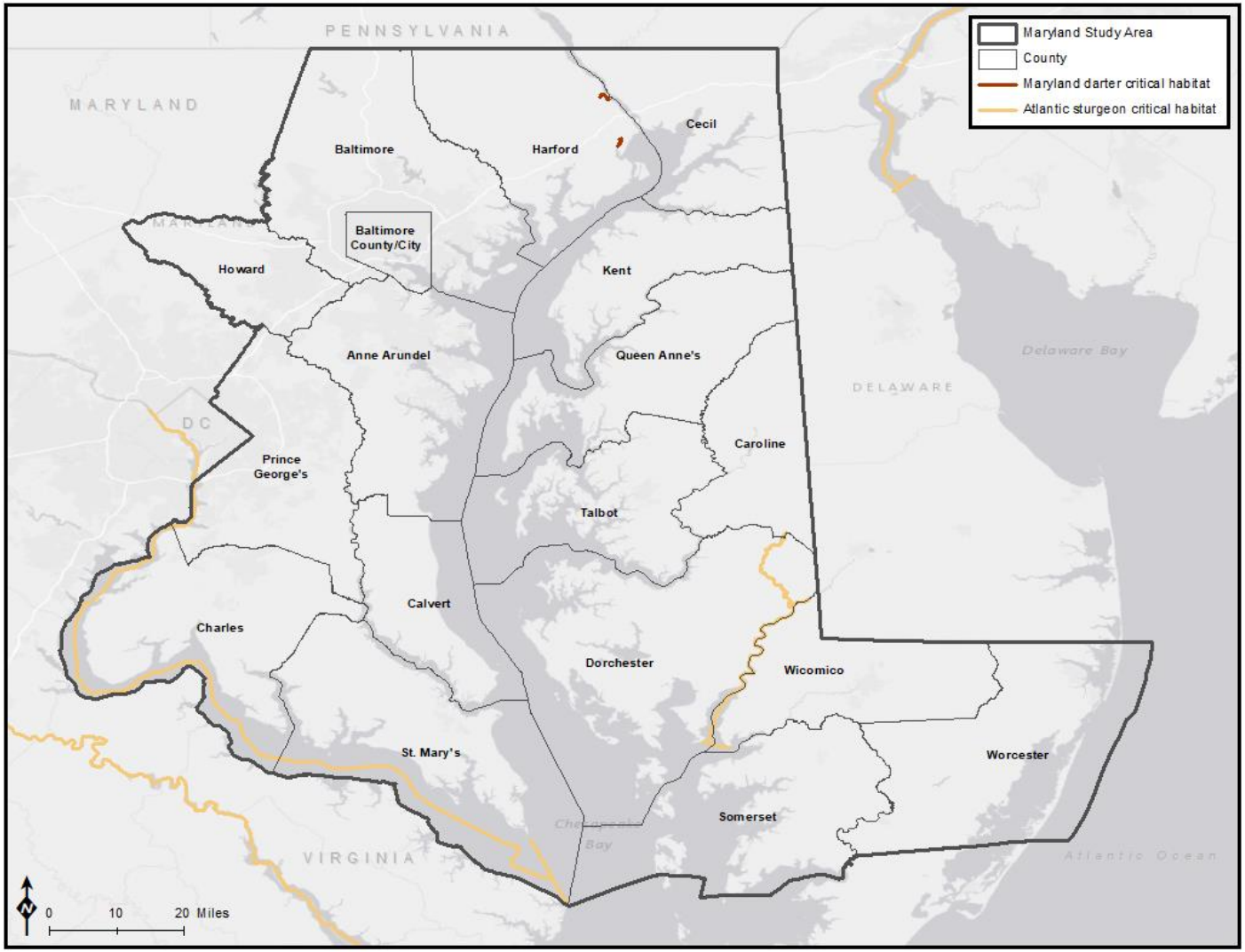
Maryland's water resources include the Chesapeake Bay, rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

11.2.1.1 Chesapeake Bay

The Chesapeake Bay is an estuary, a body of water where fresh and salt water mix. The Bay is the largest estuary in the U.S.; it stretches 200 miles from Havre de Grace, Maryland down to Virginia Beach, Virginia. The Bay includes major ports in Baltimore and Hampton Roads. The Potomac, the Patapsco, the Patuxent, and the Susquehanna Rivers within the Study Area flow into Chesapeake Bay, bringing 51 billion gallons of fresh water into the Bay each day. Sediment load into the Bay, primarily from eroding land, stream banks, shores, and coasts, averages 5.2 million tons a year (Chesapeake Bay Foundation 2019).

Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. The dead zone in Chesapeake Bay averages 1.7 cubic miles. The Chesapeake dead zone is most pronounced in the deep waters of the Bay's main stem during warm summer months. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (Chesapeake Bay Foundation 2019, VIMS 2019).

As shown in Figure 11-3, the coastal areas of Maryland in the Study Area include designated critical habitat for Chesapeake Bay distinct population segment of the Atlantic sturgeon and the Maryland darter species, North Atlantic right whale, and fin whale. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Maryland, the designated critical habitats for the Atlantic sturgeon are in the Nanticoke River, Marshyhope Creek, and Potomac River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).



Sources: USFWS 2019i, USFWS 2019j

Figure 11-3. Critical Habitat within the Maryland Study Area

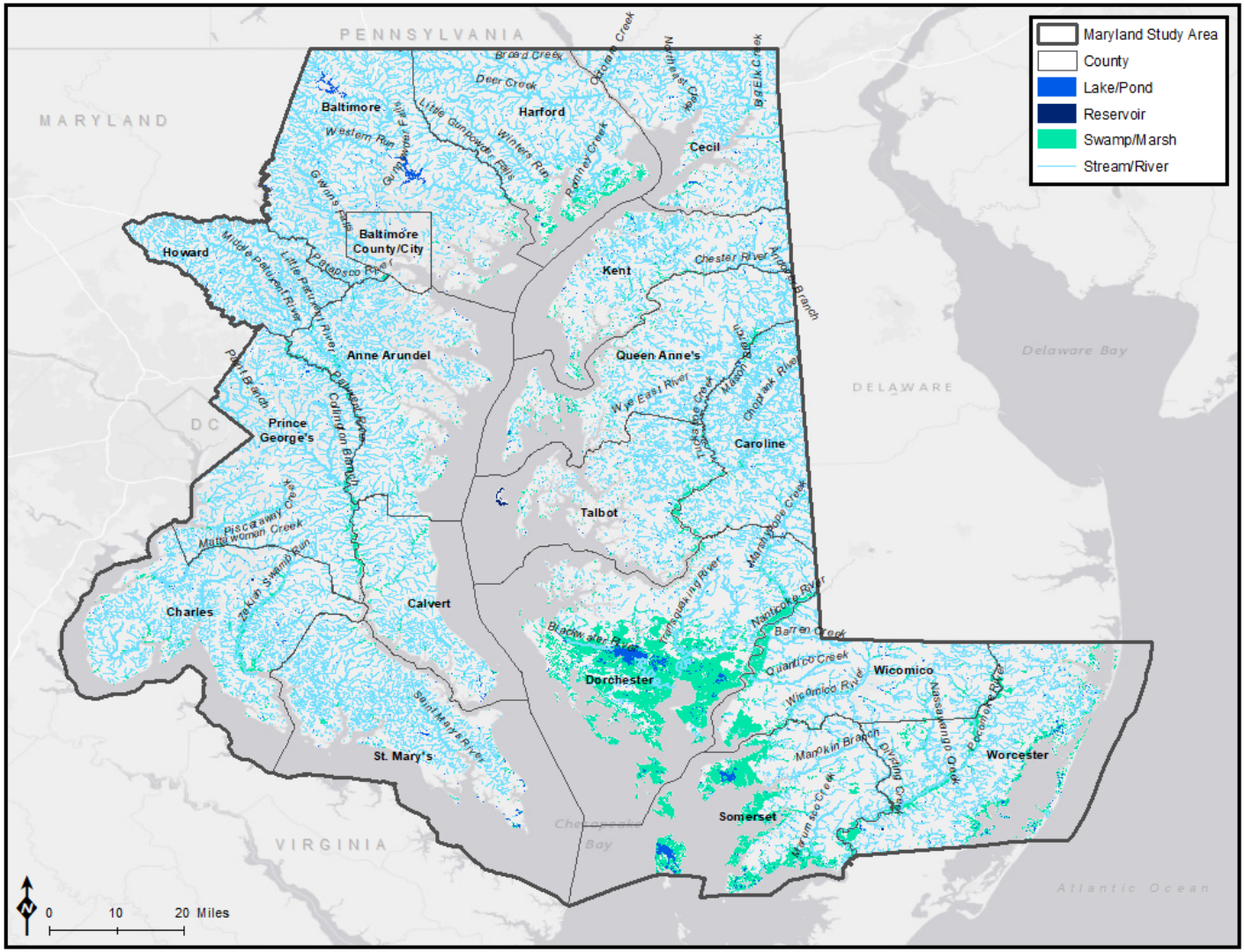
The Maryland darter is found only in freshwater habitats (Swan Creek, Gashey's Run, and Deer Creek, which are located within the Susquehanna River drainage basin) in Harford County. Most sightings of the darter have been in Deer Creek. The darter is a small, bottom-dwelling fish that prefers rock crevices or riffles that tend to be located around the Fall Line areas of streams, where the hills transition to the coastal plain. The darter also prefers clean, well-oxygenated, swiftly flowing streams (USFWS 2011, MDNR 2020b).

11.2.1.2 Rivers

The Study Area is defined by its abundant waterways and coastlines on the Chesapeake Bay and Atlantic Ocean. Its largest city, Baltimore, has a long history as a major seaport. Maryland has 23 rivers and various bays, as well as many lakes and creeks, none of any great size. Principal rivers within the Study Area include the Potomac, the Patapsco, the Patuxent and the Susquehanna rivers (Visit Maryland 2020a). Figure 11-4 shows the major surface water bodies within the Study Area.

The headwaters of the Potomac River are in the Allegheny Mountains of West Virginia. The river marks the border between Virginia and Maryland and is fed by tributaries from both States, including the Anacostia, Shenandoah, and Monocacy Rivers. The Potomac River covers 383 miles from West Virginia to the tidewater at Point Lookout, Maryland where it enters the Chesapeake Bay. Historically, pollution and degradation of the river were a problem. The Potomac River was designated as an American Heritage River in 1998, which enabled communities along the river to utilize Federal funds for revitalization efforts (American Rivers 2019, Potomac Conservancy 2020). The Potomac Conservancy nonprofit land trust was established in 1993 with a purpose of stewarding conservation easements along the river (Potomac Conservancy 2019). The Conservancy has noted pollutants such as nitrogen, phosphorous, and suspended sediments are declining in the river over time. As a result, various fish species that have been previously impacted are showing signs of recovery. Urban runoff remains an issue (American Rivers 2019). The headwaters of the Potomac River are in the Allegheny Mountains of West Virginia. The river marks the border between Virginia and Maryland and is fed by tributaries from both States, including the Anacostia, Shenandoah, and Monocacy Rivers. As shown in Figure 11-3, the Potomac River, is critical habitat for the Atlantic sturgeon (NOAA 2017c, NOAA 2019l, USFWS 2019i, USFWS 2019j).

The Patapsco River is a 39-mile-long river in central Maryland. The Patapsco Watershed is located in the southwestern portion of Baltimore County within the Study Area. While the Patapsco River is minor for most of its length, the last ten miles are a large tidal estuary inlet of Chesapeake Bay. The tidal area of the Patapsco River is comprised of the Northwest Harbor and Middle Branch and is crossed by the Baltimore Harbor and For McHenry Tunnels. A small watershed action plan was implemented to identify strategies to bring small watersheds into compliance with water quality standards and goals developed by stakeholders in the watershed (Baltimore County 2019). The river is prone to periodic flooding, with catastrophic floods dating back to the 1868 flood that washed away 14 houses and killed 39 people around Ellicott city.



Source: USGS 2019e

Figure 11-4. Hydrography in the Maryland Study Area

The Patuxent River, the largest estuary in North America, is one of three major tributaries in Maryland that feeds into the Chesapeake Bay. The river is 110 miles long and is located entirely within the State of Maryland. The Patuxent River Basin is 937 square miles, a portion of which lies in the Study Area. In 1984, water quality in the Patuxent River was declining due to rapid population growth despite 85% of its watershed being classified as agriculture and forest. During this time, wastewater treatment plants were the major source of poor water quality. The CWA Section 208 Water Quality Plan was approved by Maryland and the USEPA in 1983 and was aimed at decreasing point source pollution from wastewater treatment plants. As of 2012, conditions of the Patuxent River remain impaired due to rapid development (paxcon.org 2019).

The Susquehanna River flows 444 miles from Otsego Lake in Cooperstown, New York, to Havre de Grace, Maryland in Harford County where the river meets the Chesapeake Bay. It is the largest tributary of the Bay, providing 50% of its freshwater flows. The Susquehanna River is the longest, commercially non-navigable river in North America, and is also the largest river lying entirely within the United States that drains into the Atlantic Ocean (SRBC 2016). In 2002, the Susquehanna River faced a drought – falling levels of water on the lower Susquehanna River forced Baltimore to cut its withdrawals from the river and impose mandatory water use restrictions on its 1.8 million water customers in the city and surrounding suburbs (Roylance 2002). The Susquehanna River drainage basin also provides critical habitat for the Maryland darter.

11.2.1.3 Floodplains

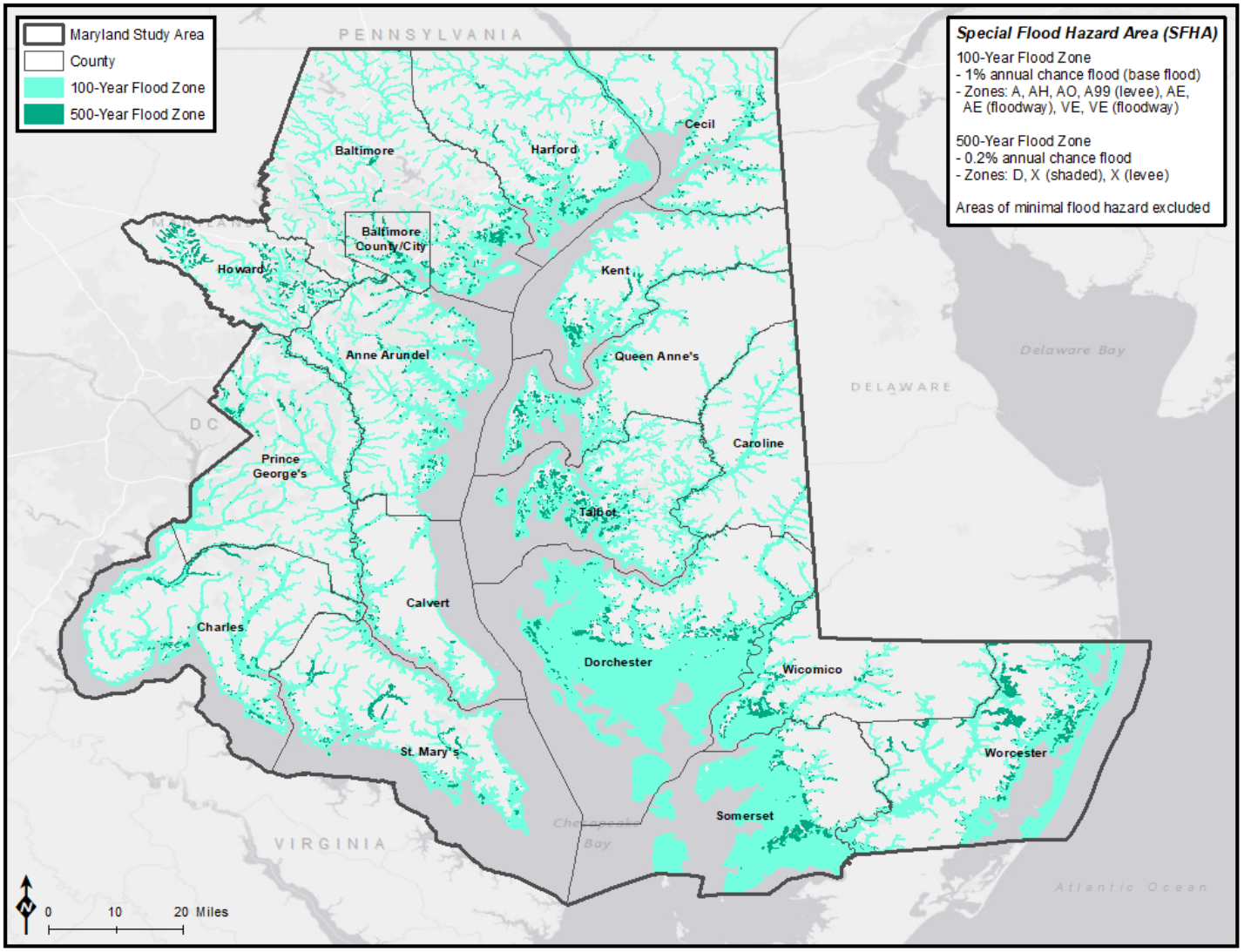
Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 Floodplain Management and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 11-5, floodplains are found throughout all counties in the Study Area. Table 11-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

11.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 11-6, wetlands are a prevalent throughout the Study Area counties, particularly on the Eastern Shore.

As described in more detail in Chapter 1.4.1.5, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 11-2 details the wetland acreage in the Study Area along with other water resources. (FGDC 2013, USFWS 2019c).



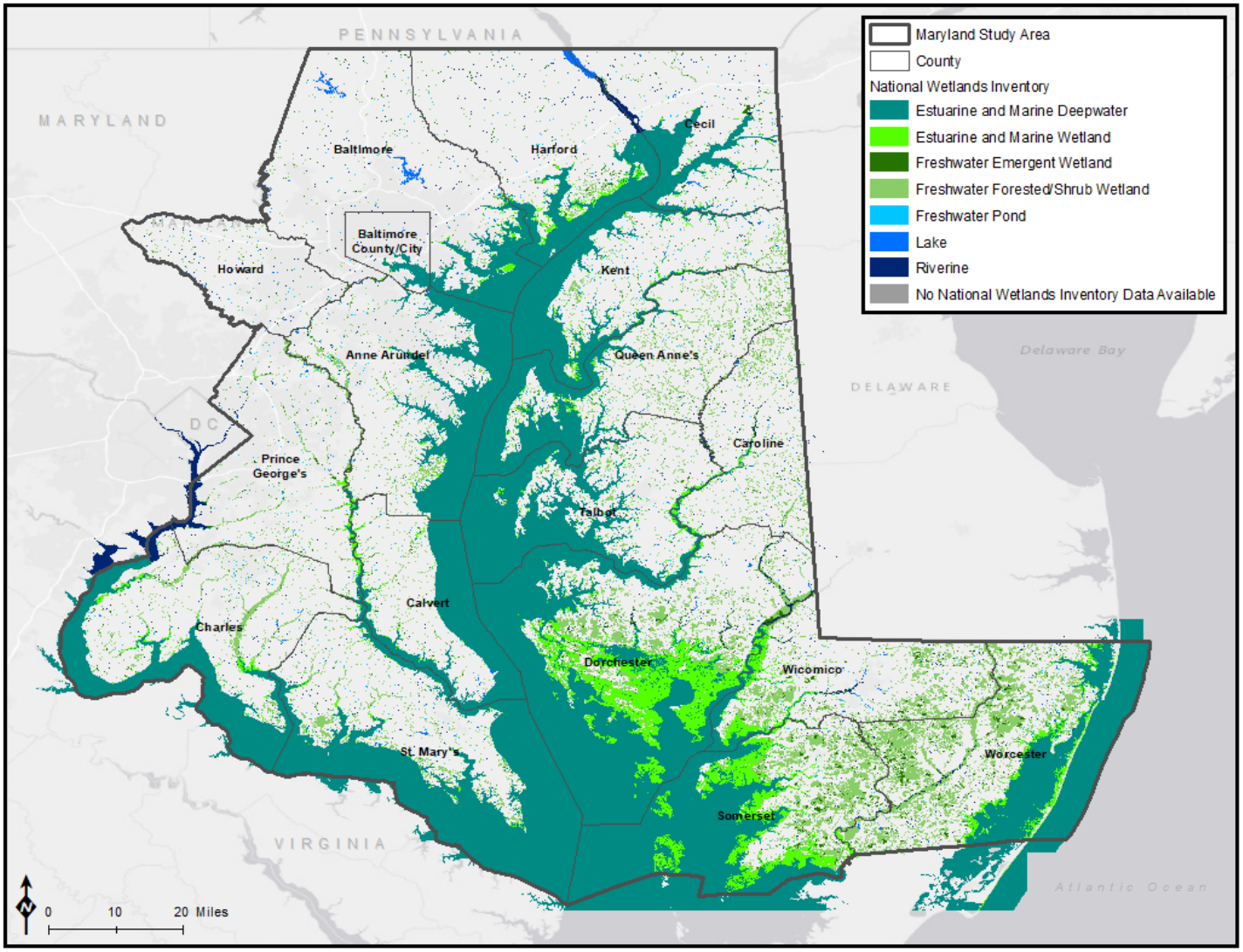
Source: FEMA 2019b

Figure 11-5. Floodplains of the Maryland Study Area

Table 11-1. Floodplains in the Maryland Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Anne Arundel	40,662	15.3	2,111	0.8
Baltimore City	6,536	12.6	1,001	1.9
Baltimore	35,043	9.2	2,421	0.6
Calvert	14,977	11.0	328	0.2
Caroline	15,838	7.7	702	0.3
Cecil	27,231	12.3	873	0.4
Charles	43,463	14.8	2,011	0.7
Dorchester	237,449	68.6	9,434	2.7
Harford	41,245	14.7	2,678	1.0
Howard	9,089	5.7	1,323	0.8
Kent	25,705	14.5	1,231	0.7
Prince George's	33,716	10.9	1,641	0.5
Queen Anne's	31,307	13.2	1,724	0.7
Somerset	133,727	65.3	7,877	3.8
St. Mary's	36,153	15.7	1,465	0.6
Talbot	45,682	26.6	3,692	2.1
Wicomico	46,539	19.4	2,267	0.9
Worcester	88,277	29.5	11,124	3.7
Study Area Total	**912,638**	**21.7**	**53,903**	**1.3**

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or National level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: USFWS 2018a

Figure 11-6. Wetlands in the Maryland Study Area

Table 11-2. Wetlands in Maryland Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Anne Arundel	131,495	2,269	1,185	13,930	111,356	248	1,313	1,193
Baltimore City	7,517	55	47	67	6,836	130	98	283
Baltimore	63,112	2,789	988	3,514	47,652	4,946	1,068	2,156
Calvert	94,537	2,857	667	6,041	83,870	276	542	283
Caroline	28,286	1,758	1,071	19,225	2,794	200	786	2,450
Cecil	54,395	1,454	2,000	3,954	39,544	2,068	1,255	4,121
Charles	148,080	5,962	1,403	21,406	111,801	257	1,417	5,835
Dorchester	432,169	86,969	3,305	53,233	283,339	512	1,405	3,407
Harford	72,934	6,234	2,056	5,115	53,166	1,713	1,074	3,575
Howard	5,705	0	442	2,593	0	994	573	1,104
Kent	104,310	3,683	1,615	10,262	85,938	378	1,798	635
Prince George's	29,736	2,188	1,977	13,601	2,576	463	1,807	7,124
Queen Anne's	123,026	3,841	1,246	25,902	89,682	187	1,196	971
Somerset	295,441	54,414	5,143	48,659	185,903	0	662	660
St. Mary's	284,599	3,376	662	18,674	259,120	441	1,273	1,052
Talbot	150,791	5,086	922	8,790	133,765	103	997	1,129
Wicomico	76,882	13,108	3,164	42,514	14,297	474	885	2,440
Worcester	264,956	18,534	7,755	92,856	141,334	368	1,181	2,927
Study Area Total	2,367,972	214,578	35,648	390,335	1,652,975	13,758	19,332	41,346

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or National level.

The Emergency Wetlands Act enacted in 1986, along with the CZMA and amendments encourage wetland protection through funding incentives. The Emergency Wetland Resources Act requires States to include wetland protection in their Comprehensive Plans in order to qualify for Federal funding for recreational land within the State. The NPS provides guidance for the wetland section of the Comprehensive Plan. Coastal States that adopt coastal zone management programs and plans approved by NOAA are eligible for Federal funding and technical assistance through the CZMA. Maryland regulates coastal wetlands under the Maryland CZMA. This means that the Maryland CoastSmart Council regulates any activities pertaining to the filling, removing, dredging, draining, constructing, or in any way altering any critical area within the coastal counties that are under its jurisdiction. The State Coastal Management Act provides 10 criteria to guide the Coastal Council in determining whether to issue a permit. Two of the key criteria are "(1) a comparison of economic benefits to preservation benefits and (2) the extent to which all feasible safeguards to avoid adverse economic impact are considered. Under the Coastal Council regulations, dredging and filling wetlands is undertaken only if the activity is water dependent and no feasible alternatives exist. Applications are denied for purposes other than access, navigation, mining, or drainage unless an overriding public interest can be demonstrated" (USFWS 1991).

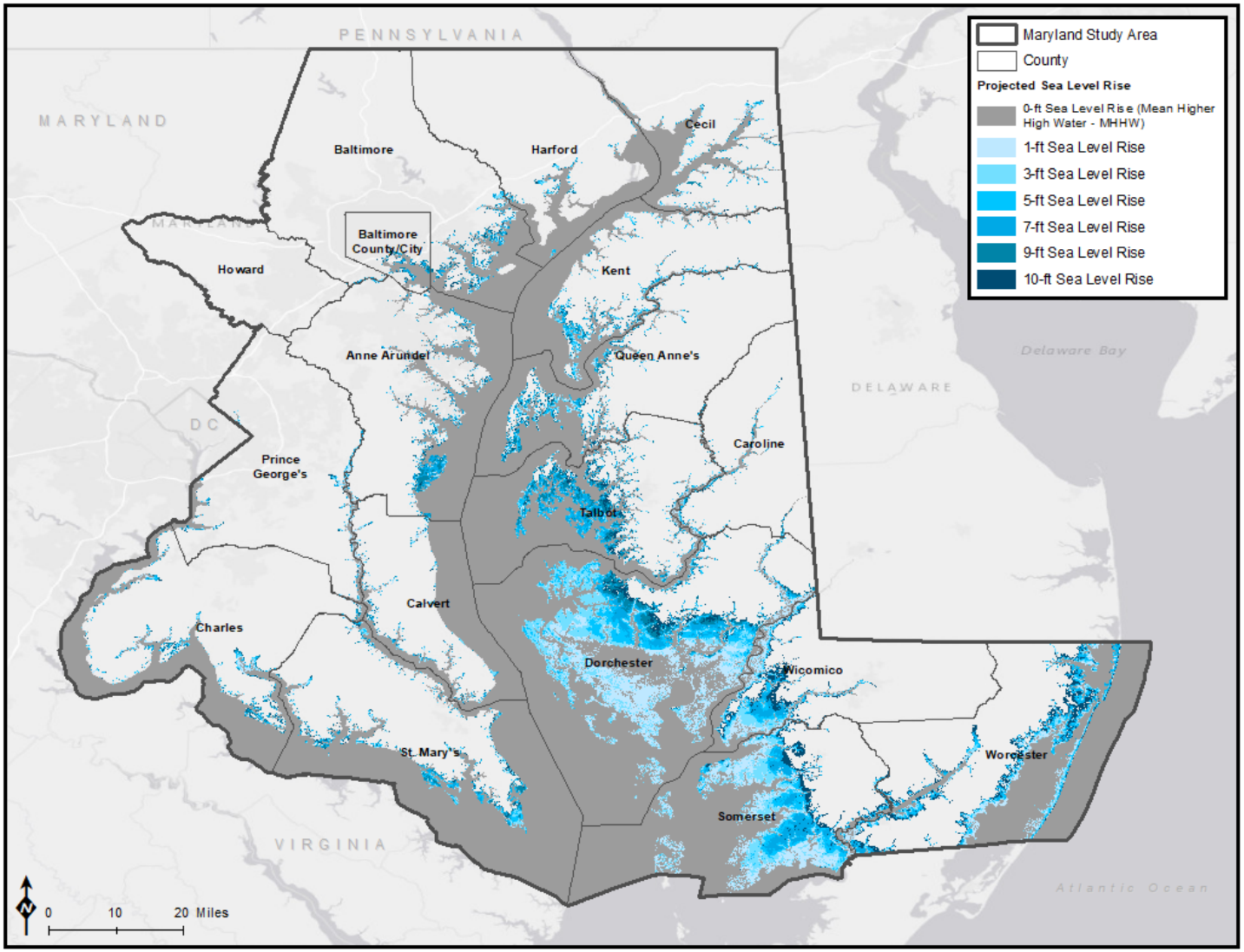
11.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

11.2.2.1 Sea Level Rise

Figure 11-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion. Between 1950 and 2000, relative sea level rise in Maryland was about 0.6 feet (0.144 inches/year), slightly over the current global average (Boesch et al. 2018). Rates of sea level rise have accelerated over the last ten years and are now 0.2 inches/year (SeaLevelRise.org 2019). Research from the Virginia Institute of Marine Science indicate that the median acceleration rate of relative sea level rise in Maryland between 1969 and 2014 was in the range of 0.15 to 0.18 millimeter per square year, except at Solomons Island where the rate was 0.22 millimeter per square year (Boesch et al. 2018). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Maryland Study Area is 0.16 inches/year (NOAA 2019b).

If global society were able to meet the goals of the Paris Climate Agreement (a best-case scenario) the likely range (66% probability) of relative sea level rise in Maryland for 2100 would be between 1.2 and 3.0 feet, with a 5% possibility it would exceed 3.7 feet. The likely range of the relative rise of mean sea level expected in Maryland between 2000 and 2050 is between 0.8 and 1.6 feet, with 5% probability that it could exceed 2.0 feet. With continued global emissions of greenhouse gases predicting a worst-case scenario, the range of sea level rise experienced in Maryland is predicted to be between 2.0 and 5.2 feet (Boesch et al. 2018).



Source: NOAA 2018a

Figure 11-7. Projected Sea Level Rise throughout the Maryland Study Area

Regional factors contribute to variation in relative sea level rise within the Study Area. A small factor in land subsidence in the southern Chesapeake Bay Region is glacial isostatic adjustment, the flexing of the Earth's crust in response to ice loading or melting. The earth's crust flexes downward from the weight of the overlying ice causing the surrounding area (the glacial forebulge) to flex upward. The southern Chesapeake Bay Region was in the forebulge area during the last ice age and since the ice sheet started melting 18,000 years ago, the Bay Region continues adjusting slowly downward. Contributions to land subsidence from continuing glacial isostatic adjustment are probably not uniform and estimated at about 0.04 inches per year (Eggleston and Pope 2013). In Maryland, researchers estimate that land surfaces around the Chesapeake Bay estuary are falling by around 1.5 millimeters each year because of subsidence from geological rebound (Chesapeake Quarterly 2014). Further, Maryland's position on the mid-Atlantic Coast is considered a "hot spot" of higher sea level due to subsidence and also a slowing down of the flow of the Gulf Stream or other changes in ocean currents (Boesch et al. 2018).

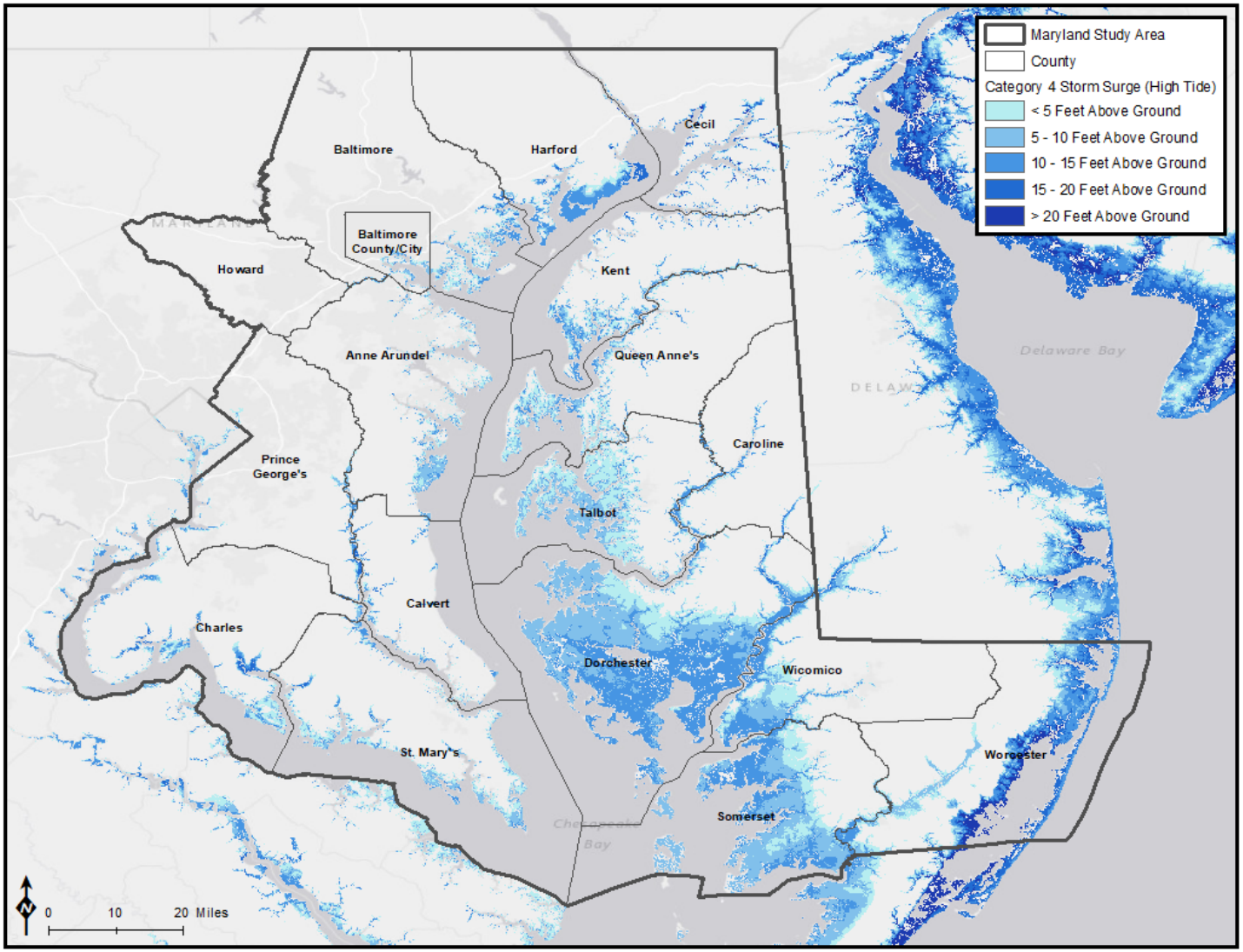
Effects of accelerated sea level rise in Maryland are already apparent, including nuisance tidal flooding, shoreline erosion, deterioration of tidal wetlands, and saline contamination of low-lying farm fields. Nuisance flooding from tidal events has increased from a few days per year in Annapolis in the 1950s to 40 or more days per year currently (Boesch et al. 2018). Areas on the southern end of Maryland's Eastern Shore that previously held maritime forest have slowly become marshes dotted with dead white tree trunks as a result saltwater intrusion from Chesapeake Bay. In other places such as Smith Island, rapidly eroding shorelines are obvious indicators of sea level rise (Chesapeake Quarterly 2014).

Coastal projects should consider Maryland's Climate Change and Coast Smart Construction: Infrastructure Siting and Design Guidelines, which provides guidance for using the 2013 sea level rise projections for projects characterized as short-term (design life less than 25 years), medium-term (design life less between 25 and 50 years), long-term (design between 50 and 100 years), and very long-term (design life over 100 years) (Boesch et al. 2018). Projects should also consider regional variations within Maryland (Boesch et al. 2018).

Compaction of the aquifer system occurs as pressures and water levels decrease with groundwater withdrawal. Rates of compaction and land subsidence vary geographically based on characteristics of the aquifer and on the amount of water withdrawn. Water withdrawal from the sand layers of the Maryland Coastal Plain aquifer system can cause pressure decreases across the stacked sand and clay layers allowing them to compress; thus triggering the land to subside. Compaction of the clay layers can continue for years as the decreased pressures propagate across the extent and depth of the aquifer (Eggleston and Pope 2013, NASA 2017). Studying land subsidence and relative sea level rise in the Southern Chesapeake Bay Region, a 2013 USGS report theorized that land subsidence from aquifer compaction accounted for much of the land subsidence. Relative sea level rise at Solomons Island and Cambridge, located in the Southern Chesapeake Bay Region, is greater because of the higher rate of land subsidence, some of which is attributed to groundwater withdrawals (Boesch et al. 2018, Eggleston and Pope 2013).

11.2.2.2 Storm Surge

Figure 11-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Maryland coastline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario.



Source: NOAA 2020a

Figure 11-8. Projected Storm Surge throughout the Maryland Study Area for a Category 4 Hurricane

Maryland can experience both nor'easters, occurring with highest severity between September and April, and tropical storms and hurricanes, occurring May-December; these storm systems are described in greater detail in Chapter 1.4.2.2. In October 2012, Hurricane Sandy pushed a storm surge of five feet of water onto the southern end of the Eastern Shore of Maryland (Chesapeake Quarterly 2014). However, the record storm surge level for the Chesapeake Bay was associated with Hurricane Isabel in 2003 at 7.3 feet (Boesch et al. 2018).

In general in Maryland, nuisance flooding exceeding 2.6 feet above standard benchmarks is considered minor and 4.8 feet is considered major. Given the storm surge record at 7.3 feet and tidal nuisance flooding norms, scientists predict that a Category 2 storm following a path of Hurricane Isabel could result in water levels at Baltimore of 10.6 feet assuming a worst case scenario (Boesch et al. 2018). Climate Central scientists report that in Maryland alone, more than 55,000 people live in homes less than five feet above the local hightide line. This zone holds 41,000 homes and $19.6 billion in property value (Chesapeake Quarterly 2014).

11.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Climate Central scientists report that in Maryland alone, more than 55,000 people live in homes less than five feet above the local hightide line. This zone holds 41,000 homes and $19.6 billion in property value (Chesapeake Quarterly 2014). Rates of sea level rise in Maryland are currently 0.2 inches/year and accelerating (SeaLevelRise.org 2019). Worst case-scenarios predict sea level rise between 2.0 and 5.2 feet by 2050 (Boesch et al. 2018). Impacted areas are already experiencing nuisance tidal flooding, shoreline erosion, deterioration of tidal wetlands, and saline contamination of low-lying farm fields. Nuisance flooding currently ranges between 2.6 feet and 4.8 feet above standard benchmarks. Combined with the current storm surge record of 7.3 feet, scientists predict that a Category 2 storm following a path of Hurricane Isabel could result in water levels at Baltimore of 10.6 feet (Boesch et al. 2018). Coastal projects should consider Maryland's Climate Change and Coast Smart Construction: Infrastructure Siting and Design Guidelines and consider regional variations from local subsidence within Maryland (Boesch et al. 2018).

11.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS activity could influence life in coastal communities.

11.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a National dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

Figure 11-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 11-3 presents the NLCD data for Baltimore City and each county within the Study Area by acreage. Table 11-4 presents the NLCD data for Baltimore City and each county by percentage and presents a summary of the overall land cover for each geographic unit. Open water land use was excluded in Table 11-4 because this type of land cover would not be considered in future industrial development. Baltimore City and each

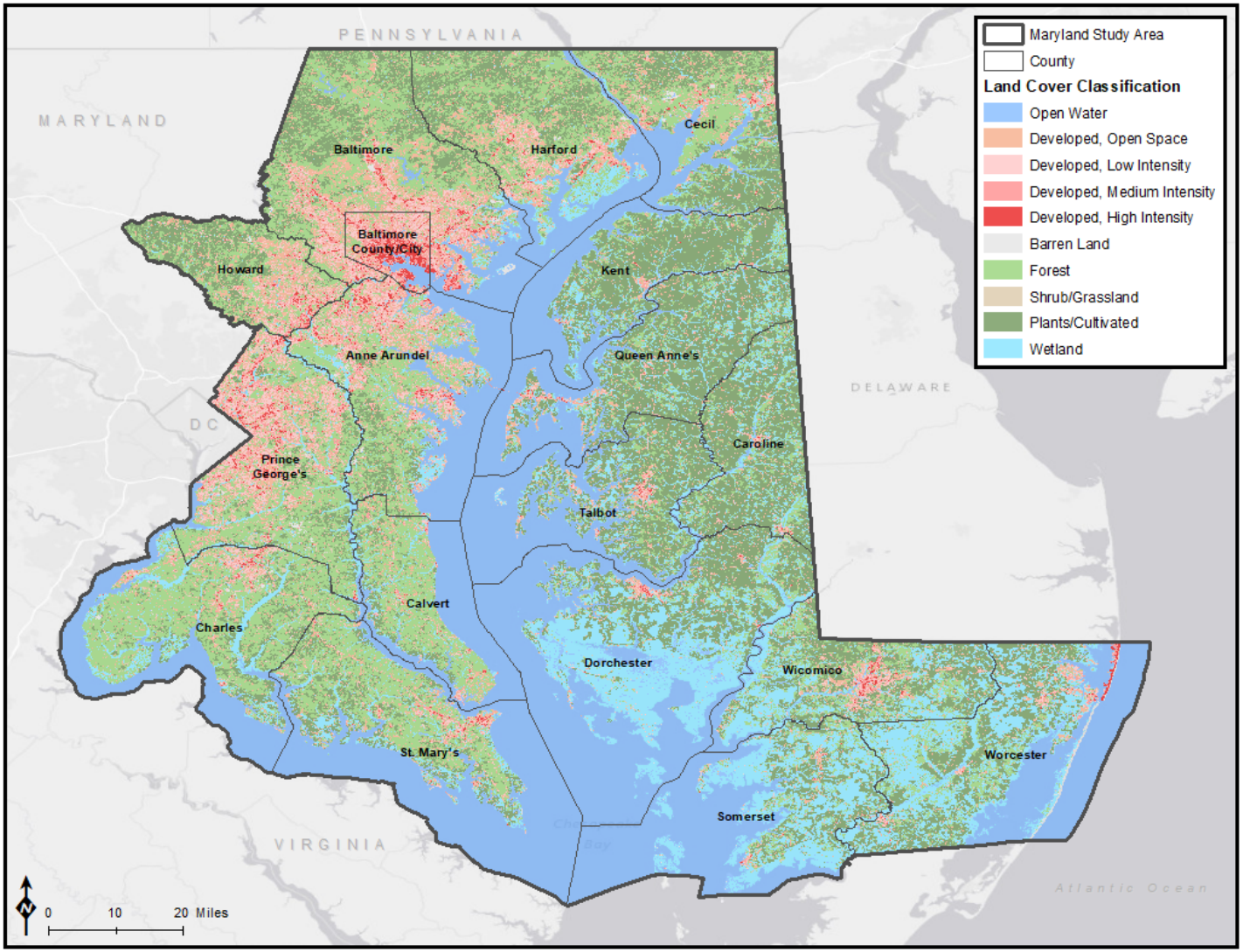
county in the Study Area was then categorized based on its land cover trend as shown in Table 11-4 and Table 11-5. The following section discusses the key findings of this analysis.

The general land cover for Baltimore City and the 18 counties within the Study Area varies. Table 11-4 and Table 11-5 present assessments of the general land cover for the City of Baltimore and each of the 18 counties based on the majority of the land cover within that geographic unit. While Baltimore City is mostly urban, many counties are largely agricultural, forest, or a mixture of various land types. Geographic units with dense urban development mixed with forest tend to be those approaching Baltimore City (Harford, Baltimore, Howard, and Ann Arundel Counties) and Washington DC (Prince George's County). However, it is important to note that the NLCD data serves as a baseline to begin making an overall land cover assessment. Because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. Therefore, although some areas of Maryland may be classified as forest, they could actually range from suburban areas to National forests.

Counties on Maryland's Eastern Shore (Cecil, Kent, Queen Ann's, Caroline, Talbot, Dorchester, Wilcomico, Worcester, and Somerset Counties) are primarily agricultural lands, or a mix of agricultural land and wetland or forest land cover. The inland southern counties of Calvert, Charles, and St. Mary's are predominantly forest land cover.

It is likely that future industrial development activities will be concentrated in the counties and cities that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.

It is also likely that future industrial development would be less likely on Maryland's Eastern Shore, including Caroline, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester Counties, because these counties are much less developed and have a larger proportion of agricultural and wetlands. Correspondingly, there are fewer and smaller urban areas, more limited transportation resources, and a more diffuse distribution of business, commercial, and industrial facilities in this part of the Study Area. Western counties in the southern portion of Maryland's Chesapeake Bay area tend to have land use covers that are also predominantly non-urban and may not be conducive to industrial type projects.



Source: NLCD 2016a

Figure 11-9. National Land Cover in Maryland Study Area

Table 11-3. Acres of Land Cover by NLCD Classifications in Maryland Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Anne Arundel	376,190	42,318	37,550	17,798	5,791	103,457	896	102,355	3,562	28,424	25,766	111,730
Baltimore City	58,912	9,893	12,880	13,555	11,536	47,863	351	3,549	81	311	153	6,604
Baltimore	436,315	66,987	39,498	21,498	7,516	135,499	2,268	148,877	2,858	86,009	8,375	52,428
Calvert	220,848	15,335	4,873	1,718	535	22,461	195	79,508	2,188	18,880	13,404	84,212
Caroline	208,588	9,615	3,242	962	307	14,127	87	32,868	827	120,956	35,590	4,134
Cecil	267,416	23,074	7,227	3,262	1,143	34,704	1,602	83,181	3,076	88,990	11,353	44,510
Charles	411,482	25,244	10,734	3,861	1,171	41,010	1,060	163,120	5,663	41,644	40,502	118,483
Dorchester	629,112	10,831	5,187	1,549	568	18,136	310	28,108	3,275	109,835	183,720	285,728
Harford	337,061	37,403	14,857	6,726	2,305	61,292	563	106,710	3,327	86,525	21,816	56,829
Howard	162,172	28,998	15,891	7,914	2,322	55,126	368	56,558	1,318	45,529	2,223	1,050
Kent	264,605	7,785	1,799	567	197	10,349	174	26,811	283	114,508	25,236	87,244
Prince George's	319,255	50,583	52,388	23,268	7,824	134,063	1,848	117,230	6,924	29,210	20,748	9,232
Queen Anne's	326,845	16,275	4,851	1,686	515	23,327	93	28,054	503	141,419	42,975	90,474
Somerset	390,626	7,878	2,429	739	251	11,298	322	22,981	1,505	45,445	122,763	186,312
St. Mary's	489,118	21,940	7,802	3,254	1,268	34,265	521	109,949	4,018	50,956	29,035	260,373
Talbot	305,157	12,425	4,343	1,578	528	18,874	464	24,611	1,137	95,621	29,120	135,330
Wicomico	256,133	16,641	8,498	3,882	1,686	30,706	185	48,491	3,201	81,313	75,726	16,511
Worcester	444,706	14,230	6,430	3,363	1,859	25,882	3,631	39,793	1,965	90,738	137,980	144,718
Study Area Total	5,904,542	417,455	240,478	117,183	47,323	822,439	14,939	1,222,754	45,711	1,276,313	826,486	1,695,900

Source: NLCD 2016a

Table 11-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Maryland Study Area (Excluding Open Waters)

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Types
Anne Arundel	16.0	14.2	6.7	2.2	39.1	0.3	38.7	1.3	10.7	9.7	Urban/Forest
Baltimore City	18.9	24.6	25.9	22.1	91.5	0.7	6.8	0.2	0.6	0.3	Urban
Baltimore	17.4	10.3	5.6	2.0	35.3	0.6	38.8	0.7	22.4	2.2	Forest/ Urban /Agriculture
Calvert	11.2	3.6	1.3	0.4	16.4	0.1	58.2	1.6	13.8	9.8	Forest
Caroline	4.7	1.6	0.5	0.2	6.9	0.0	16.1	0.4	59.2	17.4	Agriculture
Cecil	10.4	3.2	1.5	0.5	15.6	0.7	37.3	1.4	39.9	5.1	Agriculture/Forest
Charles	8.6	3.7	1.3	0.4	14.0	0.4	55.7	1.9	14.2	13.8	Forest
Dorchester	3.2	1.5	0.5	0.2	5.3	0.1	8.2	1.0	32.0	53.5	Wetland/Agriculture
Harford	13.3	5.3	2.4	0.8	21.9	0.2	38.1	1.2	30.9	7.8	Forest/Agriculture/ Urban
Howard	18.0	9.9	4.9	1.4	34.2	0.2	35.1	0.8	28.3	1.4	Forest/ Urban /Agriculture
Kent	4.4	1.0	0.3	0.1	5.8	0.1	15.1	0.2	64.6	14.2	Agriculture
Prince George's	16.3	16.9	7.5	2.5	43.2	0.6	37.8	2.2	9.4	6.7	Urban /Forest
Queen Anne's	6.9	2.1	0.7	0.2	9.9	0.0	11.9	0.2	59.8	18.2	Agriculture
Somerset	3.9	1.2	0.4	0.1	5.5	0.2	11.2	0.7	22.2	60.1	Wetland
St. Mary's	9.6	3.4	1.4	0.6	15.0	0.2	48.1	1.8	22.3	12.7	Forest
Talbot	7.3	2.6	0.9	0.3	11.1	0.3	14.5	0.7	56.3	17.1	Agriculture
Wicomico	6.9	3.5	1.6	0.7	12.8	0.1	20.2	1.3	33.9	31.6	Agriculture/Wetlands
Worcester	4.7	2.1	1.1	0.6	8.6	1.2	13.3	0.7	30.2	46.0	Wetlands/Agriculture
Study Area Total	9.9	5.7	2.8	1.1	19.5	0.4	29.1	1.1	30.3	19.6	Agriculture/Forest

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

Table 11-5. Major Land Cover within each County in the Maryland Study Area

Predominant Land Cover Type(s)	Count	Geographic Units
Agriculture	4	Caroline, Kent, Queen Anne's, Talbot
Forest	3	Calvert, Charles, St. Mary's
Forest/Urban/Agriculture	3	Baltimore, Harford, Howard
Agriculture/Wetland	3	Dorchester, Wicomico, Worcester
Urban/Forest	2	Anne Arundel, Prince George's
Agriculture/Forest	1	Cecil
Wetlands	1	Somerset
Urban	1	Baltimore City

Source: NLCD 2016a

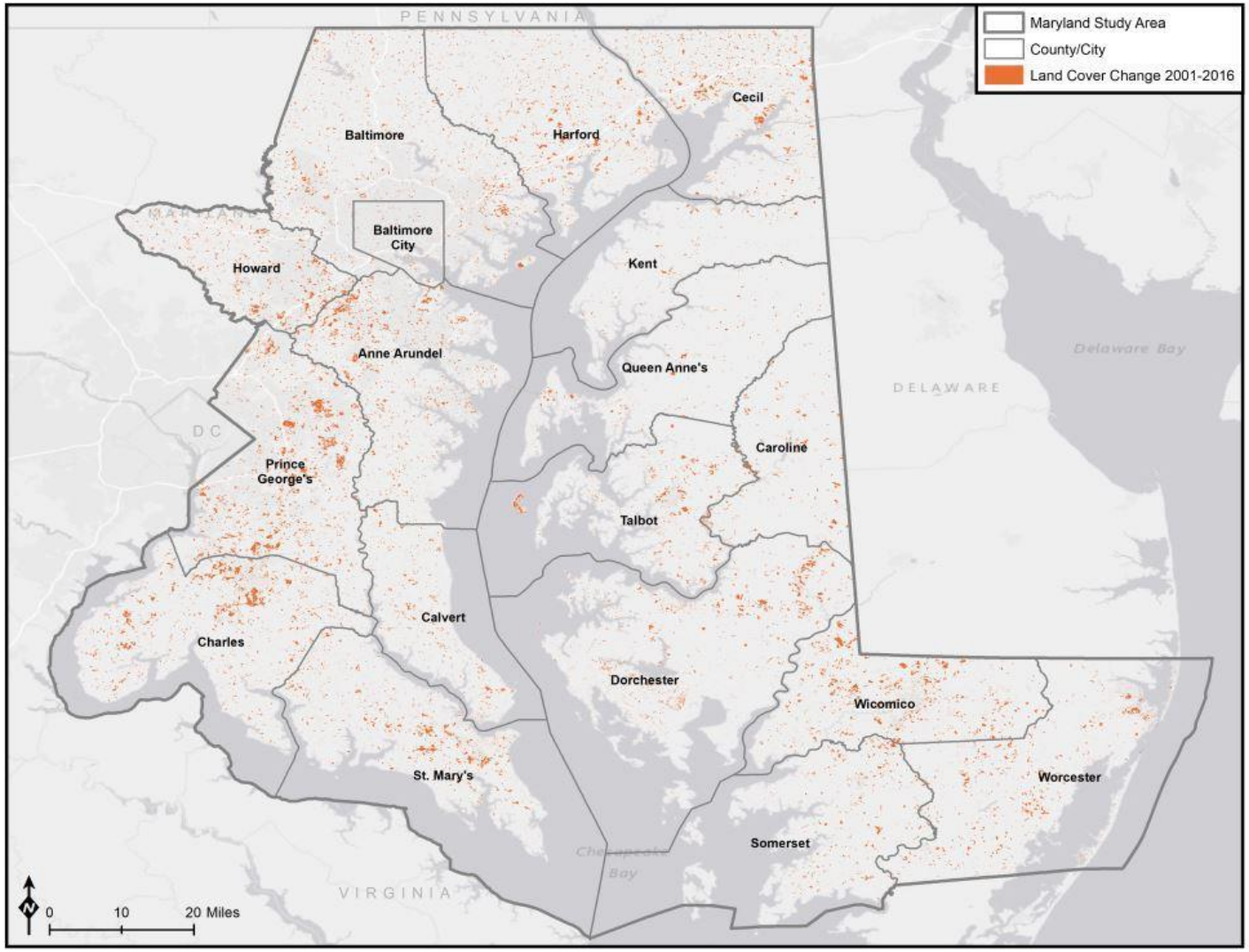
The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In Maryland, 2.6% of the land cover in the Study Area changed at least once. Figure 11-10 and Table 11-6 show the land cover change within the Study Area from 2001 to 2016. Prince George's County experienced the most significant land cover change at 6.1%. This county is adjacent to the District of Columbia, which is over 85% developed land cover, therefore it is likely that growth in Prince George's County relates to growth around the District and/or along the Interstate 95 corridor. Kent County experienced the least land cover change at only 0.8% followed closely by Queen Anne's County with 0.9%. Both of these counties are on Maryland's Eastern Shore and have no major population centers, however most of the change appears to be from or to developed land cover types (MRLC 2016).

Table 11-6. Land Cover Change for the Maryland Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Anne Arundel	376,190	12,414	3.3
Baltimore City	58,912	1,060	1.8
Baltimore	436,315	11,757	2.7
Calvert	220,847	3,889	1.8
Caroline	208,588	4,027	1.9
Cecil	267,416	9,902	3.7
Charles	411,482	14,043	3.4
Dorchester	629,114	9,993	1.6
Harford	337,062	10,188	3.0
Howard	162,172	8,537	5.3
Kent	264,605	2,208	0.8
Prince George's	319,255	19,409	6.1
Queen Anne's	326,845	3,090	0.9
Somerset	390,630	4,928	1.3
St. Mary's	489,118	9,408	1.9
Talbot	305,157	5,808	1.9
Wicomico	256,133	12,314	4.8
Worcester	444,712	8,554	1.9
Study Area Total	**5,904,552**	**151,527**	**2.6**

Source: NLCD 2001-2016

Based on the analysis of the general land cover within the Study Area, it seems most likely that counties including Ann Arundel, Baltimore, Harford, Howard, and Prince George's would be the most suitable counties to accommodate future industrial coastal projects.



Source: NLCD 2001-2016

Figure 11-10. Land Cover Change in the Maryland Study Area

11.3.2 Land Use

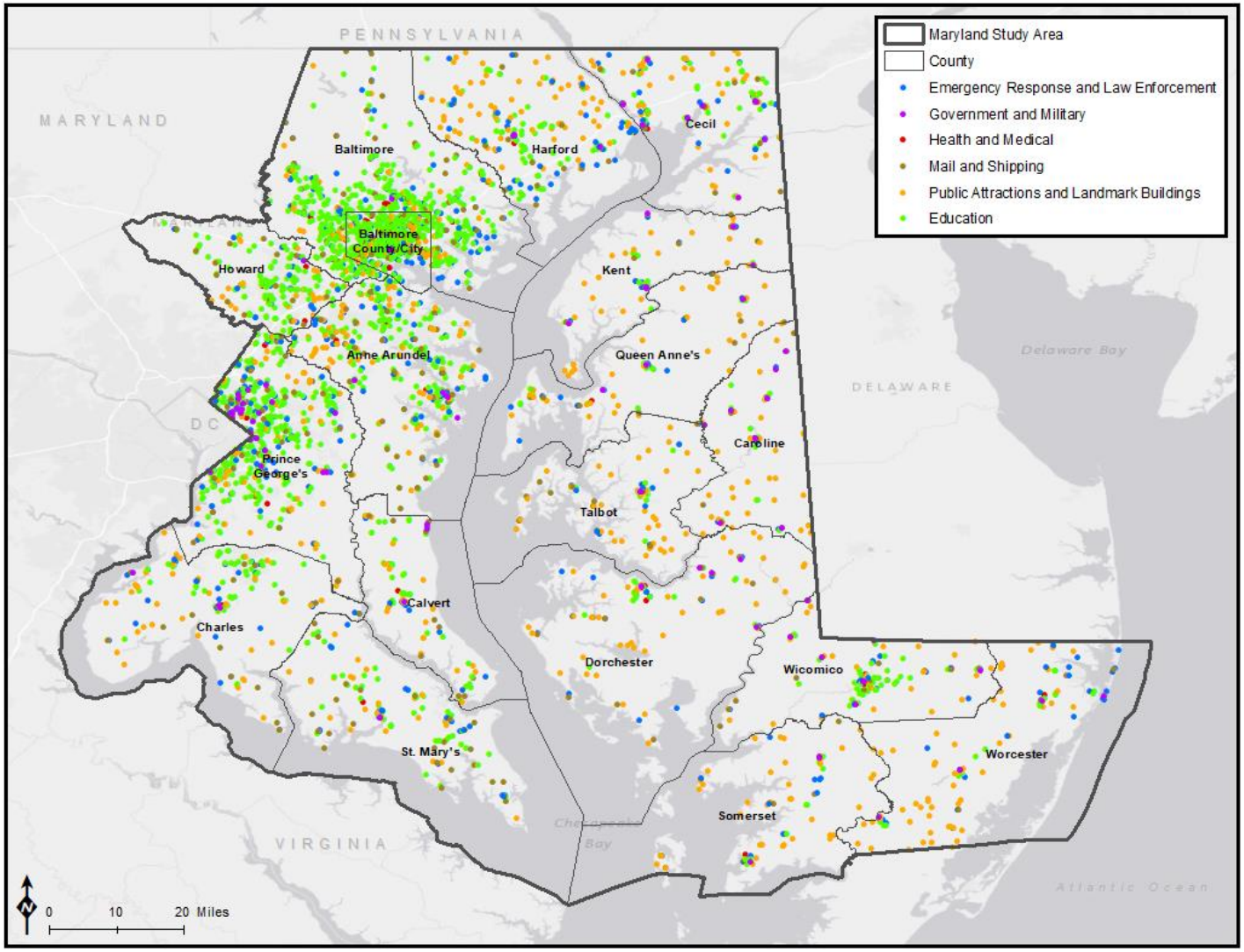
Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

11.3.2.1 Existing and Future Land Use

The land cover data provides an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 11-11 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 11-12 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis which identified developed areas in Chapter 11.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

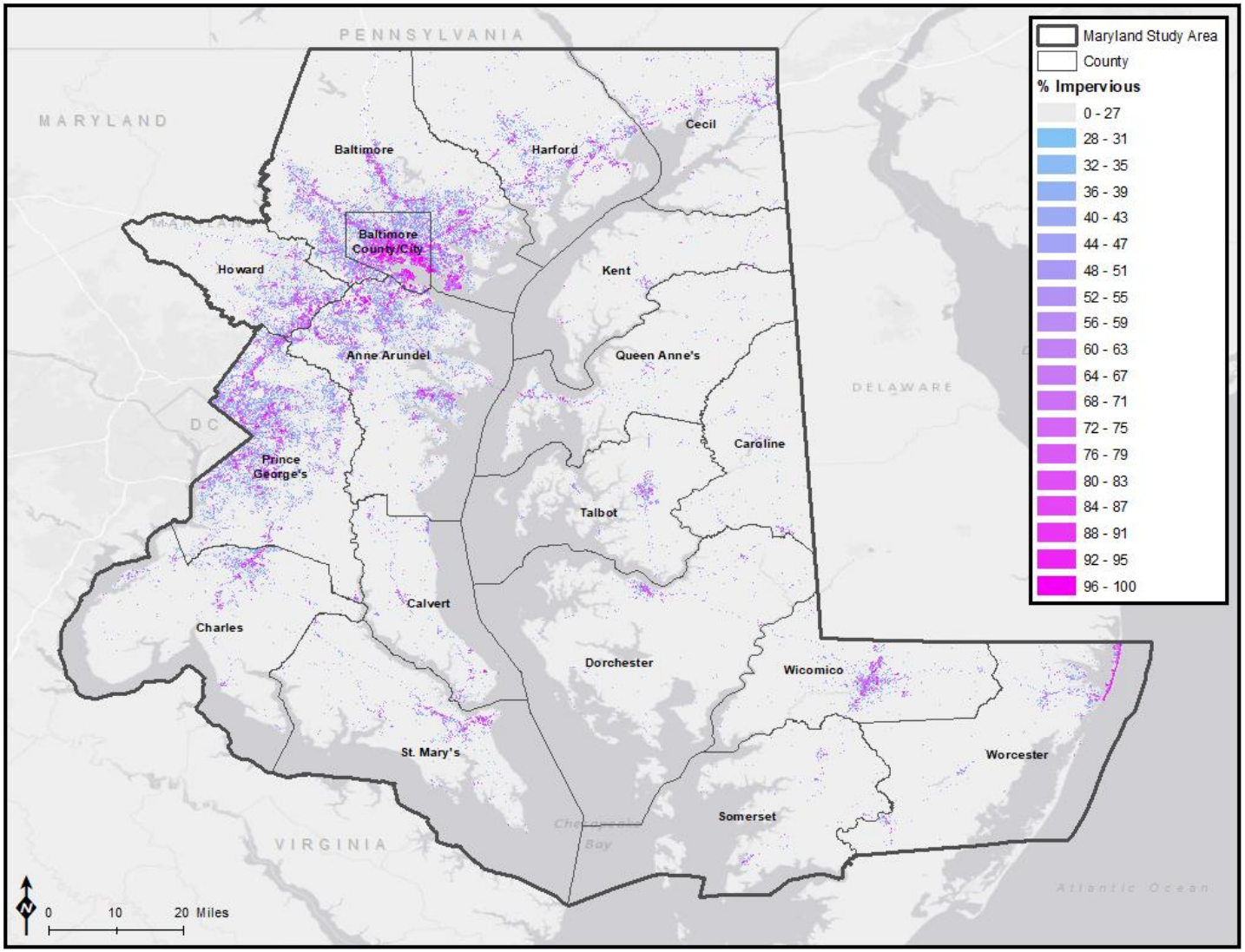
A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Counties within the Study Area may have a distinct comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of five to ten or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to show case future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 11.3.2.2.

In summary, existing land use data shows there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data shows the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses. Structures and impervious cover in the Study Area mirror land cover trends for urban development. Geographic areas with more intense land use are Baltimore County (City of Baltimore) and other counties adjacent to the City of Baltimore, Howard and Anne Arundel County; counties along the Interstate 95 corridor, Prince George's, Hartford, and Cecil County; and other areas with cities of populations over 25,000, as shown in Figure 11-2.



Source: USGS 2017

Figure 11-11. Select Existing Land Uses within the Maryland Study Area



Source: NLCD 2016b

Figure 11-12. Impervious Surfaces within the Maryland Study Area

In Maryland, local jurisdictions have land use planning authority through the Land Use Article of the Maryland Annotated Code in all non-charter counties and all incorporated municipalities, except for Montgomery and Prince George's counties and some of their jurisdictions (MDP 2020). However, the Maryland Department of Planning works closely with Maryland's counties and municipalities in guiding future development and reviews comprehensive plans for consistency with the State's Smart Growth and growth management laws (MDP 2020). Maryland Department of Planning releases an annual report to highlight its accomplishments (MDP 2019).

Maryland is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. There are 149 Qualified Opportunity Zones designated in Maryland, located in 23 different counties. Baltimore County houses the largest number of zones within the State at 42 (Realized 2020). Maps of opportunity zones in Maryland are located online https://dhcd.maryland.gov/Pages/OZ/OpportunityZones.aspx.

Analysis of future OCS-related projects should consider resources such as the Opportunity Zones that have already targeted areas for potential development. Additionally, future OCS-related project would benefit from consideration of local comprehensive plans (or equivalent) for the county or city within which they are interested in developing a new project. Counties and cities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the OCS-related project planners in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time. Upon cursory review of comprehensive land use planning documents from the Study Area, future land use trends in Maryland try to balance economic growth with preserving rural land and environmental sustainability.

11.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

11.3.2.3 Industrial Incentives

Maryland offers several tax credits, grants, and other business incentives to businesses and industries (MDC 2018). All State-sponsored incentives are offered through the Maryland Department of Commerce,

which serves as the State's primary economic development agency (MDC 2018). In addition to business and financial incentives, Maryland also offers agencies that support and offer funding for businesses. These agencies are the Maryland Industrial Development Financing Authority and Advantage Maryland. Maryland Industrial Development Financing Authority encourages private sector growth and investments with insurance, and the release of tax-exempt and taxable revenue bonds. Insurance through Maryland Industrial Development Financing Authority reduces credit risk but is limited by the applicable program limits (MDC 2020). Advantage Maryland is a flexible and broad program that funds grants, loans, and investments to encourage and support economic development initiatives. Uses include business attraction and retention, infrastructure support, brownfield redevelopment, and other strategic local planning (MDC 2020).

The Brownsfield Revitalization Incentive Program provides an investor or business entity with tax credits, loans, or grants for the redevelopment of eligible brownfield properties in jurisdictions that participate in the Brownsfield Revitalization Incentive Program (MDC 2018).

Enterprise Zone Tax Credits are given through the Enterprise Zone program, which serves to lower the property and income tax of the business or taxpayer. The business or taxpayer may be issued different credits based on criteria regarding their new employees (MDC 2018).

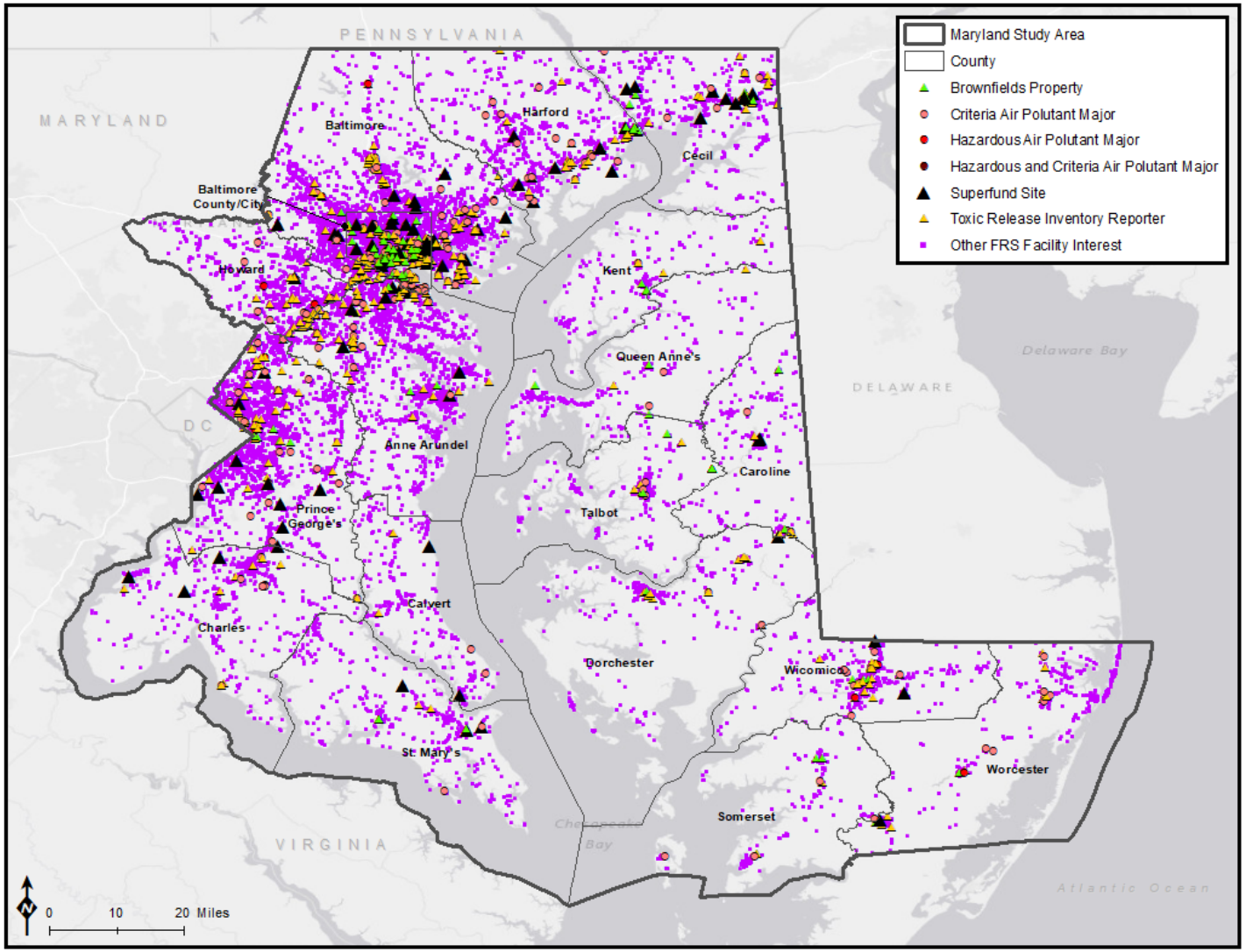
The Job Creation Tax Credit is available to companies or businesses that create a minimum number of new full-time positions. In order to be eligible, businesses must create at least 60 new full time jobs. The credit is applied against the State income tax and is valued at $3,000 per job or $5,000 per job in a revitalization area (MDC 2018).

Maryland commerce is also bolstered and supported by several business development teams provided by Maryland Commerce. The Maryland Commerce Office of International Investment and Trade works to facilitate the export of products to global markets and international marketing (MDC 2018).

11.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 11-13 presents the USEPA—tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.



Source: USEPA 2018a

Figure 11-13. USEPA Facility Register Service Record for the Maryland Study Area

- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility:* Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 11-13, industry is concentrated in the major urban centers of Baltimore and Prince George's County, west of the District of Columbia and along the Interstate 95 corridor. Chapter 11.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

11.3.2.5 Protected Areas

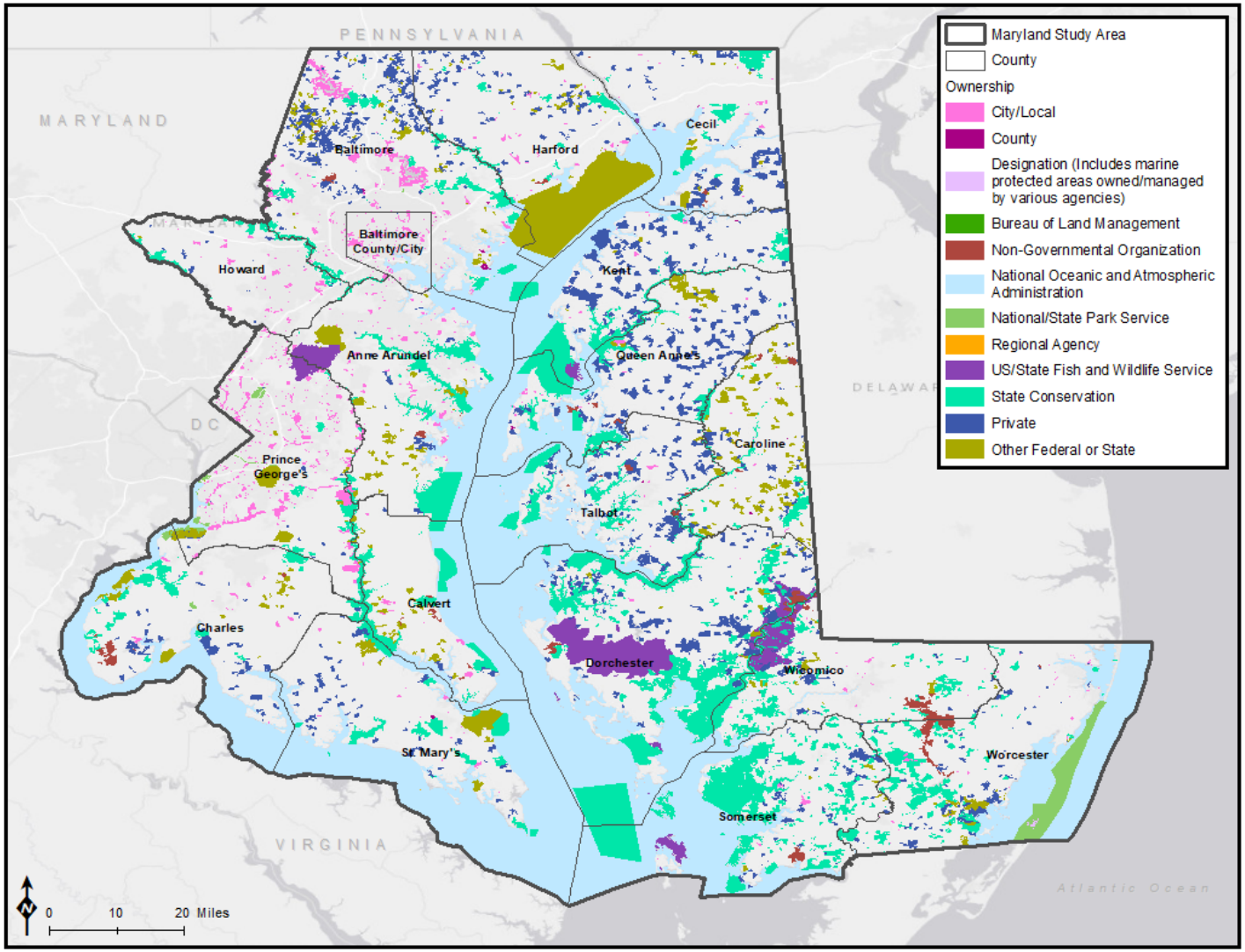
The PAD-US produced by the USGS is the official National inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier, as well as to provide a more complete picture of recreational opportunities (USGS 2019f). This will also lead to a better understanding of land use change over time. Figure 11-14 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

As can be seen in Figure 11-14, several counties on Maryland's Eastern Shore (Kent, Queen Anne's, Talbot, Dorchester, Somerset, and Worcester Counties) have large areas of protected shoreline. Counties to the west of the Chesapeake Bay also have protected State conservation lands along the shoreline. In Harford County, the protected area along the coast is Phillips Army Airfield and Aberdeen Proving Ground owned by the U.S. Army. However, it is most important to note that the Chesapeake Bay itself is a protected area (CBP 2020). Protected areas will need to be considered during analysis of potential future OCS-related projects. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

11.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Maryland, resided in the area long before the era of European exploration. They lived along the Eastern Shore and settlements were near large rivers. Over time, populations grew, and the people became less mobile, practiced agriculture, and feasted on seafood. They also began to develop trade networks. Settlements were focused in riverine areas and were notable for concentrated villages and elaborate ceremonial practices (Maryland Archaeological Conservation Lab 2012). This culture continued into the period of European settlement. At that time, the tribes of Maryland were Algonquian in language and politics, but they were under pressure from the Iroquois to the northwest (DiLisio and Bready 2019).



Source: USGS 2019f

Figure 11-14. Protected Areas within the Maryland Study Area

The founding of Maryland is tied to an Englishman, George Calvert. Calvert was interested in sailing to the New World for commercial reasons and to create a refuge for Roman Catholics. Calvert originally landed in Newfoundland, Canada, but decided to seek his fortunes where the weather was warmer. King Charles I granted him land north of the Potomac River where he was named the 1st Baron Baltimore of the Province of Maryland. When George Calvert died in 1632, his son Cecil Calvert, became the 2nd Baron Baltimore and named the colony after King Charles I wife, Queen Henrietta Maria (Encyclopedia.com 2020a). George Calvert's second son, Leonard Calvert, sailed to America on November 22, 1633, with approximately 250 settlers. They landed at St. Clements Island in southern Maryland on March 25,1634, which is still celebrated today as Maryland Day. This was the site of the first Catholic mass in the colonies, and two days later, Leonard Calvert purchased a site from the Yaocomico Indians and established the town of St. Mary's. St. Mary's became the first capital of Maryland (Encyclopedia.com 2020a). Maryland's settlers made peace with the local American Indians and established farms and trading posts on the shores and islands of the lower Chesapeake. By the 1660s, the population center shifted to the north and west and in 1694, the capital was moved from St. Mary's to Protestant-dominated Anne Arundel Town (now Annapolis). Baltimore was later founded in 1729.

Until 1767, the British colonies of Pennsylvania, Maryland, and Delaware disputed the colony boundaries. The long-standing dispute was settled in 1767 when Great Britain recognized latitude 39°43′ N as the legal boundary. The boundary was named the Mason and Dixon Line for its surveyors, Charles Mason and Jeremiah Dixon. By 1769, this line came to be regarded as the traditional division between the North (free states) and the South (slave states). Although no major battles of the American Revolutionary War (1775-1783) were fought in Maryland, Marylanders took an active part in the American Revolution. The Continental Congress, often on the move to avoid British troops, met in Baltimore from December 1776 to March 1777 and met in Annapolis from November 1783 to June 1784. Thus, these cities were among the eight that served as U.S. capitals before the designation of a permanent seat of government in the District of Columbia. (DiLisio and Bready 2019, Encyclopedia.com 2020a). At the close of the Revolutionary War, in 1783, the Continental Congress convened in Annapolis, where it accepted Washington's resignation from the army and ratified the Treaty of Paris. After the Revolutionary War, states quarreled among themselves, including Maryland and Virginia for navigational rights to the Potomac River and Chesapeake Bay. However, Maryland and Virginia signed an agreement known as the Compact of 1785, or the Mount Vernon Compact. This set a model example of how states could cooperate, and ultimately led to the Annapolis Convention in 1786 and the Constitutional Convention in 1787 in Philadelphia which resulted in the creation of the Constitution of the United States. In 1791, Maryland ceded territory and advanced money for public buildings to help form the District of Columbia (DiLisio and Bready 2019).

During the War of 1812 (1812-1815), in August 1814, British troops set fire to several government and military buildings in Washington, D.C. In September 1814, British troops attempted to inflict similar destruction on Baltimore's Fort McHenry; however, the British attack at Fort McHenry was unsuccessful and the American flag remained flying at the fort. Upon seeing this, Francis Scott Key, a witness to the bombing attack of Fort McHenry, was inspired to write "The Star-Spangled Banner," which became the national anthem in 1931 (History.com Editors 2009). Following the War of 1812, Maryland and the rest of the country concentrated on making improvements in transport and communication. In 1818, the Cumberland Road, or National Road, was completed and was the first road funded by the federal government. The road promoted westward expansion, encouraged commerce between the colonies, and began the interstate highway system (National Geographic 2020).

Harriet Tubman was born in slavery on Maryland's Eastern Shore. She escaped to Pennsylvania and became a conductor of the Underground Railroad helping slaves escape to freedom from 1849 to 1860. She later served as a cook, nurse, scout, and spy for the Union Army during the Civil War (Harriet Tubman 2020). The 125 mile long Harriet Tubman Byway includes 45 sites associated with Harriet

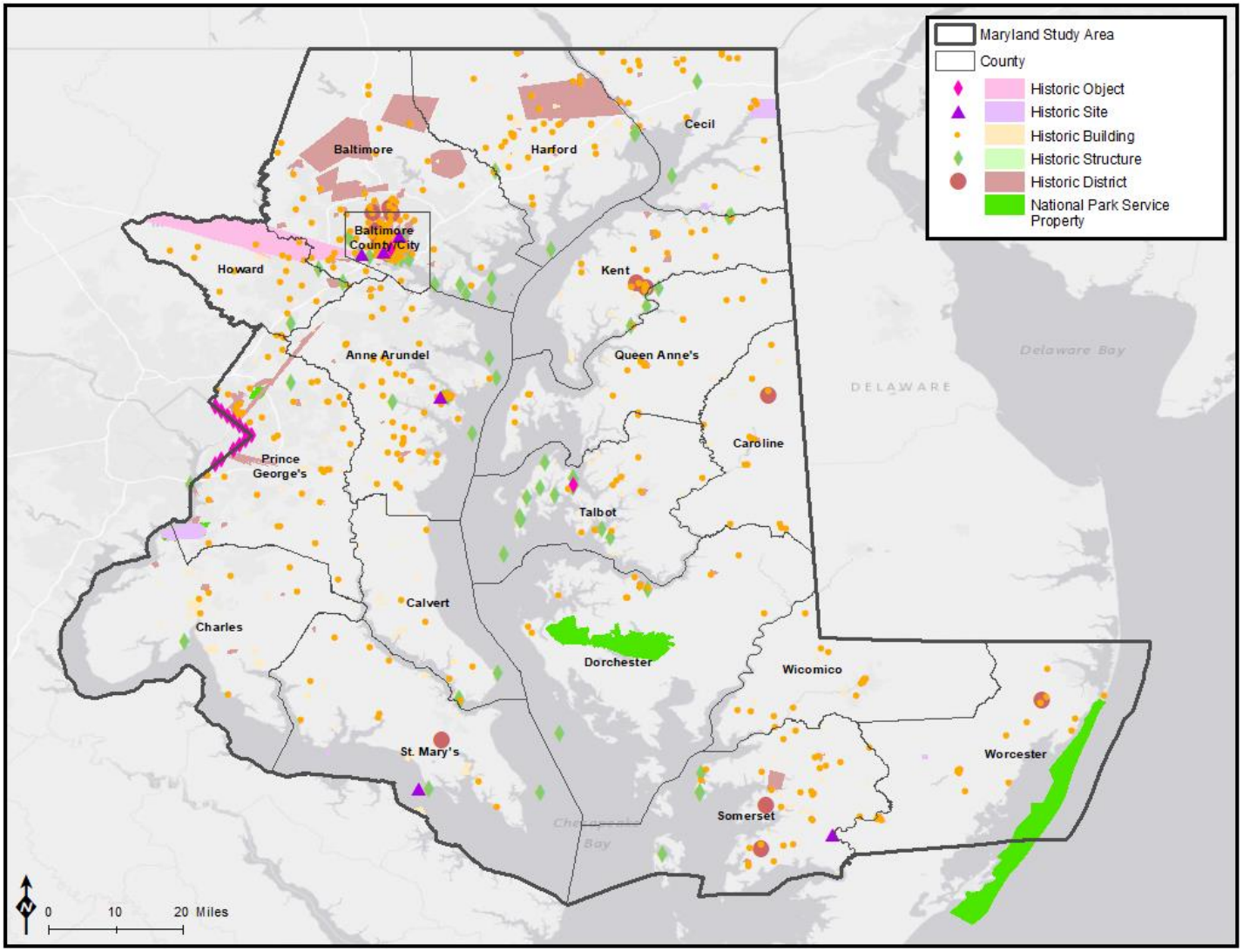
Tubman's life and the Underground Railroad along the Eastern Shore between Maryland, Delaware, and Pennsylvania (Harriet Tubman 2020).

As mentioned, the northern border of Maryland is the Mason-Dixon Line, which separates the North and the South. But although Maryland was a slave state, Marylanders were divided during the Civil War (1861-1865). Residents of the Eastern Shore and southern Maryland who owned large farms supported the Confederacy, while workingmen in northern and western Maryland supported the Union. Thus, Maryland did not secede with the other southern states during the Civil War. In 1861, Federal troops occupied Baltimore and Annapolis (DiLisio and Bready 2019). Maryland was important during the Civil War because it was the only land that separated the Union Capital in the District of Columbia and the Confederate capital in Virginia. Maryland was largely occupied by Union troops, but Marylanders fought on both sides during the war. One major battle took place on Maryland soil—the Battle of Antietam in 1862. By 1864, Maryland voted to abolish slavery.

After the Civil War, Maryland prospered. The state was an important stockpile for raw materials from, and consumer goods to the South and Midwest, and became a growing center of industry that rarely was controlled from within the state. Increasingly, the character of Maryland began to change because of its proximity to the seat of national government. During, and after, World Wars I and II, Maryland became a major center for Federal installations, both military and civilian. The most important change was the radically different aspect of the Maryland suburbs of the District of Columbia, which reflected change not only in the greater numbers of people but also in their unusually high educational and economic status (DiLisio and Bready 2019).

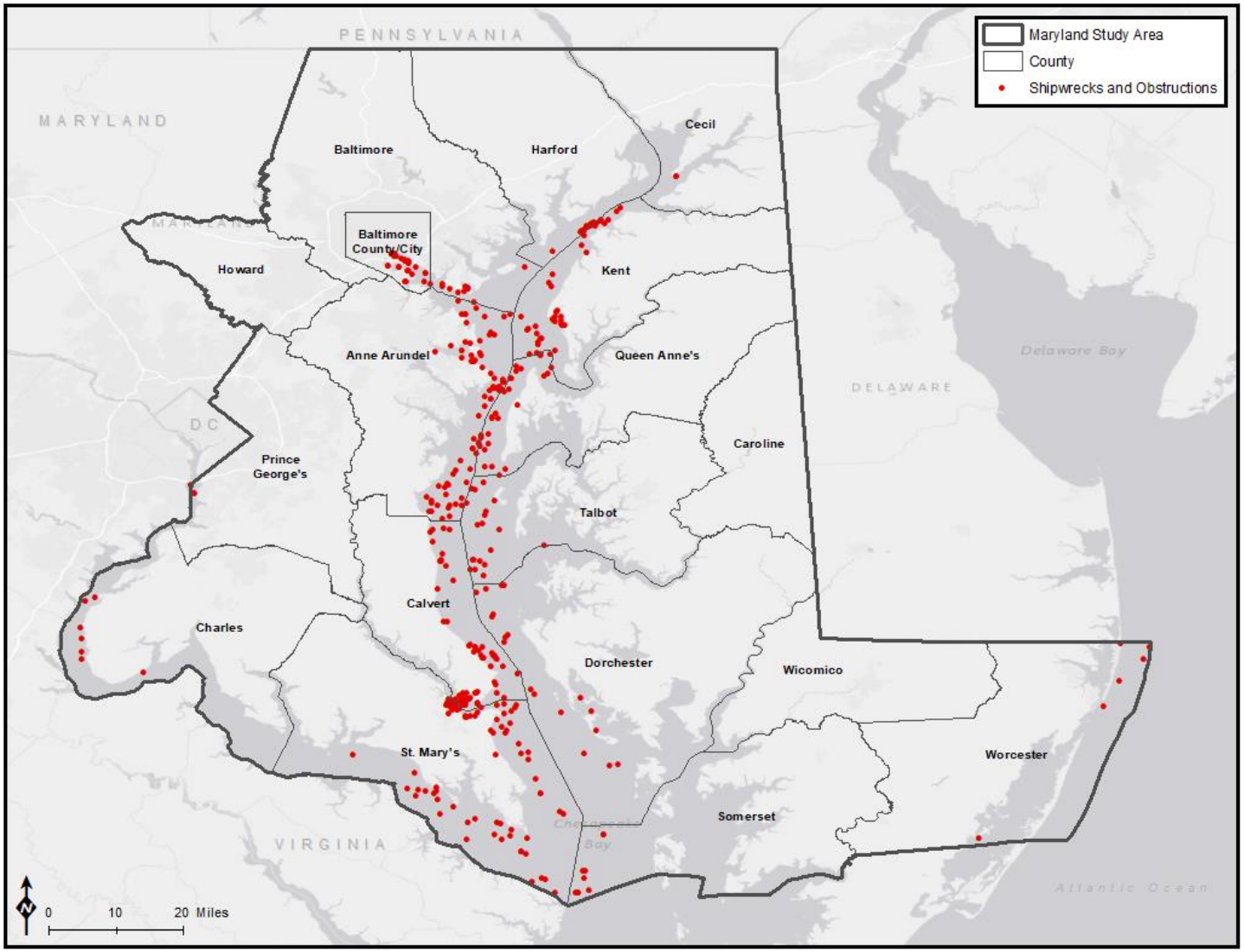
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with American Indians, colonization, the American Revolution, the War of 1812, and the American Civil War; sites associated with slavery and the abolitionist movement; the Underground Railroad; World War I and II; and the Civil Rights Movement. Maryland's economy was historically based overwhelmingly on agriculture focusing heavily on tobacco up until the early 2000's. The state's leading manufactured products were men's clothing and steel primarily in the automotive industry (Encyclopedia.com 2020a). Figure 11-15 and Figure 11-16 present a summary of many of these historic locations, including maritime sites and shipwrecks in the Chesapeake Bay and the Atlantic Ocean.

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coast states (including Maryland) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.



Source: NPS 2014

Figure 11-15. Cultural and Historic Sites within the Maryland Study Area



Source: NOAA 2016a

Figure 11-16. Shipwrecks and Obstructions within the Maryland Study Area

In summary, many cultural sites in the Study Area are identified in Figure 11-15 and Figure 11-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Maryland's cultural and historical resources, potential future projects will need to conduct detailed cultural resource surveys of proposed project sites (and their immediate vicinity) to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

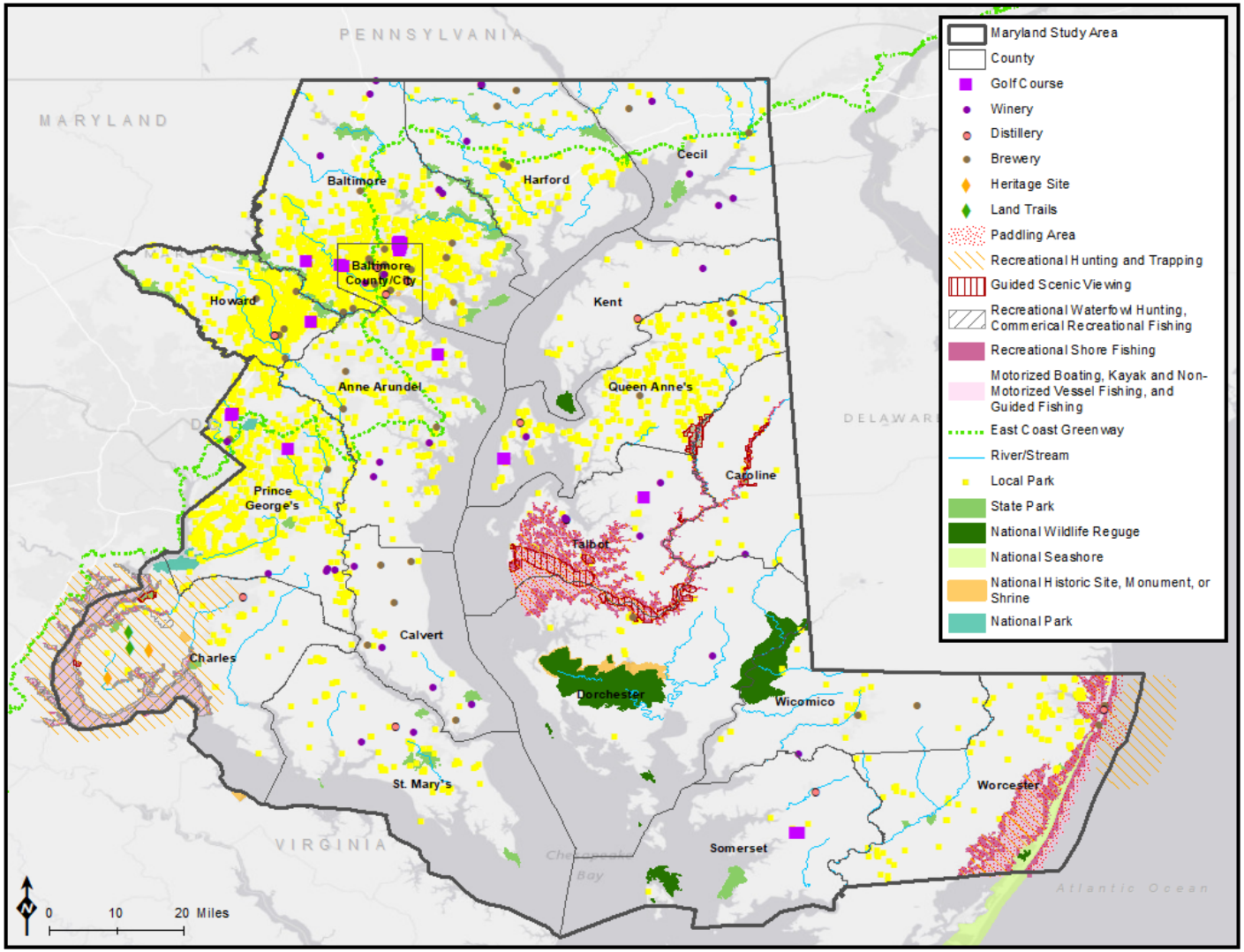
11.3.2.7 Recreation

The Study Area has diverse recreational opportunities including historic sites, museums, beaches, State and National parks, wineries, dining and shopping areas, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 11-17. The cultural and historic resources shown in Figure 11-15 and Figure 11-16 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 11-14. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 11.3.2.6), transportation (Chapter 11.3.2.8), tourism employment (included in Chapter 11.4.4), and rental housing (included in Chapter 11.4.3).

According to the Maryland Office of Tourism, the Study Area is divided into five tourism regions: Central Region, Eastern Shore Region, Capital Region, Southern Region, and Western Region (Visit Maryland 2020b). Counties within the Study Area cover all but the Western Region, as shown in Figure 11-18. Maryland's tourism website also identifies counties within each Region, along with popular tourist attractions and destinations for each county (Visit Maryland 2020b).

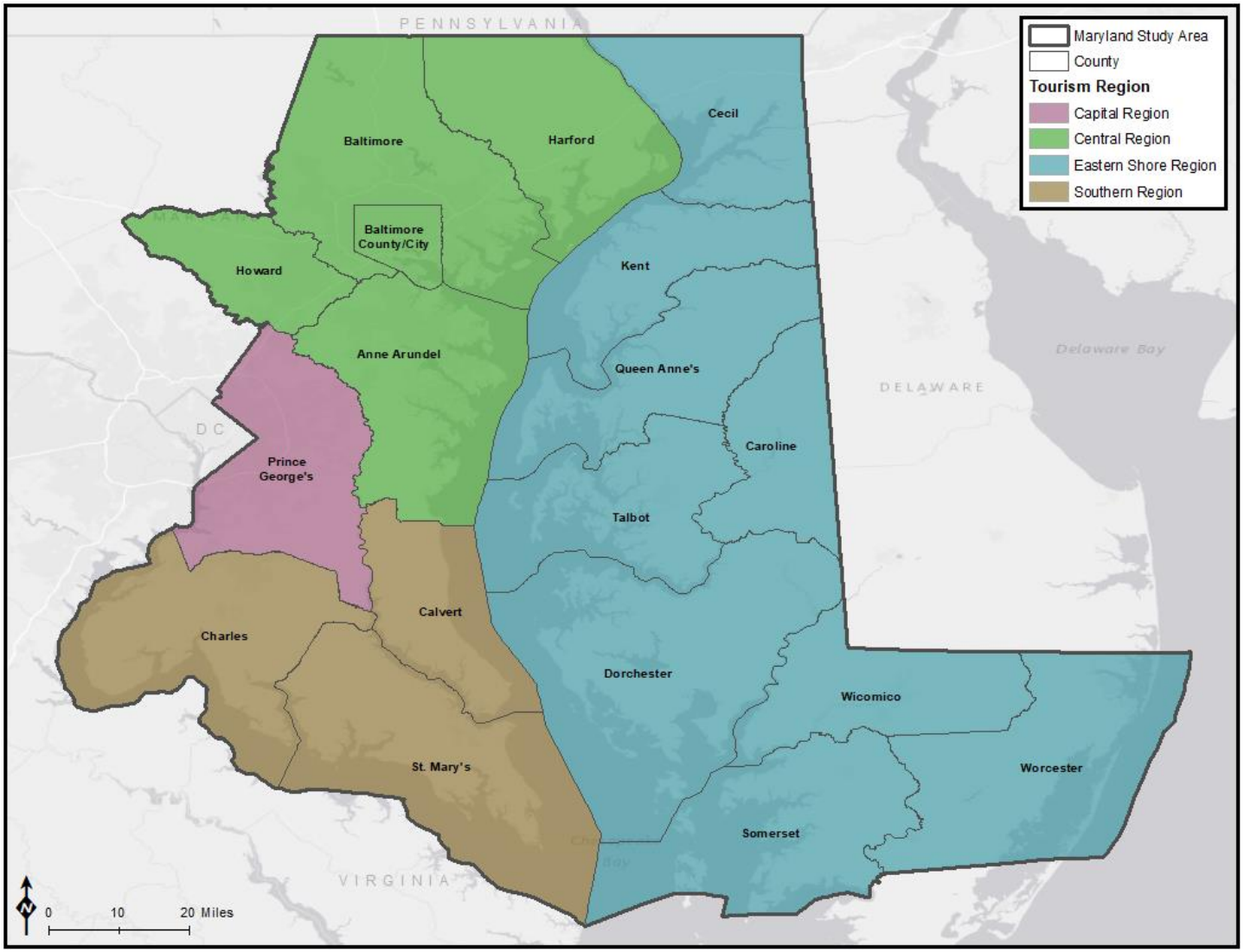
Central Region

It was estimated that, in 2018, 21.3 million domestic travelers visited the Central Region of Maryland, which includes Anne Arundel County, Baltimore County, Baltimore City, Harford County, and Howard County. Overall, the top destination in the Study Area is Baltimore City even though the high crime-rate is a concern for travelers (Zay 2019, U.S. News 2019a). Baltimore is well known for its steamed blue crabs, raw oysters, Maryland crab cakes, and Maryland crab soup. In 2017, over 26.2 million domestic and international travelers visited Baltimore, spending $5.7 billion in total visitor spending and supporting 85,678 tourism-related jobs (Visit Baltimore 2018).



Sources: Maryland.gov 2019a, NPS 2014, USFS 2019b

Figure 11-17. Select Recreational Resources within the Maryland Study Area



Source: Visit Maryland 2020b

Figure 11-18. Tourism Regions within the Maryland Study Area

Popular activities in the Central Region include shopping and dining, visiting beaches and the waterfront, and nightlife (Maryland Office of Tourism 2019). Activities in Baltimore City and Baltimore County include attending professional sporting events for the Baltimore Ravens (football) and Baltimore Orioles (baseball) and visiting the Baltimore Inner Harbor which has cruises, museums (art, history, technology and transportation, maritime, children's), the National Aquarium, Maryland Science Center, Fort McHenry National Monument, historic ships, and dining and shopping (Broadwater 2020, Visit Baltimore 2020). Some of the popular events in Baltimore County include Preakness Stakes (May), Baltimore Artscape (July), Baltimore Book Festival (September), African American Festival (July), and several other foot races, holiday parades and festivals (Top Events USA 2014c).

The City of Annapolis is located in Anne Arundel County and popular destinations include the U.S. Naval Academy, the National Cryptologic Museum, Maryland State House, St. Ann's Church which was built in the 1700s, the Annapolis Maritime Museum, and many historic buildings and sites, county trails, and parks. Access to the Chesapeake Bay also provides opportunities for a variety of water-based recreational activities in the Central Region including boating, kayaking, and canoeing, including Chesapeake Bay Sailing Excursions (Anne Arundel County 2020, Seavery and Law 2020). Also in Anne Arundel County is Maryland Live Casino. Popular events in Anne Arundel County, in the Central Region, include the Maryland Renaissance Festival (August-October), Annapolis Arts Week (June), Maryland Seafood Festival (September) and the Chesapeake Bay Blues Festival (May) (Top Events USA 2014c, ABC Events 2020, Visit Annapolis 2020, bayblues.org 2020).

In Howard County, visitors can enjoy the B&O Museum, wineries, theaters, golf courses, ghost tours in Ellicott City, and State parks (David 2020). Annual events in Howard County include Blossoms of Hoe Cherrybration Days (April), Maryland Sheep and Wool Festival (May), Capital Jazz Fest (June), Howard County Pow-Wow/American Indian Show and Festival (July), Howard County Fair (August),and Far-Cuty Celebration (September) (Visit Howard County 2020).

There are also several State parks in the Central Region. There are five State parks in Baltimore County including Gunpowder Falls State Park (18,000 acres), Hart-Miller Island State Park (1,100 acres), North Point State Battlefield from the War of 1812 (9 acres), North Point State Park (1,310 acres), and the 19.7 mile Torrey C Brown Rail Trail. There are three State parks in Harford County (Palmer State Park [555 acres], Rocks State Park [855 acres], and Susquehanna State Park) and two State parks in Anne Arundel County (Franklin Point State Park [477 acres], Helen Avalynne Tawes Garden, and Sandy Point State Park [786 acres]). There is one State park in Howard County (Patapasco Valley State Park [16,043 acres] (MDDNR 2020a).

Eastern Shore Region

The second most popular destination in the Study Area is Ocean City in Worcester County, on Maryland's Eastern Shore. The Eastern Shore Region includes Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester Counties. In 2018, approximately 8.3 million people visited the Eastern Shore Region (Maryland Office of Tourism 2019). In addition to the beach and 3-mile boardwalk in Ocean City, other popular beaches on the Eastern Shore including Assateague Island National Seashore (Worcester County), Cherry Beach (Wicomico County), Matapeake Beach State Park (Queen Anne's County), Betterton Beach (Kent County). Many of these beaches are part of the 38 State Parks in the Study Area where people can also go fishing, hiking, biking, camping, and hunting. The Maryland Department of Natural Resources has an interactive website that identifies State parks in each designated region of Maryland (MDNR 2020a). Travelers to the Eastern Shore Region can visit the zoo, horse racetrack with onsite casino, the Blackwater National Wildlife Refuge, museums, and historical landmarks. They can also go on fishing charters or take guided canoe tours (Visit Maryland 2020b, Meyer 2020).

Annual events on the Eastern Shore include the Antique and Classic Boat Festival (June), Ocean City Air Show (June), White Marlin Open (August), Sun Fest (September), National Hard Crab Derby and Fair (September), and the National Folk Festival (September), and Winterfest of Lights (November-December), (Top Events USA 2014c, Ocean City 2020, boatfestival.org 2020, National Folk Festival 2020).

Capital Region

In the Capital Region adjacent to Washington D.C. is Prince George's County. There are three State parks in Prince George's County and several local parks. The three State parks are Merkle National Resources Management Area (1900 acres), Rosaryville State Park (982 acres), and Cedarville State Forest (3,500 acres), which is said to be the location of an Indian Burial ground (MDDNR 2020a). Some of the attractions in Prince George's County include museums, the Goddard Space Flight Center, Six Flags America, and the National Harbor on the Potomac River which has several family-friendly activities including concerts, boats and kayak rentals, sightseeing cruises and tours, cultural activities, and waterfront activities (Visit Maryland 2020b, National Harbor 2020). FedEx Field, home of the Washington Redskins (football) is also in Prince George's County. Additionally, with Prince George's County being so close to the District of Columbia and Annapolis, it was estimated that 7.4 million people visited Prince George's County in 2017, and that there were 27,000 tourism related jobs (Prince George's County 2018). Annual events include Maryland Day (April), National Harbor Wine and Food Festival (June), Colonial Day (July), Chesapeake Crab and Beer Festival (August), Prince George's County Fair (September) and Annual National Harbor Tree Lighting and Fireworks (November) (Visitors Guide 2020).

Southern Region

The Southern Region includes Calvert, Charles, and St. Mary's Counties. In 2017, tourist spending was $152 million, supporting nearly 1,300 jobs (Calvert County News 2018). In 2016, tourism related sales in St. Mary's County was $163.4 million which supported 1,372 direct jobs (St. Mary's County 2017). In 2015, tourist economy in Charles County brought in $225.6 million and supported 2,026 direct jobs (Tourism Economics 2016). There are 10 State parks in this region: Jefferson Patterson Park and Museum (560 acres) and Calvert Cliffs State Park, which covers 24 miles of shoreline in the Chesapeake Bay are in Calvert County. Chapel Point State Park (600-acre undeveloped multiuse park on Port Tobacco River), Chapman State Park (862 acres), and Smallwood State Park (682 acres) are in Charles County. The five State parks in St. Mary's County include Greenwell State Park (596 acres on the Patuxent River), Newtowne Neck State Park (794-acre peninsula), Point Lookout State Park (1,595 acres) where Confederate soldiers were imprisoned during the Civil War, St. Clements Island State Park (62 acres), and St. Mary's River State Park which is divided into two sites for fishing and boating (250 acres) and for hunting and wildlife management (2,220 acres) (MDDNR 2020a). There are also several beaches in the Southern Region including Point Lookout State Park in St. Mary's County and North Beach, Breezy Point Beach, Chesapeake Beach, and Calvert Cliffs State Park in Calvert County (Visit Maryland 2020c). Annual events in St. Mary's County include the Governor's Cup Yacht Race (August), L'il Margaret's Bluegrass and Old-Time Music Festival (August), Annual Blessing of the Fleet (October), St. Mary's County Oyster Festival (October). The Patuxent River Appreciation Days (October) is in Calvert County, and each county in Southern Maryland also has a county fair in September (Southern Maryland 2020).

Summary

In summary, there are many recreational activities available in the Study Area, especially in Baltimore City and Baltimore County because of the professional sports teams, museums, waterfront activities in the Baltimore Inner Harbor, and shopping and dining experiences. Counties in the Eastern Shore Region are also popular tourist destinations because of the beaches, boardwalks, museums, restaurants, and shops.

Ocean City in Worchester County is the most visited destination in the Eastern Shore Region. Wicomico and Talbot Counties are also popular tourist destinations. Based on collected admission and amusement taxes, the counties in the Study Area least impacted by tourism are all in the Eastern Shore Region: Caroline, Somerset, Kent, Dorchester, and Cecil Counties (Maryland Office of Tourism 2019). Because of the beach-related recreational opportunities, April through September are peak tourist months in much of the Study Area. There are also several annual festivals and events that occur throughout the year the Study Area, especially in Baltimore and Worcester Counties. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages once site-specific information is known. Therefore, the potential impacts on recreation from potential future OCS-related projects should be considered during analysis.

11.3.2.8 Transportation Resources

Maryland is the ninth smallest State, but it contains a large degree of geographic diversity. The Maryland Department of Transportation (MDOT) is responsible for statewide transportation planning across all modes including State roadways, transit, rail, freight movement, pedestrian and bicycle networks, aviation, the Port of Baltimore, and driver and vehicle services. State and local governments share the responsibility for providing transportation services and facilities in Maryland. Maryland local roads carry 28% of the vehicle miles of travel statewide, while State-owned roadways carry 72% of the vehicle miles of travel. Also, Maryland is one of the few States that owns and operates a transit system. Maryland is divided into five regions – Eastern Shore, Baltimore Metro Region, Washington Metro Region, Southern Maryland, and Western Maryland (MDOT 2019). Each of the regions has its own character, distinct needs, and associated transportation system. Only the Western Maryland Region and the northern portion of the Washington Metro Region (Frederick County and Montgomery County) are not located within the Study Area.

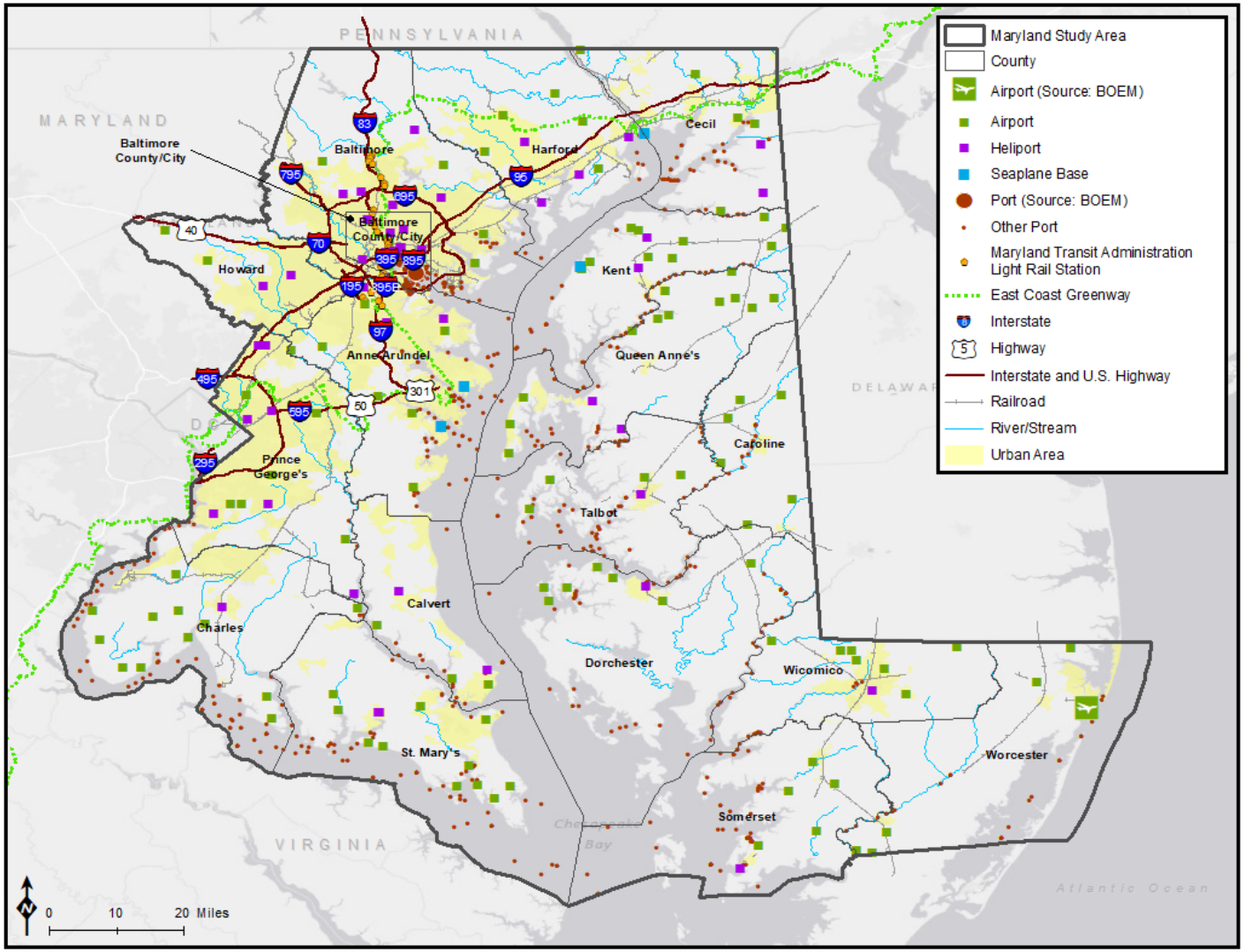
The Eastern Shore's transportation system is automobile oriented. Communities like Salisbury and Ocean City have local fixed-route bus systems. Intercity bus providers connect the Eastern Shore to the Baltimore Metro Region. The transportation network in the region connects Maryland to Pennsylvania, Delaware, and Virginia.

The Southern Maryland Transportation System is automobile oriented. Each of the region's counties operates its own fixed-route bus system. Commuter bus routes also provide access from the region to Washington DC metro area. The transportation network in the region connects Maryland to Virginia across the Potomac River.

The Baltimore Metro Region has many non-automobile transportation options including light rail, metro bus, and commuter rail. It is also home to the Port of Baltimore, Baltimore/Washington International Thurgood Marshall Airport, and Martin State Airport. The transportation network in the region connects Maryland to Pennsylvania, Delaware, and the east coast.

Although the majority of the Washington Metro Region (except for Prince George's County) is located outside of the Study Area, it contains a radial highway system and an extensive and heavily used commuter rail, subway, and bus transit network. The transportation network connects Maryland to Washington D.C. and Virginia.

Figure 11-19 shows the transportation resources throughout the Maryland Study Area. The main freight truck corridors in the Study Area include I-83, I-95, I-70, I-495, I-595, I-695, I-795, I-395, and I-895. Most of these major interstate routes are in and around Baltimore and Washington D.C. Major truck corridors in the southern part of the Study Area include U.S. Route 301, U.S. Route 50, U.S. Route 13, and U.S. Route 113.



Sources: Maryland.gov 2019b, Maryland.gov 2019c, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 11-19. Transportation Resources within the Maryland Study Area

Maryland's rail network consists of approximately 1,152 miles of track and is comprised of two Class I freight railroads, four Class III short line freight carriers, one switching/terminal railroad, and one passenger railroad. Four of these railroads, CSX, Norfolk Southern, Maryland and Delaware Railroad, and Amtrak own 76% of the entire network. The other 24% consists of short lines, rail operating within ports, and track banked by MDOT for future use. Other freight and passenger rail carriers operate via trackage rights (MDOT 2017).

The Maryland Aviation Administration is responsible for airport regulation in the State. There are 18 publicly owned general aviation airports and 18 private airports open for public use. Two of these airports are capable of cargo shipments and are located within the Study Area: Salisbury and Baltimore/Washington International Thurgood Marshall Airport (BWI/Marshall). BWI/Marshall Airport is the largest cargo airport in Maryland with approximately 415,000 square feet of air cargo warehouse space in ten buildings (MDOT 2017). Martin State Airport is a joint civil-military public use airport located just east of Baltimore. Martin State Airport is a general aviation relief airport that serves a wide variety of general aviation and commercial operators.

The Helen Delich Bentley Port of Baltimore is located along the tidal basins of the three branches of the Patapsco River in Baltimore on the upper northwest shore of the Chesapeake Bay. It is the Nation's largest port facilities for specialized cargo (roll-on/roll-off ships) and passenger facilities. The Port of Baltimore is also one of only a few U.S. east coast ports with the necessary 50-foot deep channel to handle large vessels. It consists of public marine terminals owned by the Maryland Port Administration as well as private marine terminals. In addition to the cargo activity handled at the public and private marine terminals at the Port of Baltimore, the Maryland Port Administration also opened the Cruise Maryland Terminal in 2006, which is served year-round by the Carnival and Royal Caribbean cruise lines (MPA 2020).

Maryland's extensive, multimodal transportation network faces several challenges and constraints including aging infrastructure, congestion, and climate impacts. Much of Maryland's transportation system often operates at or over capacity. Projected job and population growth, particularly in the Baltimore and Washington Regions, will add demand on heavily used elements of the transportation system, creating more congestion in the future. MDOT planning and projects to address transportation infrastructure and congestion are addressed in various long range and strategic planning documents (e.g., Maryland Transportation Plan) and programs like the 2019 Statewide Transportation Improvement Program (MDOT 2020).

Vulnerabilities from climate impacts (see Chapter 11.2.2) also contribute to transportation constraints. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., sea level and an increase in the frequency and intensity of large storm systems). Maryland with its 3,100 miles of tidal shoreline along both the Chesapeake Bay and its tributaries and the State's Atlantic Ocean shoreline and coastal bays, is highly vulnerable to sea level rise (Boesch et al. 2018). The Maryland Commission on Climate Change (MCCC) was established by Executive Order in 2007. In 2008, the MCCC Adaptation and Response Working Group released the *Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase I: Sea Level rise and coastal storms* (MCCC 2008). In 2011, the group released the *Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase II: Building societal, economic, and ecological resilience* (MCCC 2011).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Transportation needs of potential future OCS-related projects will need to be considered during analysis. For example, some projects may need to

utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways, or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Available maritime ports are both large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

11.3.3 Summary – Land Cover and Land Use

Overall, Maryland's Eastern Shore is less developed than the rest of the State, this is largely attributable to the presence of the Chesapeake Bay bisecting the State. Most of the larger urban areas are in the western part of the State, with the heaviest development centered around the City of Baltimore and adjacent to the District of Columbia.

Existing land use data shows there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data shows the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses. Structures and impervious cover in the Study Area mirror land cover trends for urban development. Geographic areas with more intense land use are Baltimore County (City of Baltimore) and other counties adjacent to the City of Baltimore, Howard and Anne Arundel County; counties along the Interstate 95 corridor, Prince George's, Hartford, and Cecil County; and other areas with cities of populations over 25,000.

Business incentives are largely directed by the Maryland Department of Commerce and aim to encourage and promote current and new business in Maryland. Most incentives that could potentially benefit an OCS-related business are related to building in under-served areas that would benefit in investments in both their workforce and infrastructure.

Several counties on Maryland's Eastern Shore (Kent, Queen Anne's, Talbot, Dorchester, Somerset, and Worcester Counties) have large areas of protected shoreline. Counties to the west of the Chesapeake Bay also have protected State conservation lands along the shoreline. In Harford County, the protected area along the coast is Phillips Army Airfield and Aberdeen Proving Ground owned by the United States Army. However, it is most important to note that the Chesapeake Bay itself is a protected area. Protected areas will need to be considered during analysis of potential future OCS-related projects. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

Many cultural and historic sites abound in the Study Area. Sites including archaeological sites, cemeteries and sites associated with, pre-history, Colonization, the American Revolution, the War of 1812, the American Civil War; slavery and the abolitionist movement; the Underground Railroad; World Wars I and II; and the Civil Rights Movement. With its proximity to the Nation's capital, Maryland holds a unique place in National history as well. In addition to known sites, many sites have yet to be discovered or to be evaluated as historic resources. The Study Area also has diverse recreational opportunities including historic sites, museums, beaches, State and National parks, wineries, dining and shopping areas, and modern built experiences. Maryland's proximity to the District of Columbia results in some connected tourism as many visitors to the Nation's capital also visit destinations in Maryland at the same time.

Cultural and historic sites and recreational destinations tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of

that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such cultural and historic resources and recreational areas. However, the nature of sites that are potentially impacted should be evaluated during project analysis and alternative sites considered that may have lesser impacts to these areas. Maryland's extensive, multimodal transportation network faces several challenges and constraints including aging infrastructure, congestion, and climate impacts. Much of Maryland's transportation system often operates at or over capacity. Projected job and population growth, particularly in the Baltimore and Washington Regions, will add demand on heavily used elements of the transportation system, creating more congestion in the future. MDOT plans to address transportation infrastructure and congestion are addressed in various long range and strategic planning documents (e.g., Maryland Transportation Plan) and programs like the 2019 Statewide Transportation Improvement Program (MDOT 2020). Vulnerabilities from climate impacts such as recurrent flooding, rising sea levels, and storm surge also contribute to transportation constraints.

11.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

11.4.1 Population

After decades of rapid growth, Maryland's population is increasing, but at a slower rate. According to the USCB, Maryland's estimated population was 5.9 million in 2017. As shown in Table 11-7, the population of Maryland grew 3.9% since the 2010 Census, having added approximately 222,527 people. During the same period, the population of the U.S. grew 4.0% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. The population of the U.S. grew at its slowest pace since 1937, according to 2018 USCB estimates. The data show that the annual rate of the Nation's population growth was 0.62% for the year ending July 2018, hitting an 80-year low, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While Maryland is affected by the Nationwide trend of aging population, as indicated by declining rates of increase between 2010 and 2018, overall natural increase remained positive. In 2018, the State gained a total of approximately 17,827 residents. The gain in population was the result of natural increase (approximately 19,845 residents) and international migration (approximately 22,575 residents), which substantially offset population loss due to domestic out-migration (approximately 22,575 residents) (USCB 2019c). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Table 11-7. 2010 and 2017 Total Population and Population Projections Through 2040 in the Maryland Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Baltimore	Anne Arundel	537,656	564,600	573,250	596,700	622,250	5.0	10.2
	Baltimore City	620,961	619,796	616,300	625,100	643,400	-0.2	3.8
	Baltimore	805,029	828,637	847,000	862,200	880,750	2.9	6.3
	Harford	244,826	250,132	257,700	271,850	289,200	2.2	15.6
	Howard	287,085	312,495	336,900	366,800	371,850	8.9	19.0
	Total Baltimore Region	***2,495,557***	***2,575,660***	***2,631,150***	***2,722,650***	***2,807,450***	***3.2***	***9.0***
Washington Suburban	Prince George's	***863,420***	***905,161***	***916,150***	***952,950***	***982,400***	***4.8***	***8.5***
Southern Maryland	Calvert	88,737	90,824	94,600	99,200	100,450	2.4	10.6
	Charles	146,551	156,021	167,050	194,650	218,550	6.5	40.1
	St. Mary's	105,151	110,979	120,150	140,750	155,350	5.5	40.0
	Total Southern Maryland Region	***340,439***	***357,824***	***381,800***	***434,600***	***474,350***	***5.1***	***32.6***
Upper Eastern Shore	Caroline	33,066	32,785	34,050	38,450	42,950	-0.8	31.0
	Cecil	101,108	102,416	104,600	119,550	135,450	1.3	32.3
	Kent	20,197	19,666	20,900	22,100	23,000	-2.6	17.0
	Queen Anne's	47,798	49,071	50,750	55,750	61,050	2.7	24.4
	Talbot	37,782	37,461	38,850	40,900	42,000	-0.8	12.1
	Total Upper Eastern Shore Region	***239,951***	***241,399***	***249,150***	***276,750***	***304,450***	***0.6***	***26.1***

Table 11-7. 2010 and 2017 Total Population and Population Projections Through 2040 in the Maryland Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Lower Eastern Shore	Dorchester	32,618	32,386	34,300	37,350	39,500	-0.7	22.0
	Somerset	26,470	25,801	26,750	28,450	29,550	-2.5	14.5
	Wicomico	98,733	102,014	106,200	118,200	126,650	3.3	24.1
	Worcester	51,454	51,559	53,100	57,950	61,600	0.2	19.5
	Total Lower Eastern Shore Region	***209,275***	***211,760***	***220,350***	***241,950***	***257,300***	***1.2***	***21.5***
	Study Area Total	**4,148,642**	**4,291,804**	**4,398,600**	**4,628,900**	**4,825,950**	**3.5**	**12.4**
	Maryland	**5,773,552**	**5,996,079**	**6,141,900**	**6,518,750**	**6,834,500**	**3.9**	**14.0**
	United States	**308,745,538**	**321,004,407**	**332,527,548[4]**	**357,975,719[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - MDP 2017; 4 - USCB 2018b

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018, UVA 2019e). However, Maryland is not part of this National trend due to its large domestic outmigration. In 2018, the majority of migrating residents moved to Virginia, Pennsylvania, Florida and Washington D.C. (USCB 2019c). Top reasons for relocation are job related, retirement, and family reasons (Collman 2019). A contraction in Federal spending was identified as a likely reason for residents leaving Maryland and neighboring Virginia, home to many government employees in the wealthy suburbs close to Washington D.C. (Murse 2019, UVA 2019c, UVA 2019a). People moving out of the city of Baltimore due to its high crime rate as well as high city income and property tax rates is another likely reason contributing to out-migration (Placher 2018a).

11.4.1.1 Study Area Trends

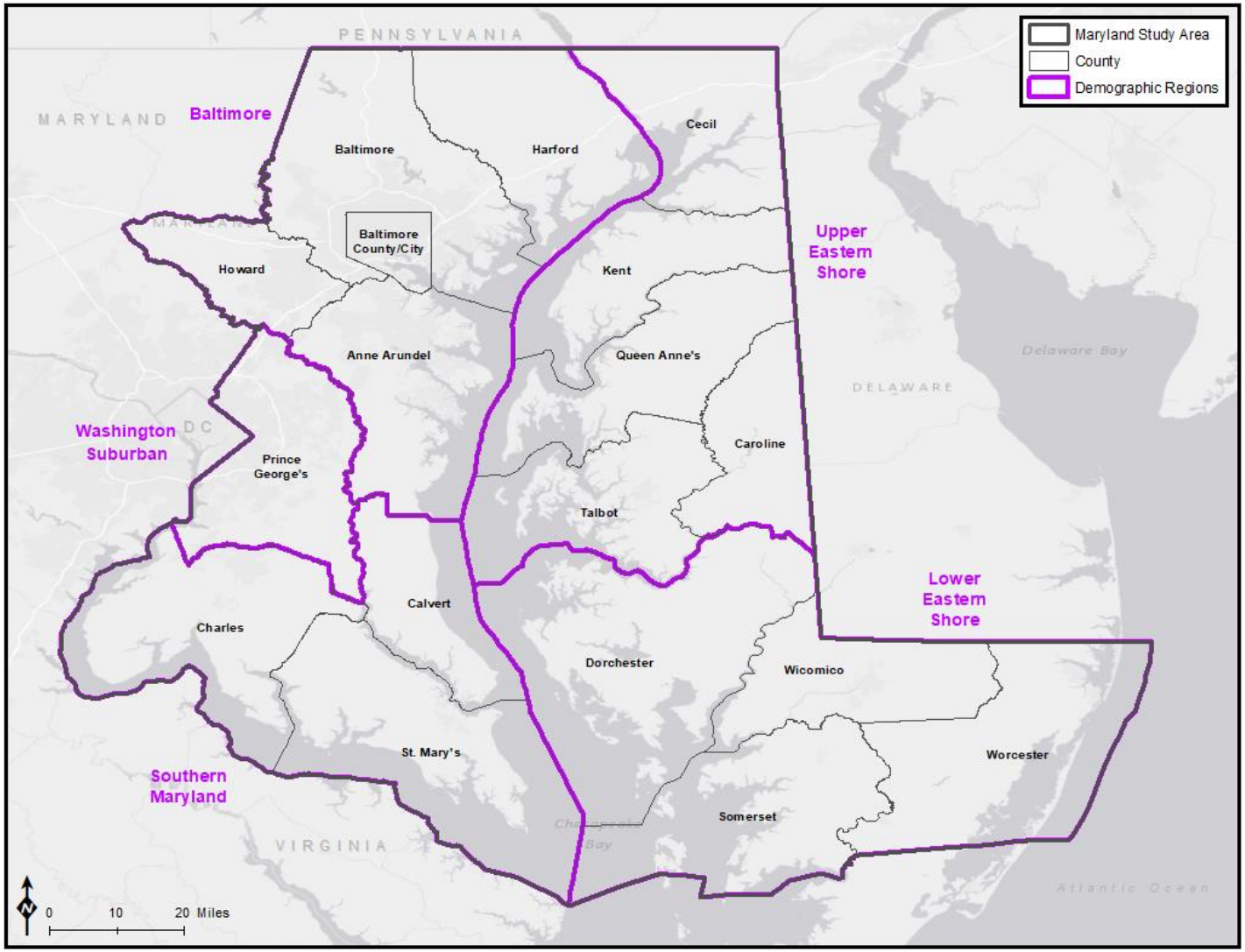
Figure 11-20 shows the five demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 11.2 because they are derived from official demographic regions used by the Maryland Department of Planning. The geographic units (17 counties and one city [Baltimore]) within the Study Area are located within five demographic regions defined as Baltimore, Washington Suburban, Southern Maryland, Upper Eastern Shore, and Lower Eastern Shore (MDP 2018). The Study Area represented 71.6% (4.3 million residents) of the overall State population of 5.9 million in 2017. Overall, the population of the Study Area grew 3.5%, less than the State (3.9%) and the Nation (4.0%). Table 11-7 shows population growth and decline in the Study Area counties, as well as their location with the demographic regions. Between 2010 and 2017, 12 out of 18 geographic units in the Study Area gained population, while six lost population. The city of Baltimore was the only geographic unit that lost population on Maryland's western shore. Five counties (Somerset, and the rural counties of Kent, Talbot, Caroline, and Dorchester) lost population on Maryland's Eastern Shore (Delmarva Peninsula) (USCB 2017a, USCB 2017d, USDA 2013)

Between 2010 and 2017, the Southern Maryland Region grew 5.1%, led by strong growth in Charles (6.5%) and St. Mary's (5.5%) counties. The Washington Suburban Region (which is comprised of one Study Area county – Prince George), located near the Washington metro area, grew 4.8%. The Baltimore Region grew 3.2%, led by strong growth in Howard (8.9%) and Anne Arundel (5.0%) counties, but repressed by the city of Baltimore, which had a population loss of 0.2% over the same period. The Lower and Upper Eastern Shore Regions, furthest away from the metro area and having more rural features, grew 1.2% and 0.6%, respectively during the same period (USCB 2017a, USCB 2017d).

Figure 11-21 shows population counts in census block groups within the 17 counties and one city located in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 11-22 the MSAs present in the Study Area are:

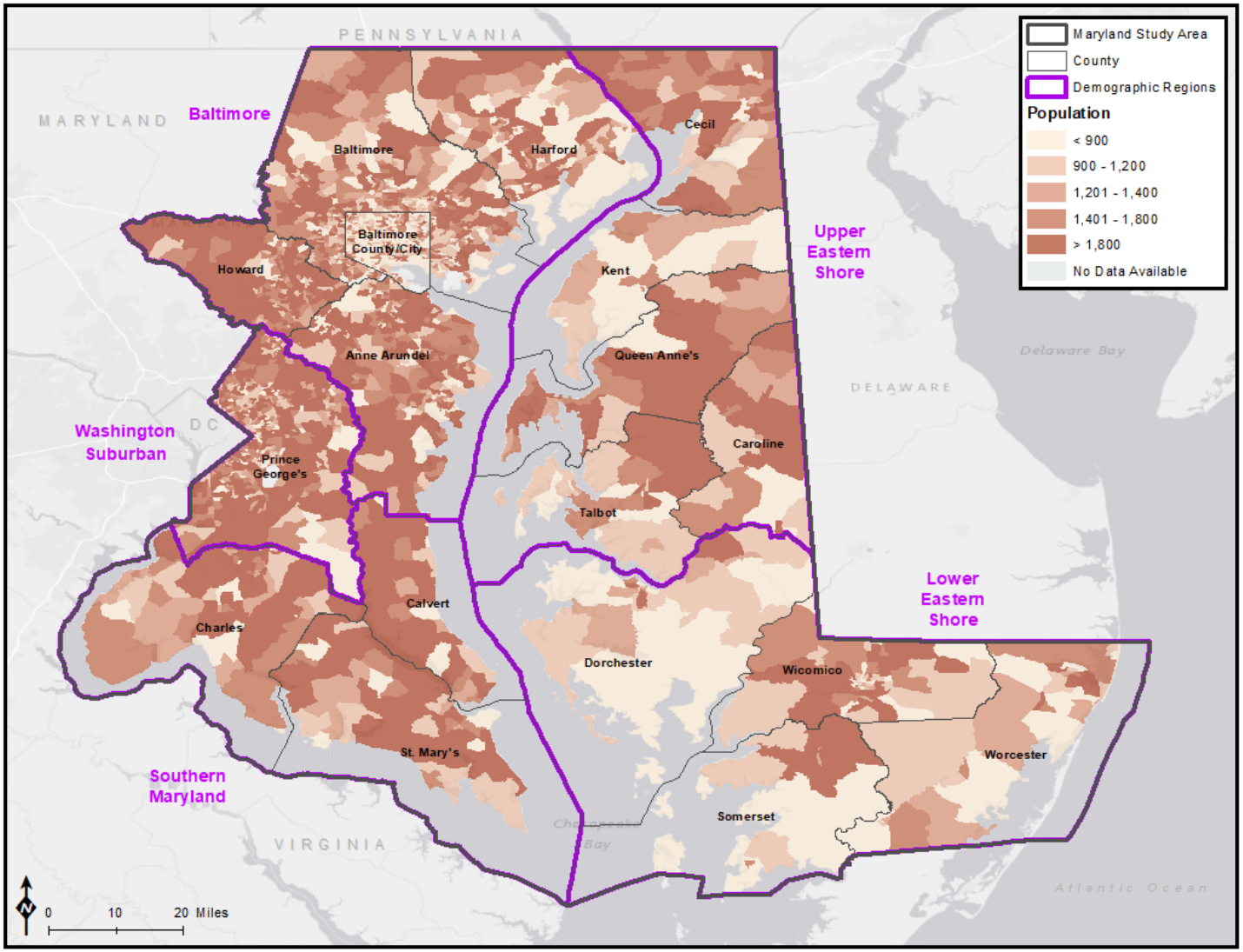
- Baltimore-Columbia-Towson, MD,
- California-Lexington Park, MD,
- Philadelphia-Camden-Wilmington, PA-NJ-DE-MD,
- Salisbury, MD-DE, and
- Washington-Arlington-Alexandria, DC-VA-MD-WV.

Portions of the Upper and Lower Eastern Shore Regions (the rural counties of Kent, Talbot, Caroline and Dorchester counties) are not within an MSA. They are less populous, reflecting the rural-urban divide. A mitigating factor for population loss in Kent, Talbot and Worchester counties is their attraction as retirement destination (Data.gov 2017, USDA 2013).



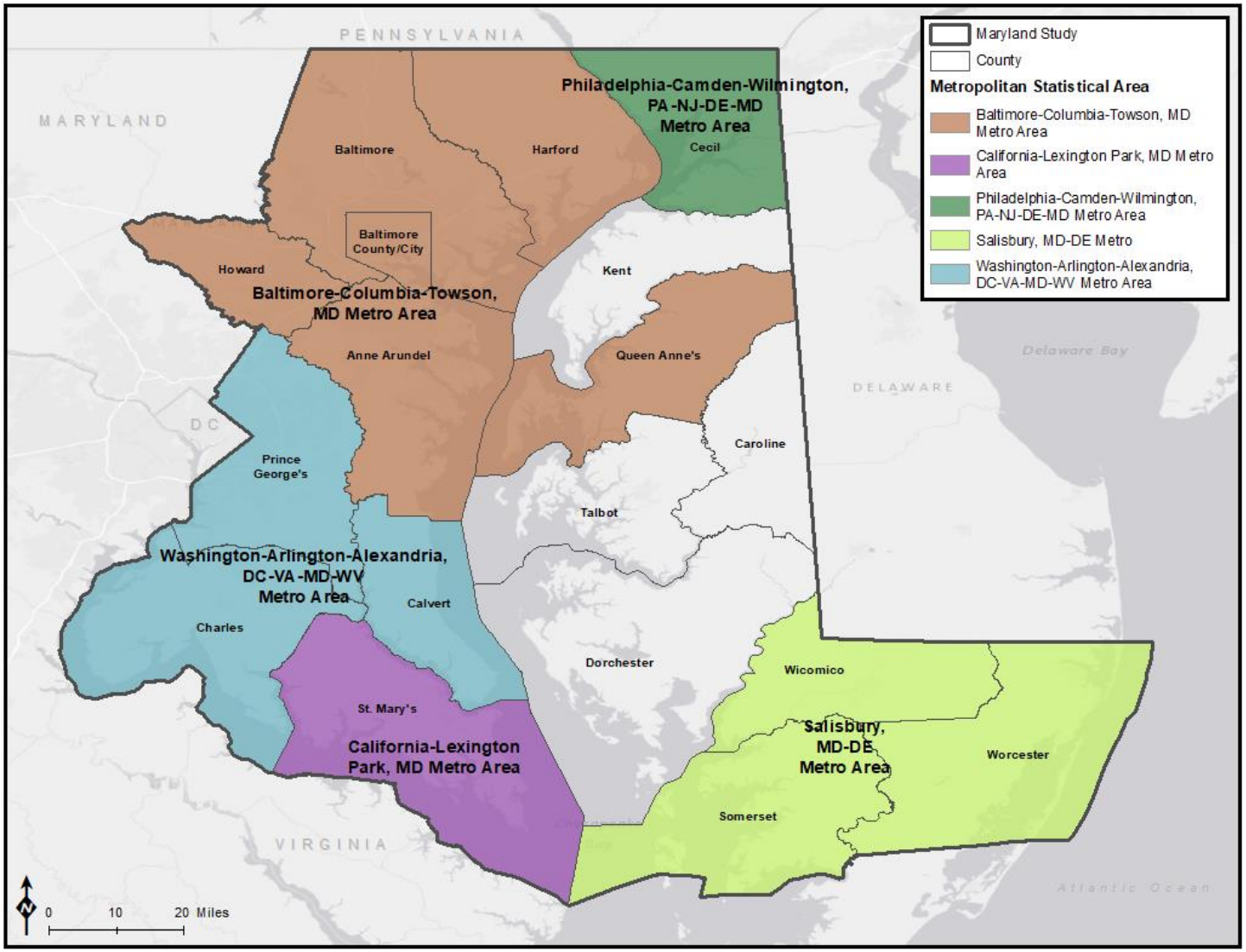
Source: MDP 2018

Figure 11-20. Demographic Regions of the Maryland Study Area



Source: USCB 2017r

Figure 11-21. Population in the Maryland Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 11-22. Metropolitan Statistical Areas Located within the Maryland Study Area

More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population, but account for less than 20% the Nation's land mass (excluding Alaska)(NOAA Fisheries 2013). This population trend is also reflected in Maryland. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in **Error! Not a valid bookmark self-reference.**, the Study Area is 6,581 square miles, representing 67.3% of the State's total land area of 9,775 square miles. Therefore, more than half (71.6%) of Maryland's population resided in 67.3% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.

Table 11-8. 2017 and 2040 Population Density in the in the Maryland Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Baltimore	Anne Arundel	564,600	622,250	415	1,361.2	1,500.2
	Baltimore City	619,796	643,400	81	7,656.9	7,948.5
	Baltimore	828,637	880,750	598	1,384.9	1,471.9
	Harford	250,132	289,200	437	572.2	661.6
	Howard	312,495	371,850	251	1,245.3	1,481.8
	Total Baltimore Region	***2,575,660***	***2,807,450***	***1,782***	***1,445.3***	***1,575.3***
Washington Suburban	Prince George's	***905,161***	***982,400***	***483***	***1,875.4***	***2,035.4***
Southern Maryland	Calvert	90,824	100,450	213	426.0	471.2
	Charles	156,021	218,550	458	340.8	477.4
	St. Mary's	110,979	155,350	359	309.4	433.1
	Total Southern Maryland Region	***357,824***	***474,350***	***1,030***	***347.5***	***460.7***
Upper Eastern Shore	Caroline	32,785	42,950	319	102.6	134.5
	Cecil	102,416	135,450	346	295.8	391.2
	Kent	19,666	23,000	277	71.0	83.0
	Queen Anne's	49,071	61,050	372	132.0	164.3
	Talbot	37,461	42,000	269	139.5	156.4
	Total Upper Eastern Shore Region	***241,399***	***304,450***	***1,583***	***152.5***	***192.3***

Table 11-8. 2017 and 2040 Population Density in the in the Maryland Study Area

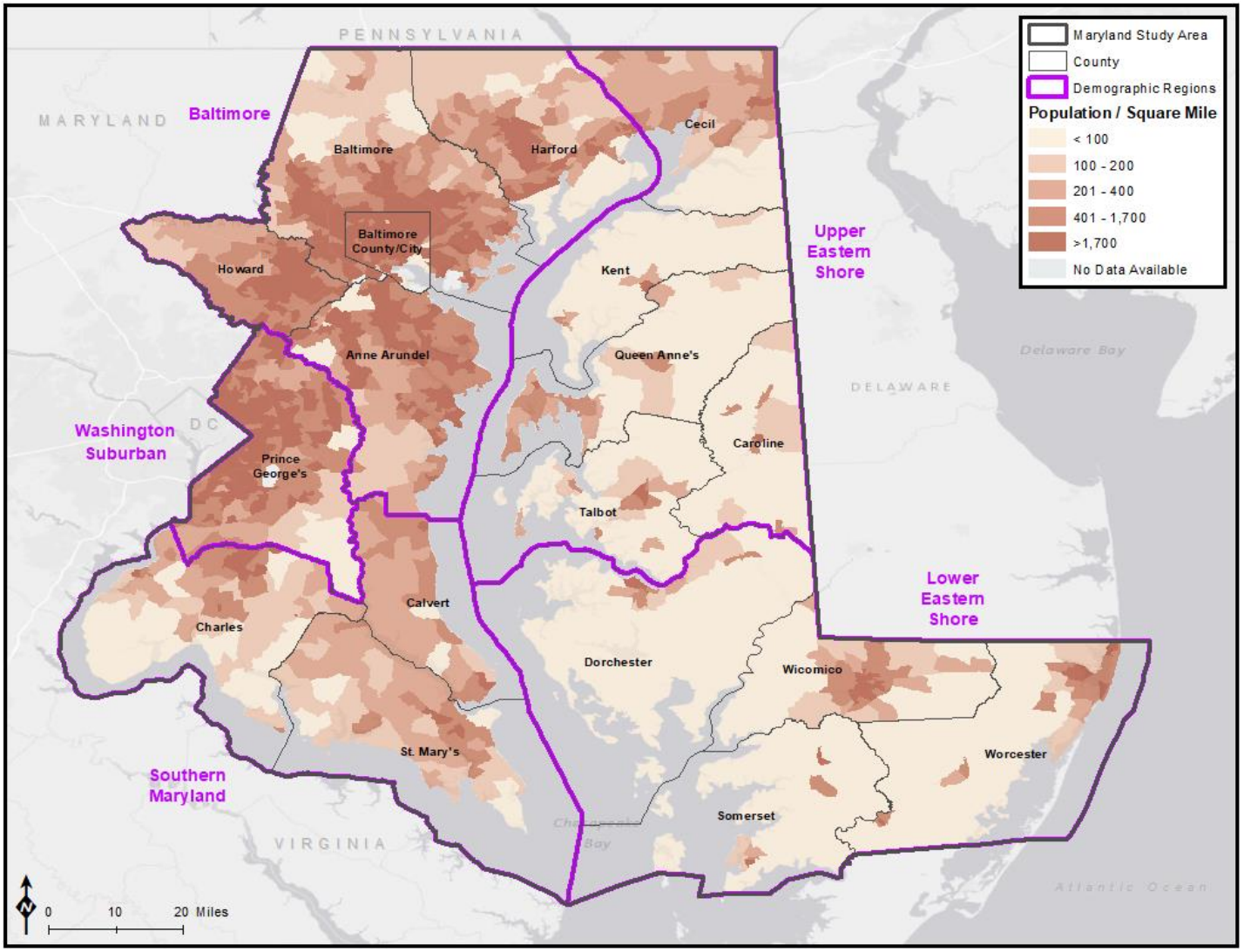
Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Lower Eastern Shore	Dorchester	32,386	39,500	541	59.9	73.0
	Somerset	25,801	29,550	320	80.7	92.4
	Wicomico	102,014	126,650	374	272.5	338.3
	Worcester	51,559	61,600	468	110.1	131.5
	Total Lower Eastern Shore Region	***211,760***	***257,300***	***1,703***	***124.3***	***151.1***
	Study Area Total	**4,291,804**	**4,825,950**	**6,581**	**652.2**	**733.4**
	Maryland	**5,996,079**	**6,834,500**	**9,775**	**613.4**	**699.2**
	United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: MDP 2017, USCB 2017c, USCB 2017d, USCB 2018b

Within the limited space of the Nation's coasts, population density far exceeds the Nation as a whole. According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the National population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 11-23, which shows population per square mile in the Study Area. As shown in Table 11-8, the population density of the Study Area was 652 persons per square mile in 2017, greater than the State (613 persons per square mile) and the Nation (90 persons per square mile). Population densities in the Study Area ranged from 59 persons per square mile in Dorchester County (located in the sparsely-populated Lower Eastern Shore Region) to 7,656 persons per square mile in the city of Baltimore (located within the populous Baltimore Region, in the Baltimore metropolitan area, and in proximity to the Washington and Philadelphia metropolitan areas (USCB 2017d, USCB 2017c).

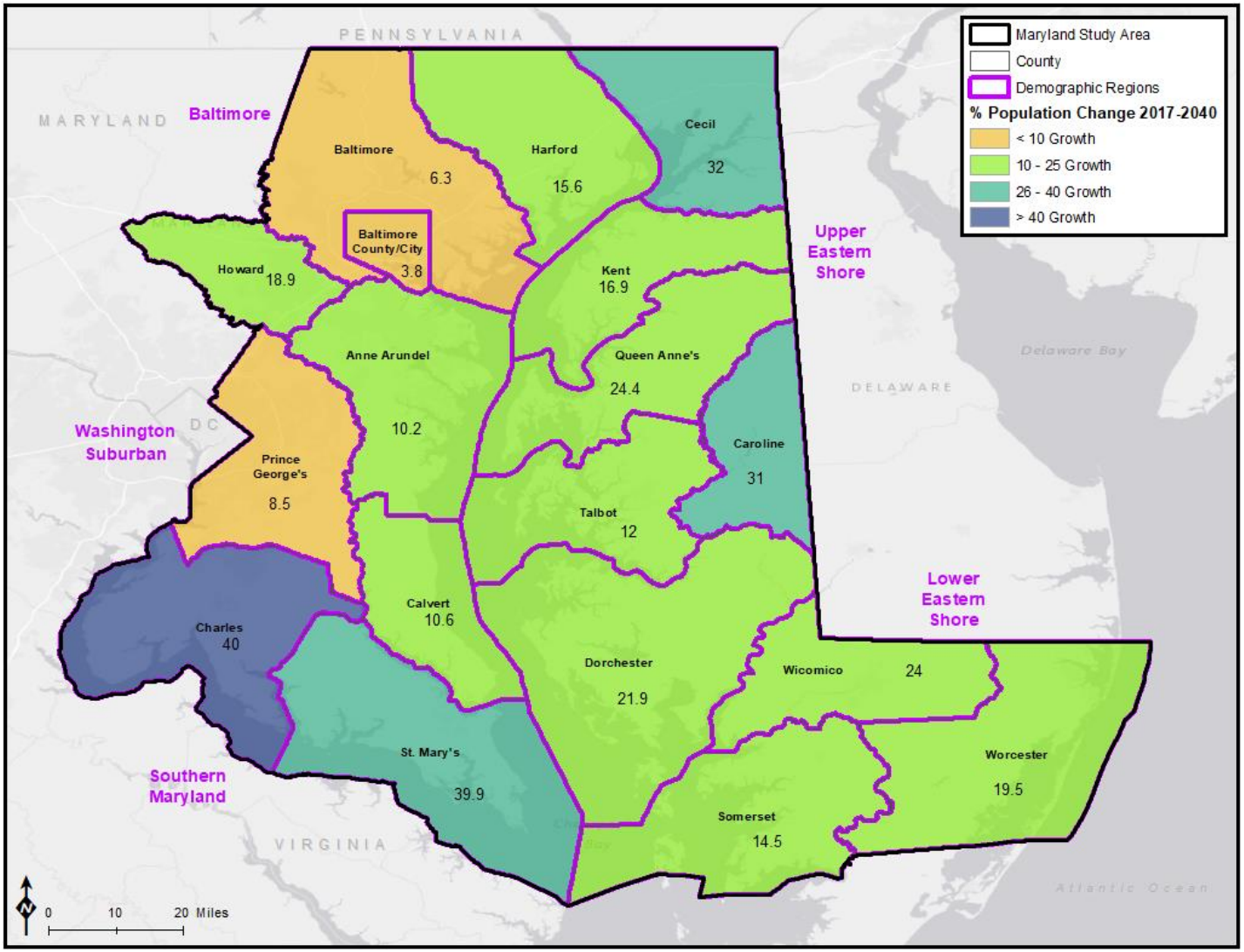
11.4.1.2 Population Projections

According to the Maryland Department of Planning, the State's population is projected to grow 14.0% (to 6.8 million residents) by 2040. Population in the Study Area is projected to follow a similar pattern, growing 12.4% (4.8 million residents) by 2040. The Nation's population is projected to grow 16.4% (373.5 million), more than the State and the Study Area. Table 11-7 provides details of the projected population for the U.S., the State, and the geographic units in the Study Area from 2017 to 2040, delineated by region. Figure 11-24 shows the overall projected percent change in population in each county during the same period (USCB 2017d, USCB 2017c, USCB 2018b, MDP 2017).



Source: USCB 2017r

Figure 11-23. Population Density in the Maryland Study Area by Census Block Group



Source: MDP 2017

Figure 11-24. Overall Projected Population Change from 2017-2040 in the Maryland Study Area by County

As shown in Table 11-7, projections indicate that 70.6% (4.8 million people) of the State's population will reside in the Study Area by 2040 as compared to 71.6% (4.3 million people) in 2017. Projected growth will not be uniform across the Study Area. Strongest growth is projected in the Southern Maryland (32.6%) region as younger families move to suburbs in Charles and St. Mary's counties in search of relatively cheaper housing and less crowded schools (Olivio 2018). Growth projections for the other regions are: Upper Eastern Shore (26.1%), Lower Eastern Shore (21.5%), Baltimore (9.0%), and Washington Suburban (8.5%) between 2017 and 2040. Upper Eastern Shore counties Cecil (located in the Philadelphia metropolitan area) and Caroline (located near the Baltimore metropolitan area) are projected to grow 32.3% and 31.0%, respectively. Both counties are located near the Dover, DE metropolitan area as well. Slowest growth is projected in the city of Baltimore (3.8%). Population gains are projected for each geographic unit in the Study Area (USCB 2017d, MDP 2017).

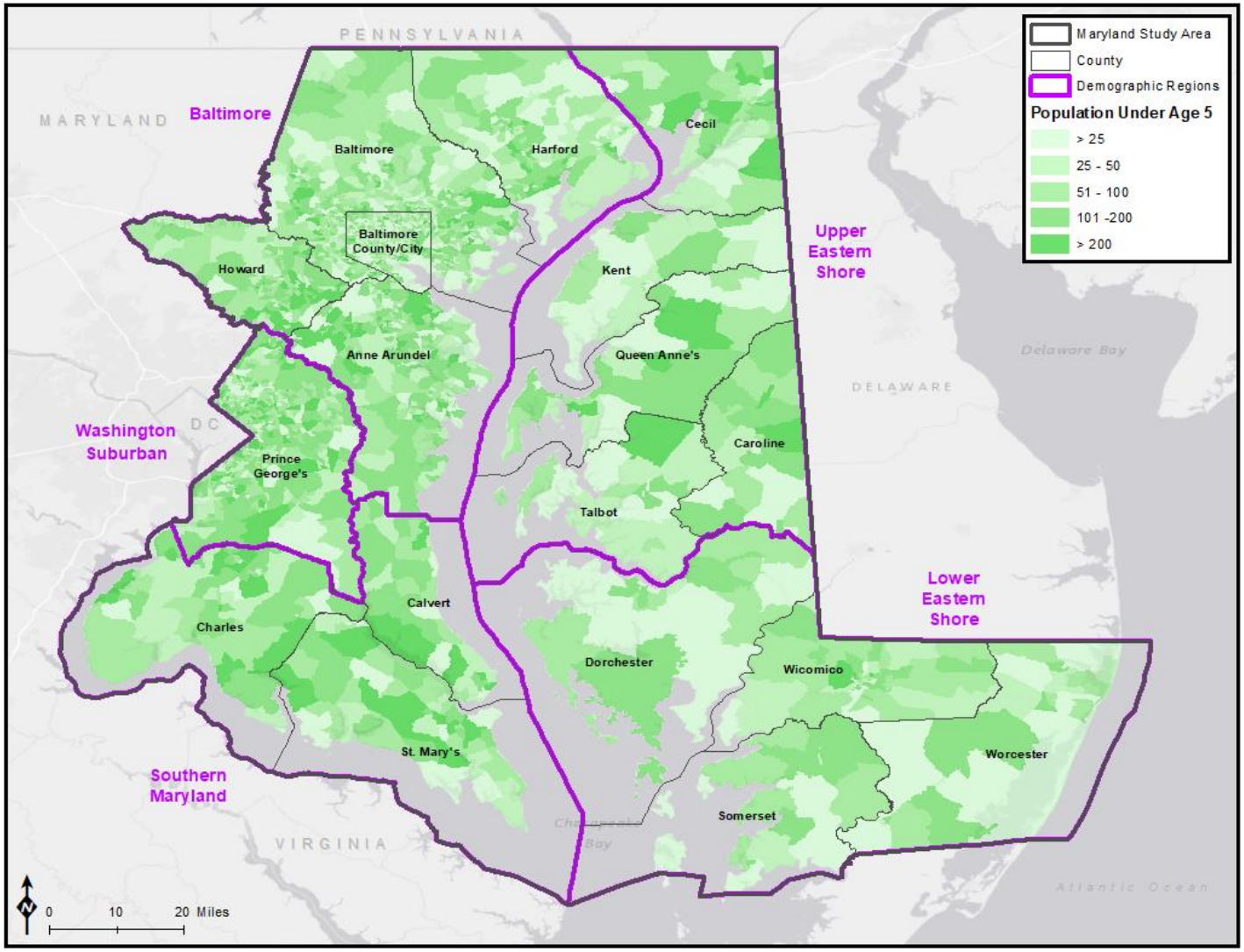
Population densities in National coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future (NOAA 2013). As shown in Table 11-8, this trend is apparent in the Maryland Study Area, as population density is projected to increase from 652 persons per square mile to 733 persons per square mile in the Study Area between 2017 and 2040 (USCB 2017d, USCB 2017c, MDP 2017). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

11.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80 year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Maryland and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 11-25 and Figure 11-26 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 11-27 and Figure 11-28 show the projected change in these groups by 2040. Table 11-9 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Maryland and the Study Area (Brookings Institute 2018, USCB 2017b, MDP 2017).

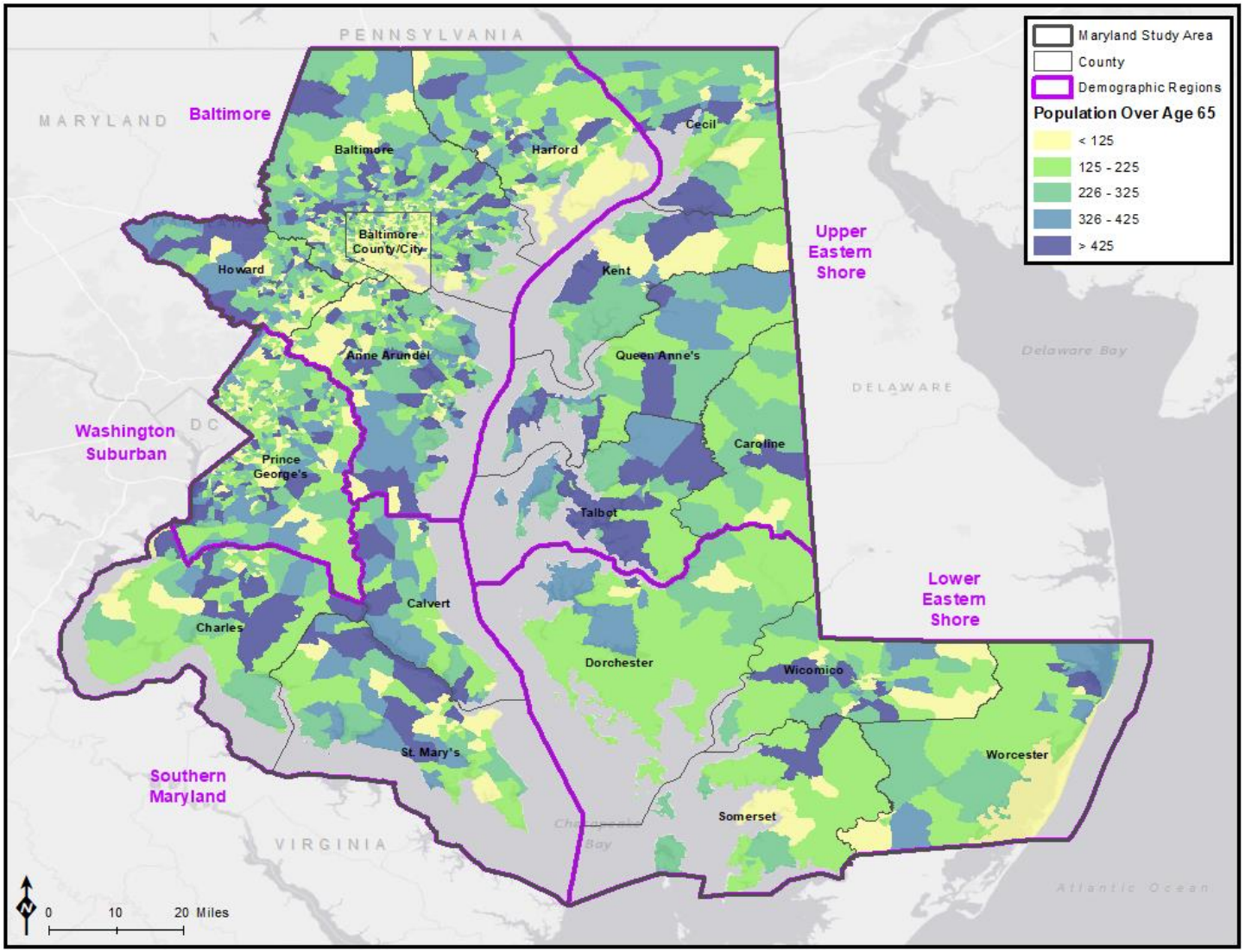
Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area, but they are not present in significantly greater or smaller numbers compared to the State and the Nation, according to Table 11-9 (USCB 2017b).

According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 6.1% in Maryland and 6.1% in the Study Area. While the population of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 11-9 shows the breakdown by demographic region. Projections by the year 2040 indicate this group's decline in the Nation (to 5.7%); the State (to 6.0%) and the Study Area (to 5.9%). For the study area, this is an overall decrease of 0.2% in the proportion of the population under age 5 from 2017-2040 (USCB 2017b, USCB 2018b, MDP 2017).



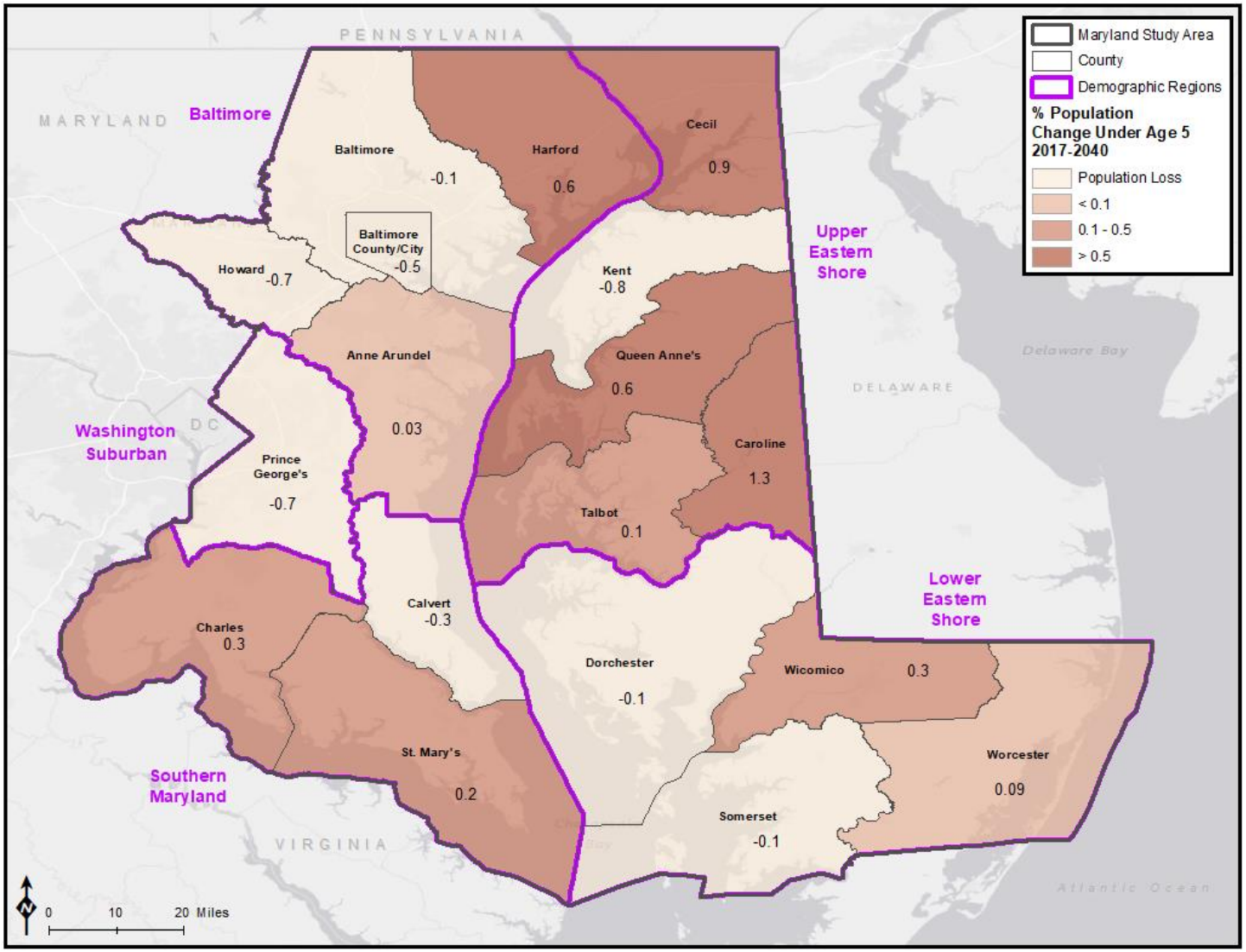
Source: USCB 2017r

Figure 11-25. Population Under Age 5 in the Maryland Study Area by Census Block Group



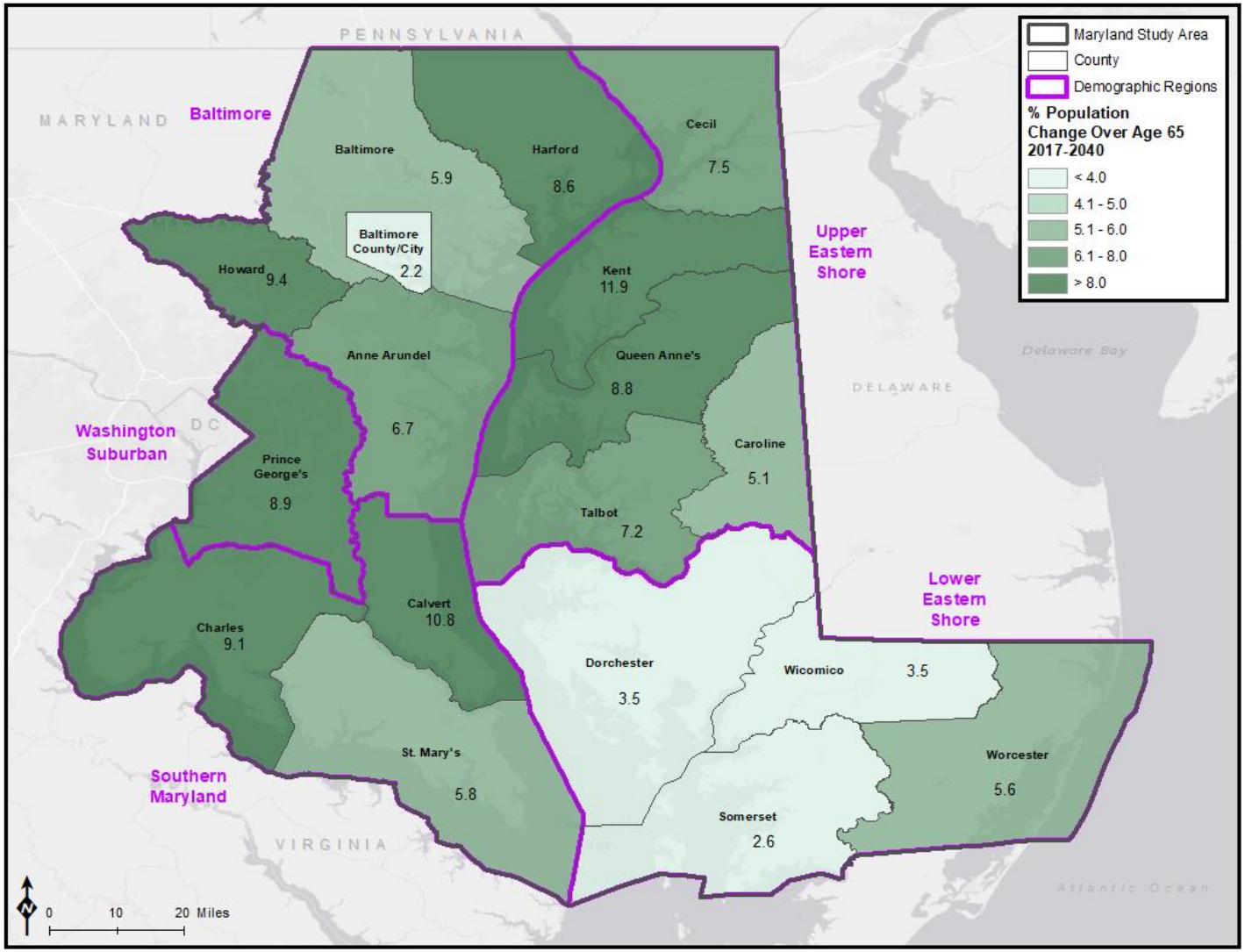
Source: USCB 2017r

Figure 11-26. Population Over Age 65 in the Maryland Study Area by Census Block Group



Source: MDP 2017

Figure 11-27. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Maryland Study Area by 2040



Source: MDP 2017

Figure 11-28. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Maryland Study Area by 2040

Table 11-9. Population Under Age 5 and Over Age 65 in the Maryland Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2038)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Baltimore	Anne Arundel	564,600	34,996	6.2	77,681	13.8	622,250	38,751	6.2	127,014	20.4
	Baltimore City	619,796	40,779	6.6	79,265	12.8	643,400	39,141	6.1	96,586	15.0
	Baltimore	828,637	49,096	5.9	133,437	16.1	880,750	51,401	5.8	194,175	22.0
	Harford	250,132	14,001	5.6	37,368	14.9	289,200	17,834	6.2	67,942	23.5
	Howard	312,495	18,623	6.0	39,232	12.6	371,850	19,728	5.3	81,755	22.0
	Total Baltimore Region	***2,575,660***	***157,495***	***6.1***	***366,983***	***14.2***	***2,807,450***	***166,855***	***5.9***	***567,472***	***20.2***
Washington Suburban	Prince George's	***905,161***	***59,834***	***6.6***	***106,530***	***11.8***	***982,400***	***57,586***	***5.9***	***202,778***	***20.6***
Southern Maryland	Calvert	90,824	4,874	5.4	12,382	13.6	100,450	5,121	5.1	24,501	24.4
	Charles	156,021	9,533	6.1	17,753	11.4	218,550	13,936	6.4	44,844	20.5
	St. Mary's	110,979	7,190	6.5	13,184	11.9	155,350	10,439	6.7	27,530	17.7
	Total Southern Maryland Region	***357,824***	***21,597***	***6.0***	***43,319***	***12.1***	***474,350***	***29,496***	***6.2***	***96,875***	***20.4***
Upper Eastern Shore	Caroline	32,785	2,010	6.1	5,062	15.4	42,950	3,174	7.4	8,795	20.5
	Cecil	102,416	5,796	5.7	14,748	14.4	135,450	8,913	6.6	29,693	21.9
	Kent	19,666	842	4.3	4,941	25.1	23,000	808	3.5	8,511	37.0
	Queen Anne's	49,071	2,489	5.1	8,753	17.8	61,050	3,472	5.7	16,244	26.6
	Talbot	37,461	1,707	4.6	10,073	26.9	42,000	1,957	4.7	14,311	34.1
	Total Upper Eastern Shore Region	***241,399***	***12,844***	***5.3***	***43,577***	***18.1***	***304,450***	***18,324***	***6.0***	***77,554***	***25.5***
Lower Eastern Shore	Dorchester	32,386	1,922	5.9	6,506	20.1	39,500	2,305	5.8	9,340	23.6
	Somerset	25,801	1,230	4.8	3,958	15.3	29,550	1,379	4.7	5,290	17.9
	Wicomico	102,014	6,160	6.0	15,015	14.7	126,650	7,968	6.3	23,039	18.2
	Worcester	51,559	2,217	4.3	13,509	26.2	61,600	2,702	4.4	19,569	31.8
	Total Lower Eastern Shore Region	***211,760***	***11,529***	***5.4***	***38,988***	***18.4***	***257,300***	***14,354***	***5.6***	***57,238***	***22.2***
	Study Area Total	**4,291,804**	**263,299**	**6.1**	**599,397**	**14.0**	**4,825,950**	**286,615**	**5.9**	**1,001,917**	**20.8**
	Maryland	**5,996,079**	**366,750**	**6.1**	**849,185**	**14.2**	**6,834,500**	**409,702**	**6.0**	**1,448,135**	**21.2**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: MDP 2017, USCB 2017b, USCB 2018b

Table 11-9 indicates that the Upper and Lower Eastern Shore Regions had the smallest percentages (5.3% and 5.4%, respectively) of young children in 2017; an increase (to 6.0% and 5.6%, respectively) is projected by 2040 contrary to National trends (USCB 2017b, MDP 2017).

According to 2017 estimates shown in Table 11-9, the elderly represented 14.9% of the U.S. population; 14.2% in Maryland, and 14.0% in the Study Area. The population of elderly is projected to rise, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 21.2% in the State, and 20.8% in the Study Area. Each region in the Study Area projects an increase in the elderly population. The sparsely populated Lower Eastern Shore Region had the largest percentage (18.4%) of elderly in 2017; a further increase to 22.2% is projected by 2040. The Washington Suburban Region had the smallest percentage of seniors in 2017 (11.8%); and by 2040 the percentage is projected to rise to 20.6%. For the study area, this is an overall increase of 6.8% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, MDP 2017).

11.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 11-10.

As shown in Table 11-10, in 2017 homeownership in Maryland was 66.8%, higher than the Nation (63.8%) and the Study Area (66.0%). Renters comprised approximately 33.2% of the State population in 2017, less than the Study Area (34.0%) and the Nation (36.2%) (USCB 2017m). The percentage of owner-occupied housing was highest in the Southern Maryland Region, which may be attributed to older, more established populations with families working in the Washington D.C. area or elderly populations who prefer to own their home rather than rent. The percentage of owner-occupied housing was lowest in the Washington Suburban Region, which may be attributed to younger populations (millennials) working in the Washington DC metropolitan area preferring to rent.

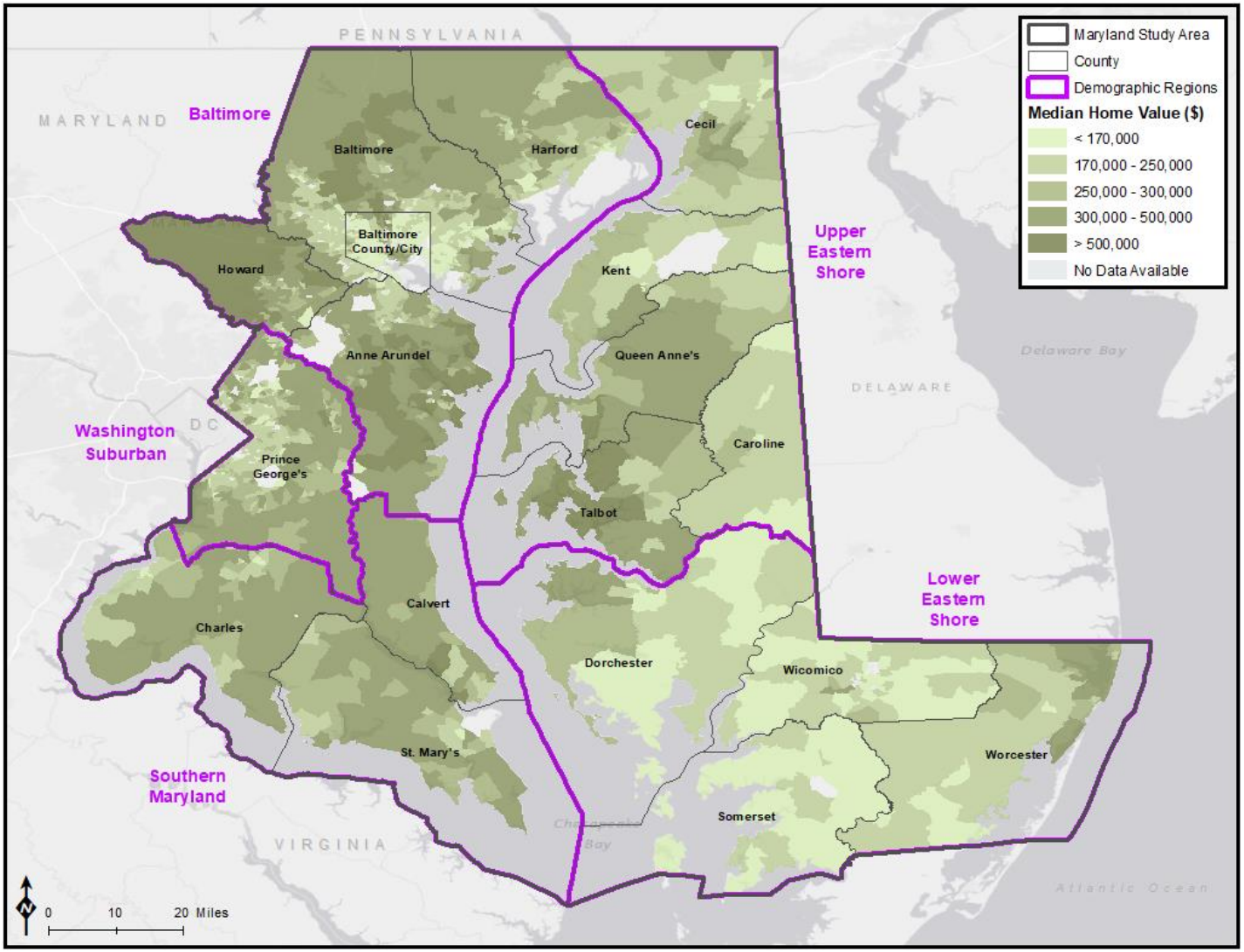
Figure 11-29 illustrates median home values in the Study Area. Median home values were higher in the State ($296,500) than the Study Area ($272,900) and the Nation ($193,500). Home values in the State increased 1.6% during the 12-month period ending November 2019, according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Zillow.com 2019bb). The market temperature of the State, as well as all metropolitan areas within the Study Area, is characterized as "very hot" which indicates market conditions favorable to sellers (Zillow.com 2019bb). In the 12-month period ending November 2019, metropolitan area home values increased at the following rates:

- Baltimore-Columbia-Towson Metro - 0.8% (Zillow.com 2019cc).
- California-Lexington Park Metro - 1.4% (Zillow.com 2019dd).
- Philadelphia-Camden-Wilmington metropolitan area - 3.2% (Zillow.com 2019ee).
- Salisbury metropolitan area - 1.8% (Zillow.com 2019ff).
- Washington- Arlington-Alexandria - 3.4% (Zillow.com 2019b).

Table 11-10. Housing Utilization and Vacancy Rates in the Maryland Study Area

Region	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Gross Rent
Baltimore	Anne Arundel	220,641	205,395	15,246	6.9	152,576	74.3	52,819	25.7	$346,000	$1,579
	Baltimore City	294,858	239,791	55,067	18.7	113,558	47.4	126,233	52.6	$153,200	$1,009
	Baltimore	336,358	312,859	23,499	7.0	205,962	65.8	106,897	34.2	$249,600	$1,224
	Harford	98,853	92,895	5,958	6.0	73,027	78.6	19,868	21.4	$281,400	$1,197
	Howard	116,493	111,337	5,156	4.4	82,082	73.7	29,255	26.3	$439,900	$1,661
	Total Baltimore Region	***1,067,203***	***962,277***	***104,926***	***9.8***	***627,205***	***65.2***	***335,072***	***34.8***	***NA***	***NA***
Washington Suburban	Prince George's	***330,326***	***306,694***	***23,632***	***7.2***	***189,513***	***61.8***	***117,181***	***38.2***	***NA***	***NA***
Southern Maryland	Calvert	34,785	31,462	3,323	9.6	26,241	83.4	5,221	16.6	$347,200	$1,612
	Charles	58,883	54,988	3,895	6.6	42,505	77.3	12,483	22.7	$294,000	$1,618
	St. Mary's	43,834	39,276	4,558	10.4	28,257	71.9	11,019	28.1	$291,500	$1,288
	Total Southern Maryland Region	***137,502***	***125,726***	***11,776***	***8.6***	***97,003***	***77.2***	***28,723***	***22.8***	***NA***	***NA***
Upper Eastern Shore	Caroline	13,564	11,996	1,568	11.6	8,540	71.2	3,456	28.8	$201,200	$924
	Cecil	42,487	37,076	5,411	12.7	27,110	73.1	9,966	26.9	$238,000	$1,071
	Kent	10,662	7,605	3,057	28.7	5,332	70.1	2,273	29.9	$237,400	$938
	Queen Anne's	20,885	17,995	2,890	13.8	14,587	81.1	3,408	18.9	$343,200	$1,325
	Talbot	20,152	16,498	3,654	18.1	11,599	70.3	4,899	29.7	$326,300	$1,084
	Total Upper Eastern Shore Region	***107,750***	***91,170***	***16,580***	***15.4***	***67,168***	***73.7***	***24,002***	***26.3***	***NA***	***NA***
Lower Eastern Shore	Dorchester	16,734	12,940	3,794	22.7	8,518	65.8	4,422	34.2	$179,300	$869
	Somerset	11,334	8,362	2,972	26.2	5,405	64.6	2,957	35.4	$131,000	$673
	Wicomico	42,146	37,415	4,731	11.2	22,709	60.7	14,706	39.3	$171,700	$1,042
	Worcester	56,031	21,190	34,841	62.2	15,774	74.4	5,416	25.6	$252,100	$994
	Total Lower Eastern Shore Region	***126,245***	***79,907***	***46,338***	***36.7***	***52,406***	***65.6***	***27,501***	***34.4***	***NA***	***NA***
	Study Area Total	**1,769,026**	**1,565,774**	**203,252**	**11.5**	**1,033,295**	**66.0**	**532,479**	**34.0**	**$272,900**	**$1,224**
	Maryland	**2,427,014**	**2,181,093**	**245,921**	**10.1**	**1,456,758**	**66.8**	**724,335**	**33.2**	**$296,500**	**$1,311**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 11-29. Median Home Value in the Maryland Study Area by Census Block Group

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters Nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

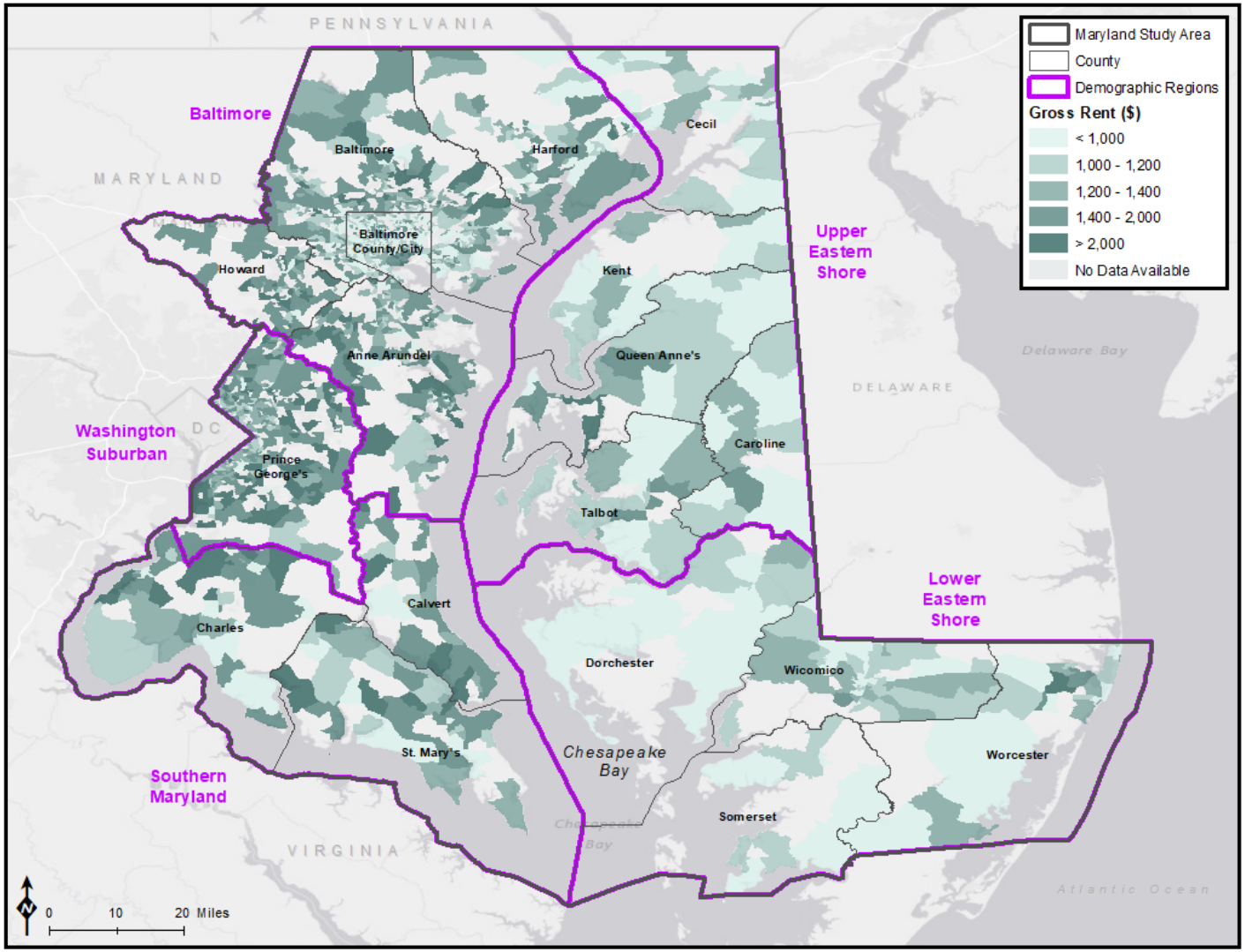
Figure 11-30 illustrates median gross rent, indicating that more expensive rents are located on Maryland's western shore. According to the National Low Income Housing Coalition, as of 2019, throughout the State, fair market rent for a two-bedroom rental unit is $1,431. In these conditions, a minimum wage worker would have to work approximately 109 hours a week in order to afford a two-bedroom fair market rate home. Maryland has a shortage of approximately 118,810 rental homes affordable and available to extremely low-income households. Approximately 178,481 (24%) of renter households in Maryland are considered extremely low income; approximately 128,506 (72%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (41%), single caregivers (29%), and disabled (20%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a).

As shown in Table 11-10, home vacancy rates in Maryland (10.1%) in 2017 were lower than the Nation (12.2%) and the Study Area (11.5%). Figure 11-31 illustrates vacancy rates in the Study Area by Census Block Group. The sparsely populated Lower Eastern Shore Region had the highest vacancy rate (32.2%) in 2017. High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. The owners of such properties may have a primary residence in another State, and use the home seasonally leaving it unused most of the year. Homes counted as "vacant" by the USCB may be rented out on a short-term basis via online platforms such as Airbnb and VRBO (previously known as Vacation Rentals by Owner). According to an Airbnb press release, the approximate 6,500 Maryland homeowners who hosted a total of 383,000 short-term rental guests in their home had combined earnings of $57 million in 2018 (Reed 2019). The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019). The lowest vacancy rate is in the Washington Suburban Region (7.2%) (USCB 2017g).

11.4.4 Employment

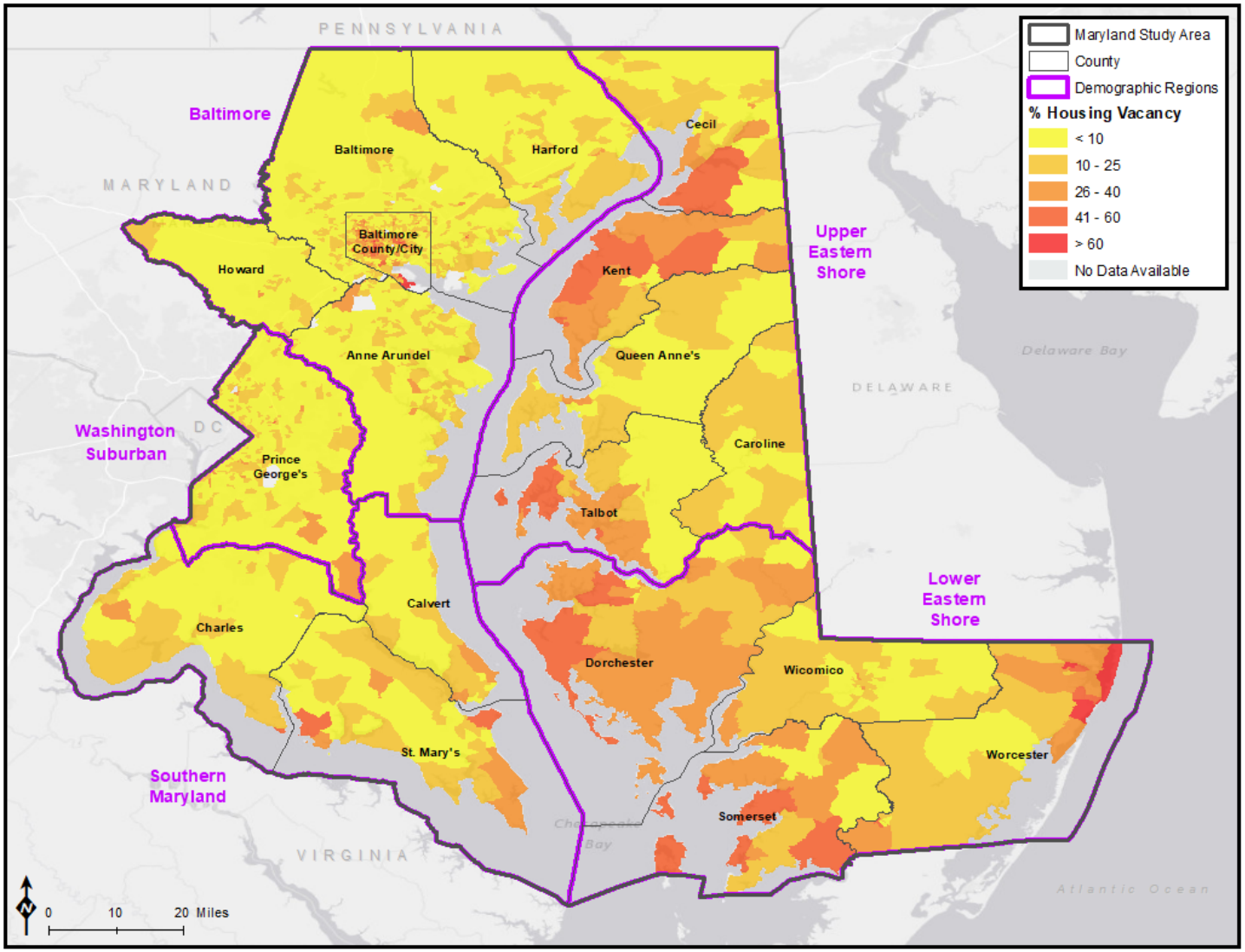
11.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 11-11. In 2017, the Study Area had a total employment of 2.2 million jobs, representing approximately 71.0% of the total jobs in Maryland, and 1.4% of the total jobs in the U.S. (USCB 2017p). Maryland's 2018 Annual Gross Domestic Product was 412.5 billion, which represented 2.0% of the Nation's gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 11-30. Median Gross Rent in the Maryland Study Area by Census Block Group



Source: USCB 2017r

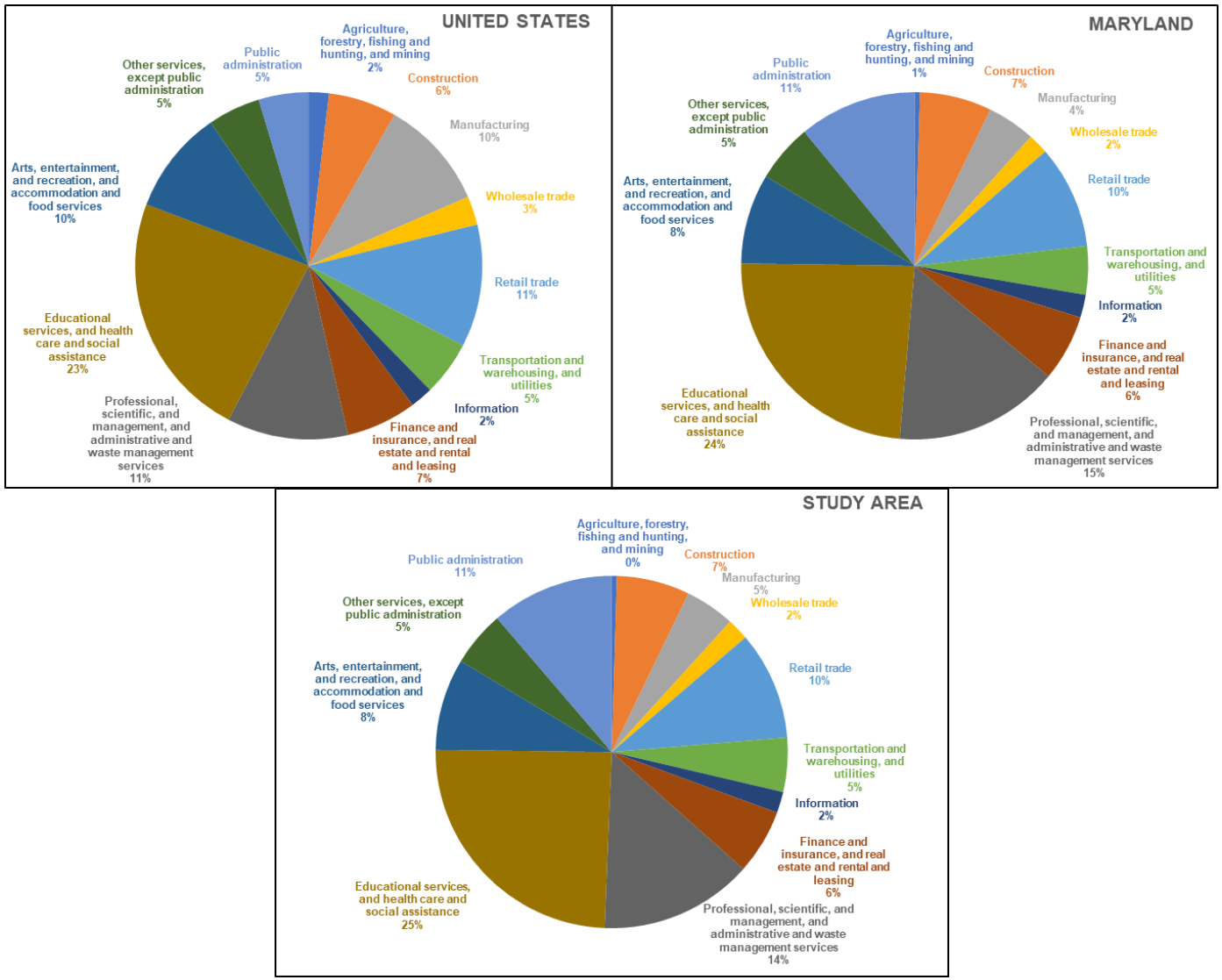
Figure 11-31. Housing Vacancy Rates in the Maryland Study Area by Census Block Group

Table 11-11. Census Bureau Labor and Industry Statistics for the U.S., Maryland, and the Maryland Study Area (number of jobs)

Industry	United States	Percent (%)	Maryland	Percent (%)	Study Area	Percent (%)
TOTAL	150,599,165		3,040,792		2,157,935	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	15,110	0.5	10,085	0.5
Construction	9,564,541	6.4	203,192	6.7	144,957	6.7
Manufacturing	15,477,389	10.3	136,368	4.5	98,088	4.5
Wholesale trade	4,042,867	2.7	57,497	1.9	43,147	2.0
Retail trade	17,167,000	11.4	292,326	9.6	214,687	9.9
Transportation and warehousing, and utilities	7,681,579	5.1	137,153	4.5	107,393	5.0
Information	3,173,300	2.1	64,760	2.1	41,886	1.9
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	187,636	6.2	128,613	6.0
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	468,379	15.4	303,991	14.1
Educational services, and health care and social assistance	34,781,348	23.1	724,995	23.8	529,779	24.6
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	254,958	8.4	182,027	8.4
Other services, except public administration	7,371,226	4.9	165,095	5.4	109,960	5.1
Public administration	7,025,870	4.7	333,323	11.0	243,322	11.3

Source: USCB 2017p

Table 11-11 and Figure 11-32 show the number of jobs in each major industry sector for the U.S., the State and the Study Area. Based on the USCB data, the dominant employment industry sectors in the Study Area are educational services, and health care and social assistance (24.6%), professional, scientific, and management, and administrative and waste management (14.1%), public administration (11.3%) and retail trade (9.9%). Generally, the dominant employment sectors in the Study Area are similar to those of the State. In the Study Area, 11.3% of people work in public administration, more than the State (11.0%) and the U.S. (4.7%), reflecting its proximity to the government jobs in the Washington metropolitan area. Manufacturing jobs in the State and the Study Area are significantly less (4.5%) than the Nation (10.3%) (USCB 2017p).



Source: USCB 2017p

Figure 11-32. Number of Jobs by Industry Sector for the U.S., Maryland, and the Maryland Study Area

Based on Bureau of Labor Statistics data, Maryland's key job sectors (not including Government) are (1) Education and Health Services, (2) Trade, Transportation, and Utilities, (3) Professional and Business Services, (4) Leisure and Hospitality, and (5) Mining, Logging, and Construction (BLS 2020d). According to the US Bureau of Labor Statistics, these five listed industries account for 67.1% of the States workforce, with Education and Health Services employing 17.3% of the State's workforce (BLS 2020d). The Government industry in Maryland is the actual leading employer in the State, however the Government industry is not usually considered in discussing industries (BLS 2020d). The Government industry employs 18.4% of Maryland's workforce, which is influenced by the proximity of the Study Area to the District of Columbia.

Figure 11-33 shows the location of jobs within the Study Area. The greater portion of jobs are located near the high-density MSAs of Baltimore-Columbia-Towson and Washington-Arlington-Alexandria, DC-VA-MD-WV. Population density increases the demand for all goods, services, space and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the rural Eastern Region. Rural areas tend to have fewer locally available options and less economic development.

11.4.4.1.1 Maryland's Ocean Economy

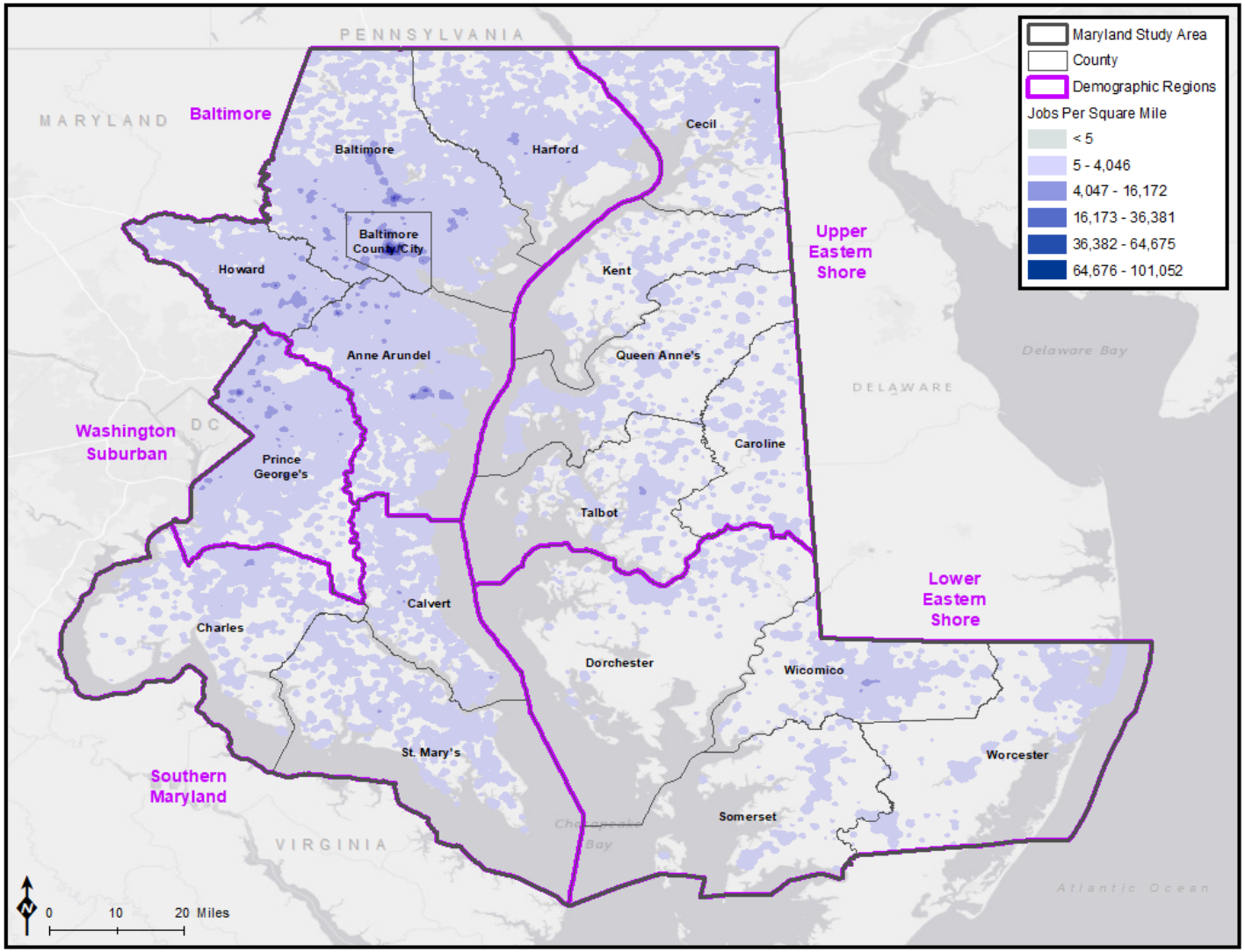
Overall, Maryland's ocean economy ranked 10th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 11-12 Maryland's ocean economy accounted for 104,064 maritime jobs in 2016, accounting for 4.1% of Maryland's employment (NOAA 2016b, USCB 2017i). Within the State, Tourism and Recreation was the dominant sector, accounting for 69.2% (70,180) of maritime jobs. The Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 102,475 maritime jobs, representing 98.5% of total maritime jobs in the State. Anne Arundel County had the greatest number of maritime jobs (30,222), representing 29.5% of maritime jobs in the Study Area (NOAA 2016b, USCB 2017i). Figure 11-34 shows the percent of maritime related jobs to total jobs in each county in the Study Area. As shown in Table 11-12**,** the highest percentage of maritime jobs to overall county jobs were in the Upper and Lower Eastern Shore Regions, reflecting their proximity to the ocean and maritime employment opportunities: Worcester (37.3%), Queen Ann's (19.7%) and Dorchester (18.4%) (NOAA 2016b).

11.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 11-12, in 2017 Maryland had higher median household income and per capita income than the U.S.

According to the USCB, the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, Maryland had a median income of $78,916 (36.9% higher than the Nation's median income), and a per capita income of $39,070 (25.3% higher than the Nation's per capita income). Median and per capita income in the Study Area were lower than the State at $71,163 and $35,848, respectively (USCB 2017k, USCB 2017n).



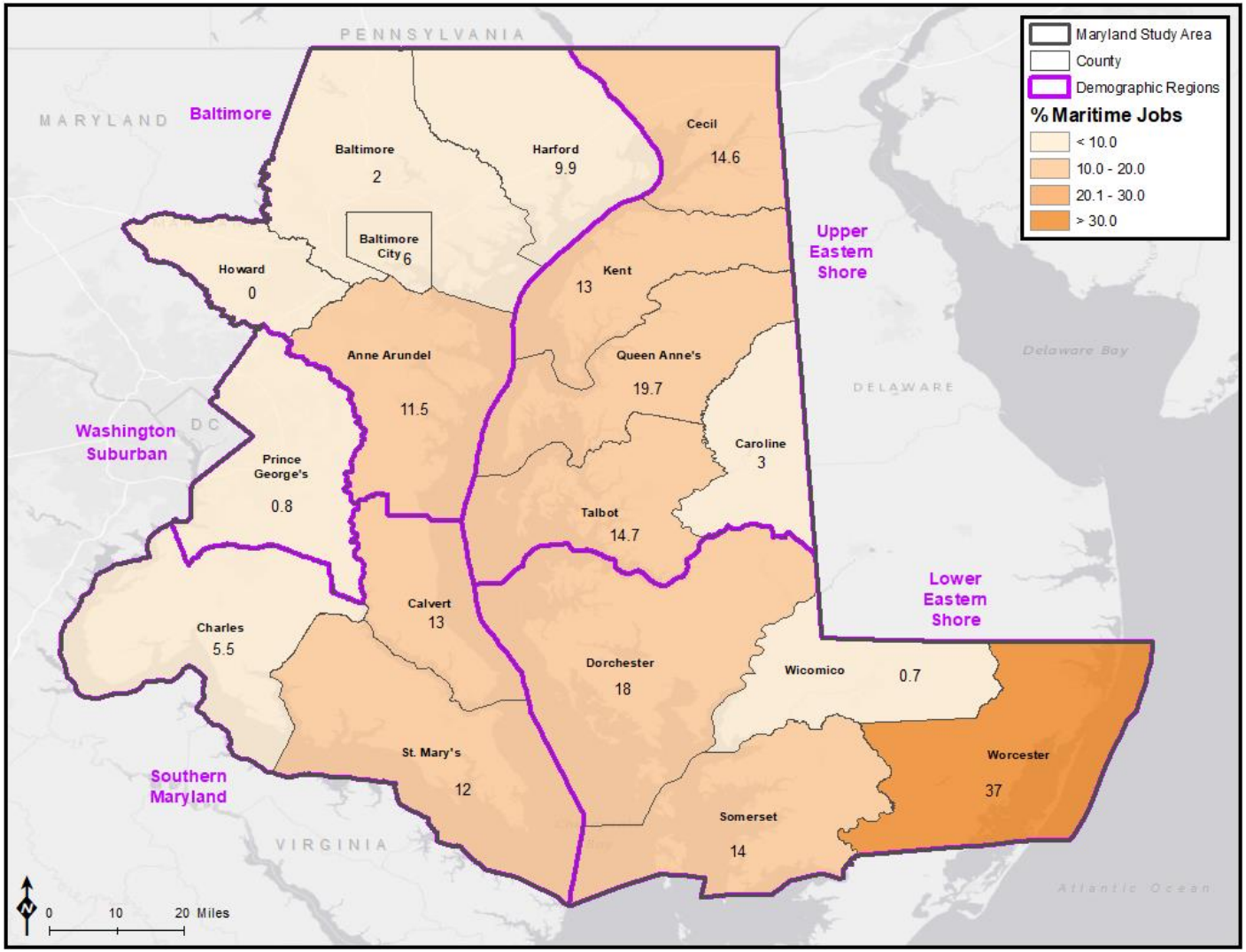
Source: USCB 2017r

Figure 11-33. Jobs Per Square Mile in the Maryland Study Area by Census Block Group

Table 11-12. Employment Data in the Maryland Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed[1] (%)	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Baltimore	Anne Arundel	318,762	306,519	290,628	15,891	5.2	261,894	30,222	11.5	$94,502	$43,258
	Baltimore City	309,185	308,703	277,954	30,749	10.0	337,057	23,099	6.9	$46,641	$28,488
	Baltimore	446,069	445,373	420,974	24,399	5.5	382,493	7,051	1.8	$71,810	$37,270
	Harford	137,924	136,253	129,108	7,145	5.2	82,401	8,138	9.9	$83,445	$37,972
	Howard	176,447	174,816	167,493	7,323	4.2	180,733	0	0.0	$115,576	$51,045
	Total Baltimore Region	***1,388,387***	***1,371,664***	***1,286,157***	***85,507***	***6.2***	***1,244,578***	***68,510***	***5.5***	***NA***	***NA***
Washington Suburban	Prince George's	***516,865***	***514,437***	***476,889***	***37,548***	***7.3***	***310,636***	***2,525***	***0.8***	***NA***	***NA***
Southern Maryland	Calvert	49,994	49,333	45,756	3,577	7.3	23,948	3,122	13.0	$100,350	$41,469
	Charles	83,856	82,373	78,635	3,738	4.5	37,375	2,053	5.5	$93,973	$38,890
	St. Mary's	58,406	56,495	54,121	2,374	4.2	33,421	3,872	11.6	$86,508	$37,528
	Total Southern Maryland Region	***192,256***	***188,201***	***178,512***	***9,689***	***5.1***	***94,744***	***9,047***	***9.5***	***NA***	***NA***
Upper Eastern Shore	Caroline	16,774	16,761	15,674	1,087	6.5	8,801	281	3.2	$52,469	$25,355
	Cecil	53,797	53,741	50,620	3,121	5.8	28,933	4,218	14.6	$70,516	$32,542
	Kent	9,600	9,588	9,131	457	4.8	7,980	1,052	13.2	$56,638	$32,217
	Queen Anne's	26,681	26,542	25,556	986	3.7	14,200	2,800	19.7	$89,241	$40,553
	Talbot	18,724	18,689	17,863	826	4.4	19,320	2,834	14.7	$65,595	$44,785
	Total Upper Eastern Shore Region	***125,576***	***125,321***	***118,844***	***6,477***	***5.2***	***79,234***	***11,185***	***14.1***	***NA***	***NA***
Lower Eastern Shore	Dorchester	16,628	16,613	15,240	1,373	8.3	10,621	1,956	18.4	$50,532	$28,911
	Somerset	9,569	9,564	8,593	971	10.2	6,319	883	14.0	$39,239	$18,395
	Wicomico	53,925	53,854	49,785	4,069	7.6	44,758	328	0.7	$54,493	$27,755
	Worcester	25,794	25,756	23,915	1,841	7.1	21,574	8,041	37.3	$59,458	$34,425
	Total Lower Eastern Shore Region	***105,916***	***105,787***	***97,533***	***8,254***	***7.8***	***83,272***	***11,208***	***13.5***	***NA***	***NA***
	Study Area Total	**2,329,000**	**2,305,410**	**2,157,935**	**147,475**	**6.4**	**1,812,464**	**102,475**	**5.7**	**$71,163**	**$35,848**
	Maryland	**3,267,069**	**3,239,167**	**3,040,792**	**198,375**	**6.1**	**2,518,408**	**104,064**	**4.1**	**$78,916**	**$39,070**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 11-34. Maritime Jobs in the Maryland Study Area by County

Figure 11-35 and Figure 11-36 show median household income and per capita income in the Study Area. The figures portray high median household and per capita incomes near the high-paying jobs in Maryland's metropolitan areas and nearby suburbs and lower paying jobs are in rural areas (USCB 2017k, USCB 2017n).

11.4.4.3 Unemployment Rates

Figure 11-37 shows the 2017 unemployment rates in the counties and cities in the Study Area by census block group. Table 11-12 presents unemployment rates for each county and city in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 6.4%, similar to the State (6.1%) but less than the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area, unemployment rates ranged from 3.7% in Queen Anne's County (Upper Eastern Shore Region) to 10.2% in Summerset County (Lower Eastern Shore Region) in 2017 (USCB 2017h).

The unemployment rate was 6.2% in the Baltimore Region in 2017, with the highest rates occurring in Baltimore City (10.0%). The unemployment rate was 7.3% in the Washington Suburban Region in 2017. The unemployment rate was 5.1% in the Southern Maryland Region in 2017. Rates range from 4.2% in St. Mary's County to 7.3% in Calvert County. The Upper Eastern Shore Region had 5.2% unemployment. Rates ranged from 3.7% in Queen Anne's County to 6.5% in Caroline County. The Lower Eastern Shore Region had an unemployment rate of 7.8%, the highest in the Study Area. Somerset County, located farthest from the metropolitan areas had a rate of 10.2% – the highest in the Study Area (USCB 2017h).

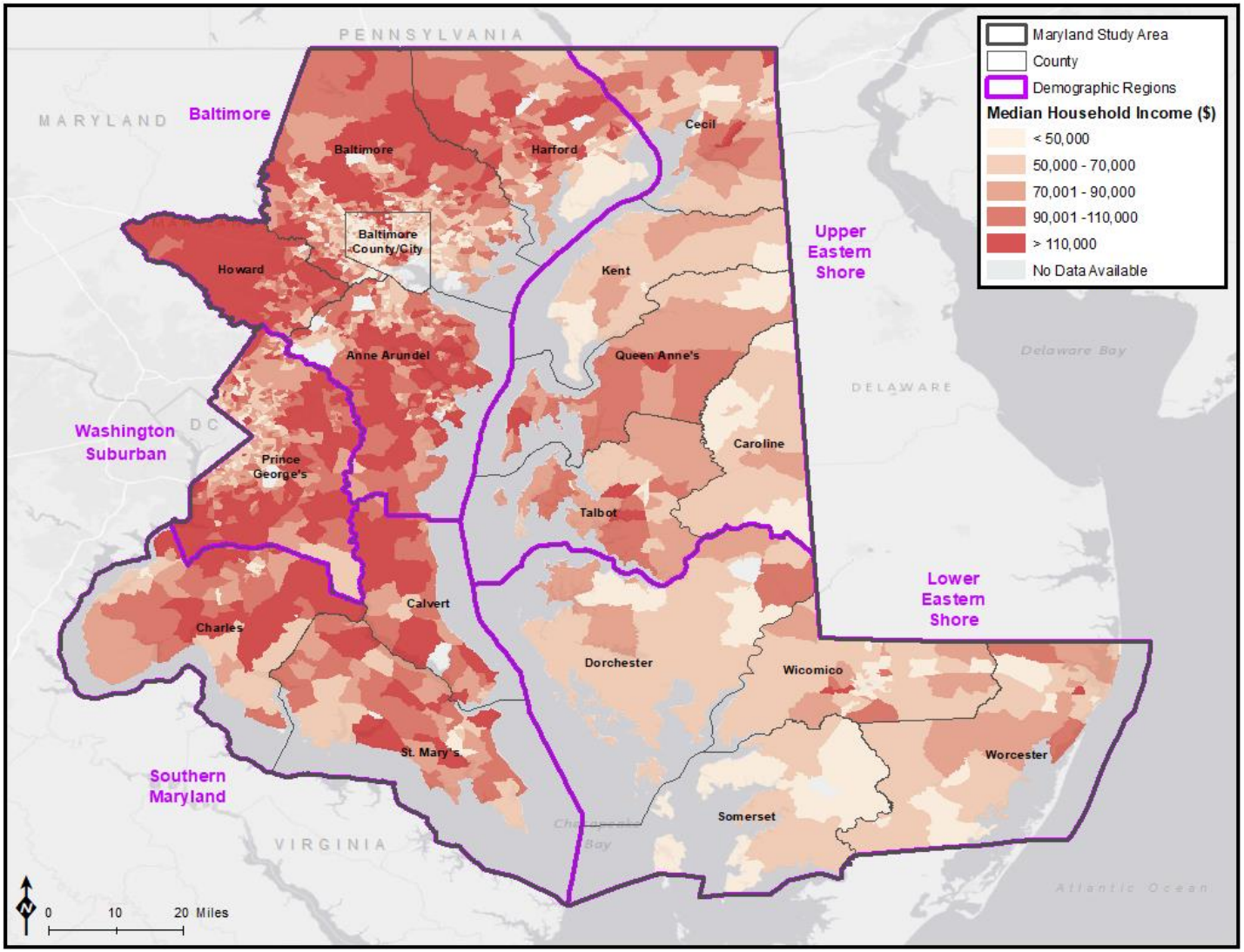
11.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 11-13 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State and the Nation (USCB 2017t).

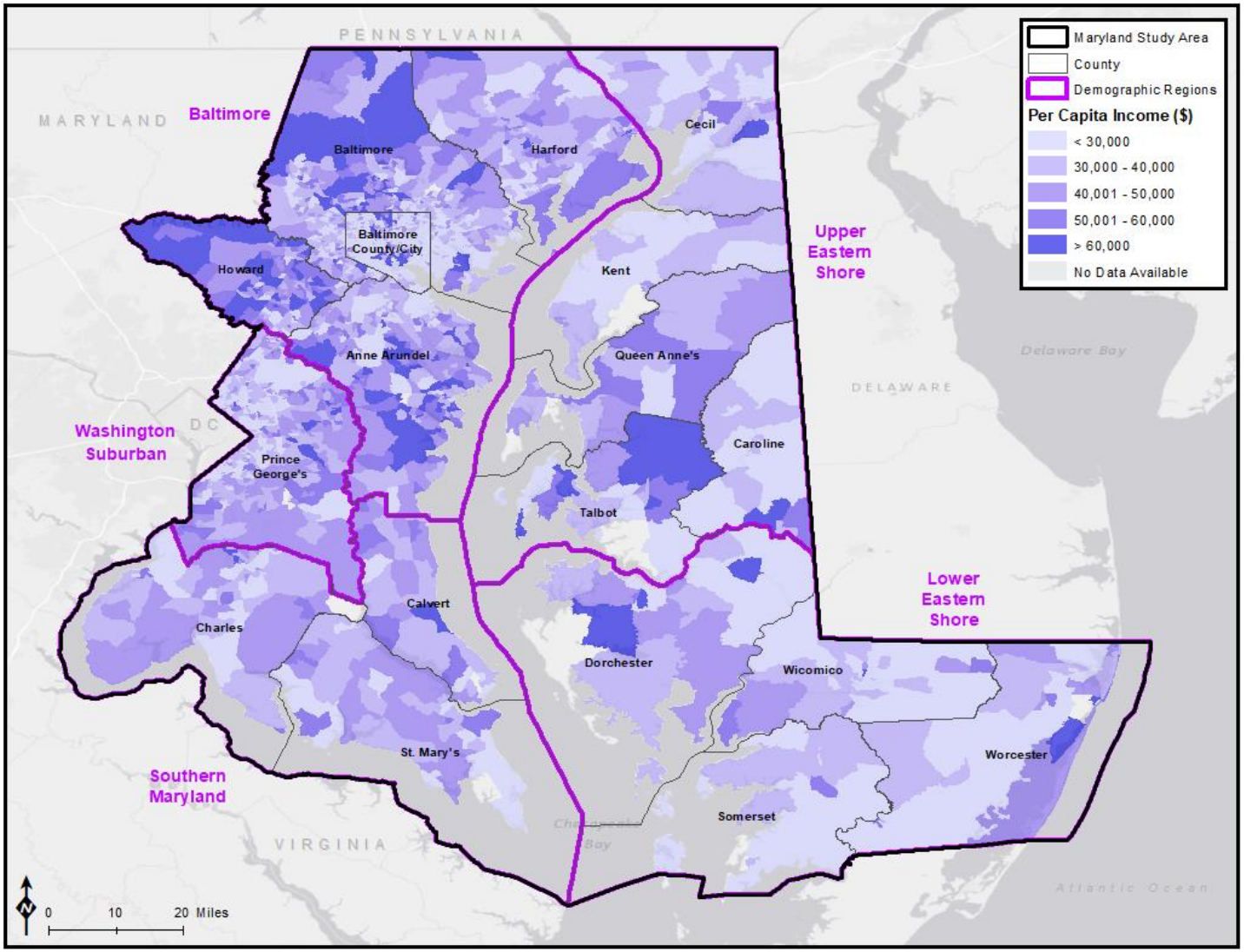
Figure 11-38 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associate's, bachelor's, and/or graduate degree) in the Nation, the State and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Maryland, 25.3% of the working-age population earned only a high school diploma; 42.7% earned a college or advanced degree.
- In the Study Area, 27.3% of the working-age population earned only a high school diploma; 38.4% earned a college or advanced degree (USCB 2017q).



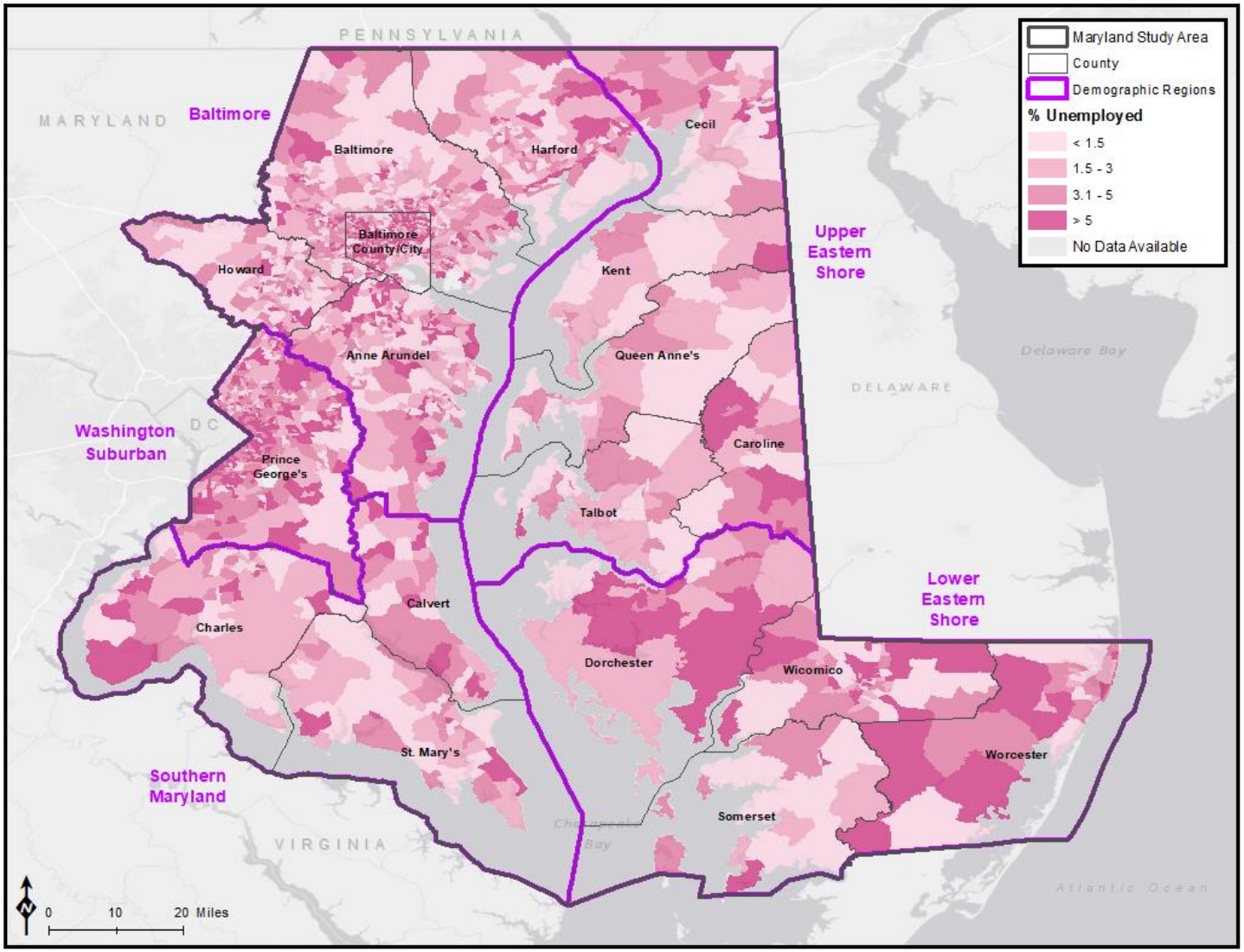
Source: USCB 2017r

Figure 11-35. Median Household Income in the Maryland Study Area by Census Block Group



Source: USCB 2017r

Figure 11-36. Per Capita Income in the Maryland Study Area by Census Block Group



Source: USCB 2017r

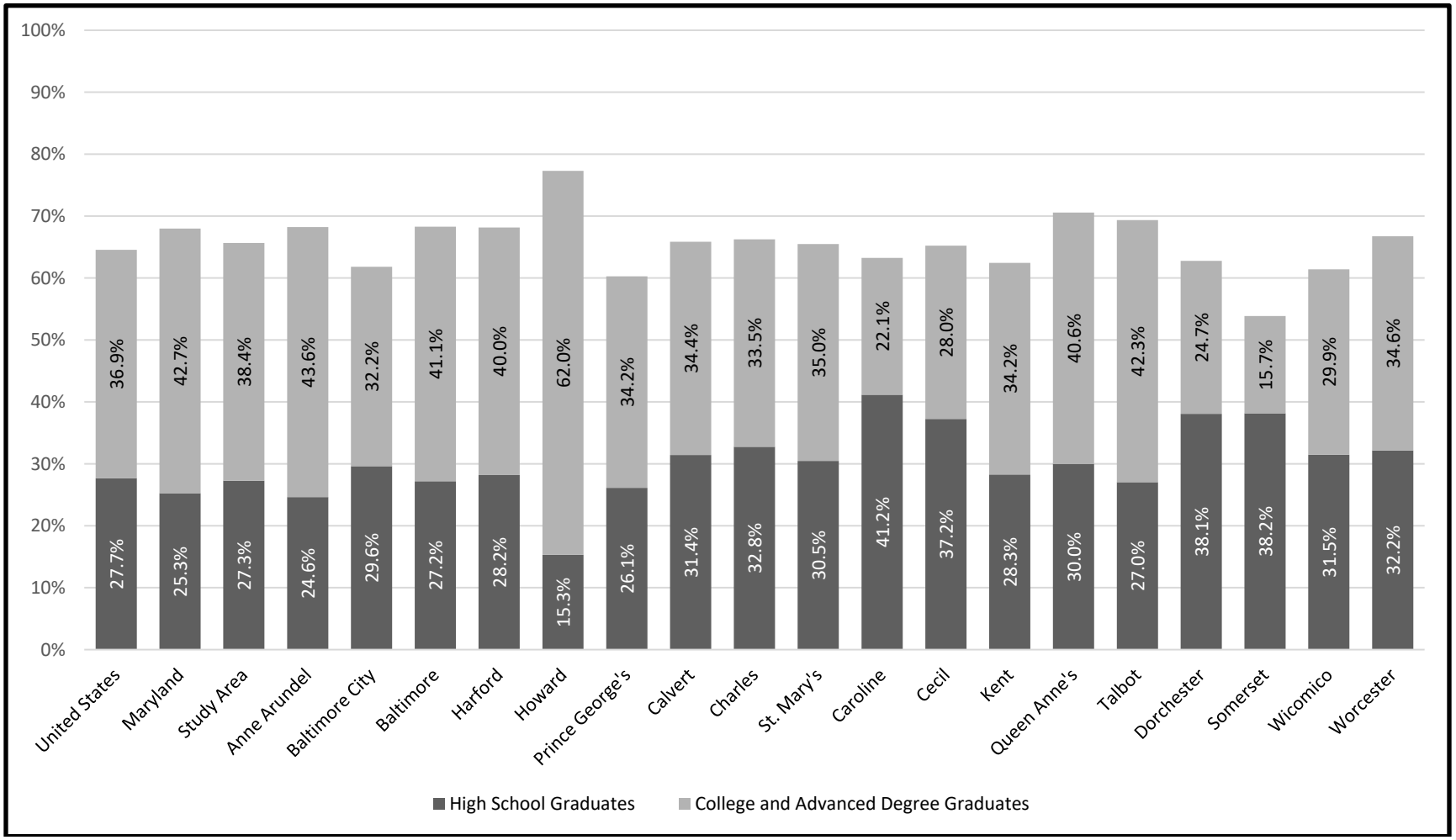
Figure 11-37. Unemployment Rates in the Maryland Study Area by Census Block Group

Table 11-13. Educational Data for the Maryland Study Area

Region	Geographic Unit	Number								Percent						
		Less than 9th grade	9th to 12th grade, no diploma	High school graduate (includes equivalent)	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree	Total	Less than 9th grade (%)	9th to 12th grade, no diploma (%)	High school graduate (includes equivalent) (%)	Some college, no degree (%)	Associate's degree (%)	Bachelor's degree (%)	Graduate or professional degree (%)
Baltimore	Anne Arundel	9,133	27,325	107,823	102,677	29,279	96,645	64,861	437,743	2.1	6.2	24.6	23.5	6.7	22.1	14.8
	Baltimore City	20,732	56,419	145,121	109,907	20,061	76,071	61,584	489,895	4.2	11.5	29.6	22.4	4.1	15.5	12.6
	Baltimore	18,315	39,524	176,565	148,217	40,355	135,206	91,430	649,612	2.8	6.1	27.2	22.8	6.2	20.8	14.1
	Harford	3,782	10,472	54,449	47,231	14,187	38,648	24,325	193,094	2.0	5.4	28.2	24.5	7.3	20.0	12.6
	Howard	4,546	7,902	36,071	41,051	11,851	68,778	65,448	235,647	1.9	3.4	15.3	17.4	5.0	29.2	27.8
	Total Baltimore Region	***56,508***	***141,642***	***520,029***	***449,083***	***115,733***	***415,348***	***307,648***	***2,005,991***	***2.8***	***7.1***	***25.9***	***22.4***	***5.8***	***20.7***	***15.3***
Washington Suburban	Prince George's	43,844	52,345	183,169	182,412	36,033	120,999	82,559	**701,361**	6.3	7.5	26.1	26.0	5.1	17.3	11.8
Southern Maryland	Calvert	1,096	3,341	21,709	19,148	4,642	11,283	7,866	69,085	1.6	4.8	31.4	27.7	6.7	16.3	11.4
	Charles	2,346	6,357	38,535	31,007	8,473	19,016	11,904	117,638	2.0	5.4	32.8	26.4	7.2	16.2	10.1
	St. Mary's	2,404	6,247	25,439	20,159	5,951	14,068	9,223	83,491	2.9	7.5	30.5	24.1	7.1	16.8	11.0
	Total Southern Maryland Region	***5,846***	***15,945***	***85,683***	***70,314***	***19,066***	***44,367***	***28,993***	***270,214***	***2.2***	***5.9***	***31.7***	***26.0***	***7.1***	***16.4***	***10.7***
Upper Eastern Shore	Caroline	1,230	2,920	10,274	5,027	1,687	2,332	1,496	24,966	4.9	11.7	41.2	20.1	6.8	9.3	6.0
	Cecil	2,187	6,949	29,270	18,194	5,084	10,432	6,462	78,578	2.8	8.8	37.2	23.2	6.5	13.3	8.2
	Kent	622	1,326	4,657	4,236	784	2,855	1,987	16,467	3.8	8.1	28.3	25.7	4.8	17.3	12.1
	Queen Anne's	750	2,357	11,474	8,152	2,892	7,841	4,780	38,246	2.0	6.2	30.0	21.3	7.6	20.5	12.5
	Talbot	996	2,223	8,254	6,141	1,989	5,881	5,045	30,529	3.3	7.3	27.0	20.1	6.5	19.3	16.5
	Total Upper Eastern Shore Region	***5,785***	***15,775***	***63,929***	***41,750***	***12,436***	***29,341***	***19,770***	***188,786***	***3.1***	***8.4***	***33.9***	***22.1***	***6.6***	***15.5***	***10.5***
Lower Eastern Shore	Dorchester	926	2,833	9,720	5,747	1,476	3,099	1,728	25,529	3.6	11.1	38.1	22.5	5.8	12.1	6.8
	Somerset	872	2,688	8,186	6,341	887	1,638	845	21,457	4.1	12.5	38.2	29.6	4.1	7.6	3.9
	Wicomico	2,331	6,521	25,029	21,844	4,458	11,957	7,398	79,538	2.9	8.2	31.5	27.5	5.6	15.0	9.3
	Worcester	1,043	3,275	13,650	9,790	2,675	7,734	4,260	42,427	2.5	7.7	32.2	23.1	6.3	18.2	10.0
	Total Lower Eastern Shore Region	***5,172***	***15,317***	***56,585***	***43,722***	***9,496***	***24,428***	***14,231***	***168,951***	***3.1***	***9.1***	***33.5***	***25.9***	***5.6***	***14.5***	***8.4***
	Study Area Total	**117,155**	**241,024**	**909,395**	**787,281**	**192,764**	**634,483**	**453,201**	**3,335,303**	**3.5**	**7.2**	**27.3**	**23.6**	**5.8**	**19.0**	**13.6**
	Maryland	**165,505**	**310,934**	**1,188,077**	**1,030,191**	**285,379**	**961,651**	**763,490**	**4,705,227**	**3.5**	**6.6**	**25.3**	**21.9**	**6.1**	**20.4**	**16.2**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between district-level summarization and State-level summarization methods. Therefore, the district statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 11-38. High School, College and Advanced Degree Graduate Rates in the Maryland Study Area

Figure 11-39 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

11.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" are necessary.

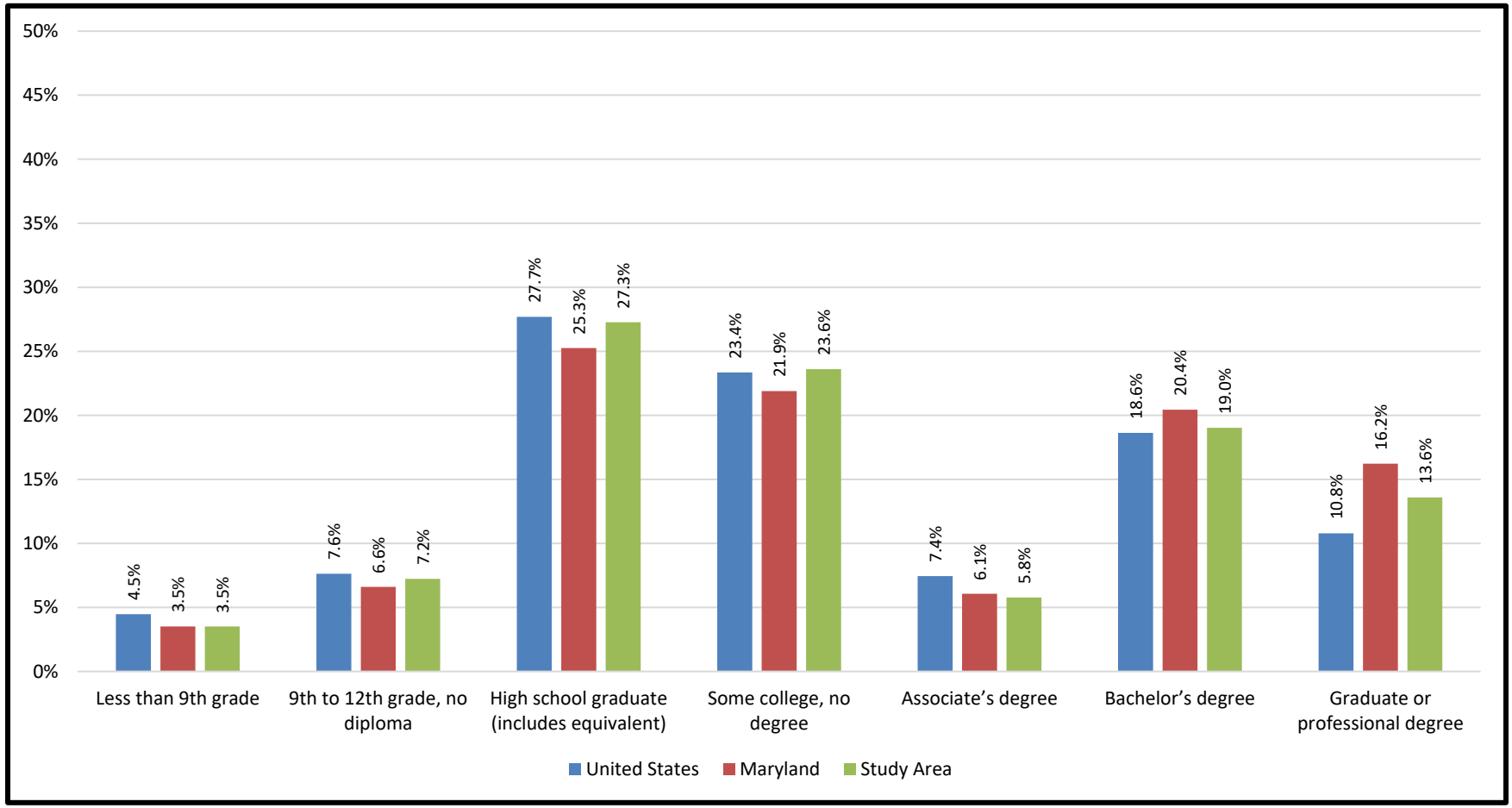
Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

11.4.5.1 Environmental Justice Communities of Concern

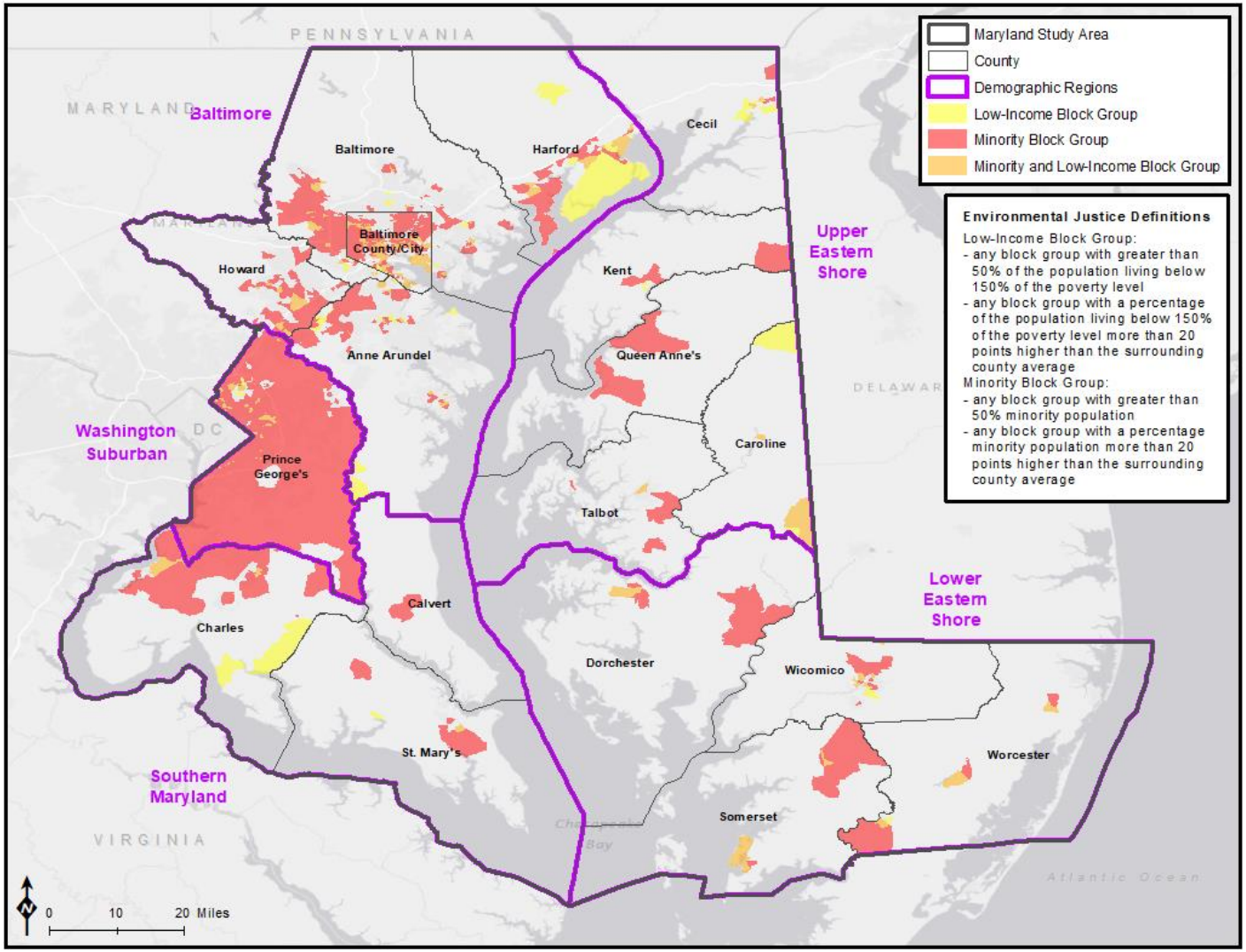
Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 11-40 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.



Source: USCB 2017q

Figure 11-39. Educational Attainment in the Maryland Study Area



Source: USCB 2017r

Figure 11-40. Minority and Low-Income Population in the Maryland Study Area by Census Block Group

11.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 11-14 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 4,291,804 people living in the Study Area, approximately 2,196,879 (51.2%) are minority. This is commensurate with the State (48.1%) and significantly higher than the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 2,835 block groups in the Study Area, approximately 49.4% (1401 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with minority populations. As shown in Table 11-14, the Washington Suburban, Baltimore and Southern Maryland Regions have high percentages of minority block groups at 93.3%, 44.1% and 31.7% respectively. The Upper Eastern Shore Region had the lowest percentage of minority block groups (9.9%) (USCB 2017f).

As illustrated in Figure 11-40, many counties contain a high percentage of minority census block groups. Prince George County had the highest percentage of minority block groups (93.3%); followed by the city of Baltimore (77.3%). Within the Study Area, the largest minority group is Black or African-American (35.5%) followed by Asian (4.7%) (USCB 2017f).

11.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 11-14 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 4,185,301 people for whom poverty status is determined living in the Study Area, approximately 703,244 (16.8%) individuals have incomes less than 150% of the poverty level. This is commensurate with the State (15.8%) and significantly lower than the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 2,835 census block groups in the Study Area, approximately 10.4% (296 block groups) are considered low-income populations (USCB 2017o).

Many regions contain block groups with high percentages of low-income populations. As shown in Table 11-14, the Lower Eastern Shore Region had the highest percentage of low-income block groups at 12.7%. The Baltimore Region has the next highest percentage, at 11.9% (USCB 2017o).

As illustrated in Figure 11-40, several counties contain large areas of low-income census block groups. They are Caroline, Harford, and Charles Counties (USCB 2017o).

Table 11-14. Low-Income and Minority Populations in the Maryland Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Baltimore	Anne Arundel	564,600	393,139	171,461	30.4	311	20	6.4	54	17.4	548,112	56,964	10.4
	Baltimore City	619,796	170,916	448,880	72.4	653	146	22.4	505	77.3	596,590	194,547	32.6
	Baltimore	828,637	486,692	341,945	41.3	529	28	5.3	156	29.5	807,987	121,527	15.0
	Harford	250,132	192,509	57,623	23.0	167	15	9.0	28	16.8	247,931	30,467	12.3
	Howard	312,495	169,069	143,426	45.9	154	6	3.9	57	37.0	310,234	27,489	8.9
	Total Baltimore Region	***2,575,660***	***1,412,325***	***1,163,335***	***45.2***	***1,814***	***215***	***11.9***	***800***	***44.1***	***2,510,854***	***430,994***	***17.2***
Washington Suburban	Prince George's	***905,161***	***120,200***	***784,961***	***86.7***	***523***	***39***	***7.5***	***488***	***93.3***	***885,531***	***140,628***	***15.9***
Southern Maryland	Calvert	90,824	71,582	19,242	21.2	44	0	0.0	2	4.5	89,882	9,065	10.1
	Charles	156,021	67,280	88,741	56.9	81	6	7.4	45	55.6	153,522	18,182	11.8
	St. Mary's	110,979	83,340	27,639	24.9	55	3	5.5	10	18.2	107,806	14,089	13.1
	Total Southern Maryland Region	***357,824***	***222,202***	***135,622***	***37.9***	***180***	***9***	***5.0***	***57***	***31.7***	***351,210***	***41,336***	***11.8***
Upper Eastern Shore	Caroline	32,785	25,022	7,763	23.7	23	4	17.4	2	8.7	32,299	8,222	25.5
	Cecil	102,416	87,889	14,527	14.2	57	5	8.8	4	7.0	101,096	16,976	16.8
	Kent	19,666	15,366	4,300	21.9	19	1	5.3	2	10.5	18,071	3,904	21.6
	Queen Anne's	49,071	42,489	6,582	13.4	26	0	0.0	2	7.7	48,544	5,188	10.7
	Talbot	37,461	29,076	8,385	22.4	27	2	7.4	5	18.5	37,049	6,840	18.5
	Total Upper Eastern Shore Region	***241,399***	***199,842***	***41,557***	***17.2***	***152***	***12***	***7.9***	***15***	***9.9***	***237,059***	***41,130***	***17.4***
Lower Eastern Shore	Dorchester	32,386	20,676	11,710	36.2	29	3	10.3	7	24.1	31,927	8,443	26.4
	Somerset	25,801	13,280	12,521	48.5	19	2	10.5	6	31.6	19,680	6,882	35.0
	Wicomico	102,014	65,154	36,860	36.1	71	10	14.1	20	28.2	98,209	24,457	24.9
	Worcester	51,559	41,246	10,313	20.0	47	6	12.8	8	17.0	50,831	9,374	18.4
	Total Lower Eastern Shore Region	***211,760***	***140,356***	***71,404***	***33.7***	***166***	***21***	***12.7***	***41***	***24.7***	***200,647***	***49,156***	***24.5***
	Study Area Total	**4,291,804**	**2,094,925**	**2,196,879**	**51.2**	**2,835**	**296**	**10.4**	**1,401**	**49.4**	**4,185,301**	**703,244**	**16.8**
	Maryland	**5,996,079**	**3,109,275**	**2,886,804**	**48.1**						**5,856,088**	**927,558**	**15.8**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

11.4.5.2 Socially Vulnerable Populations

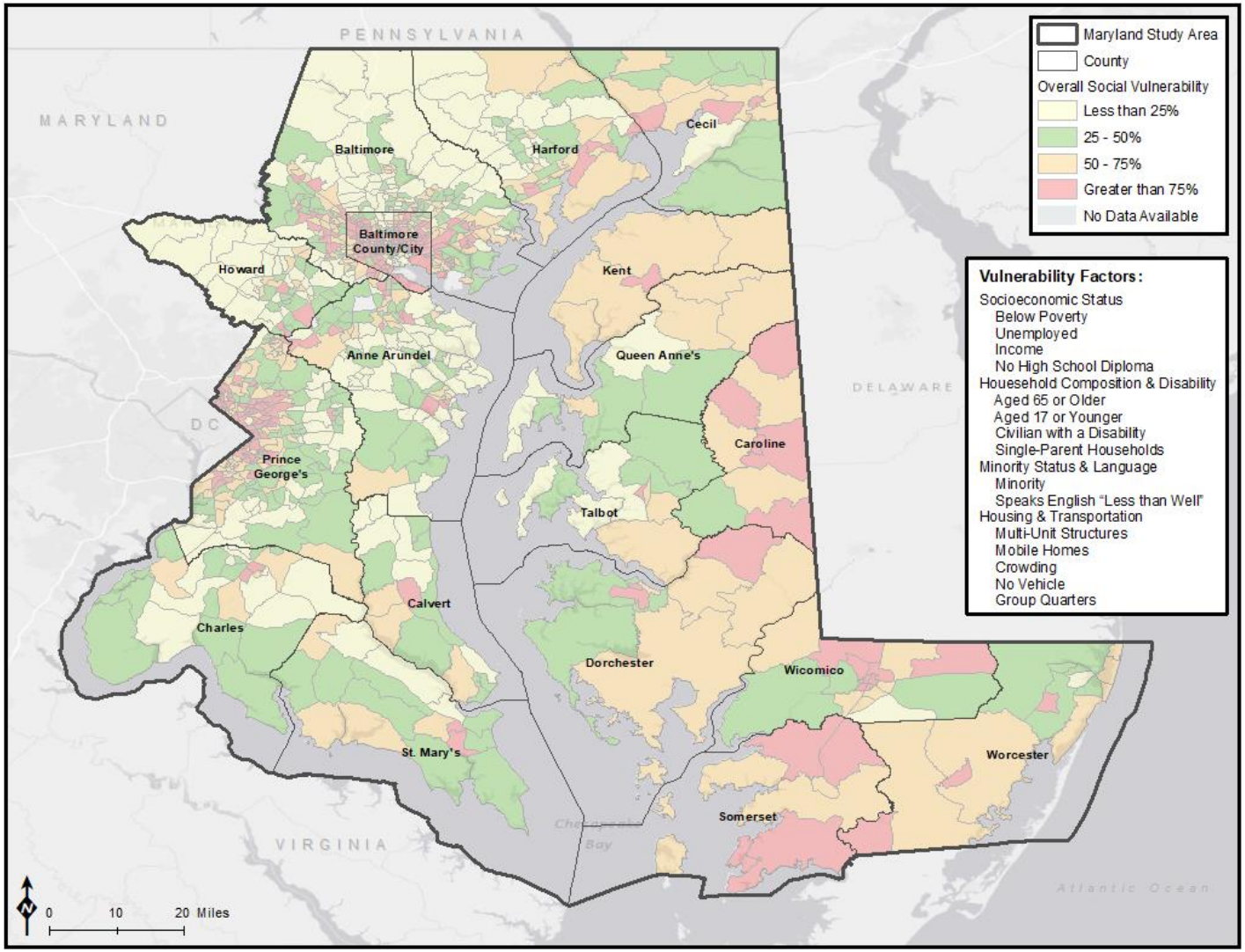
As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this report, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report, we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in Fishing Communities (Chapter 1.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 11-41 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 11-41, Caroline, Wicomico, and Somerset Counties (all located in the Upper and Lower Eastern Shore Regions) have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).

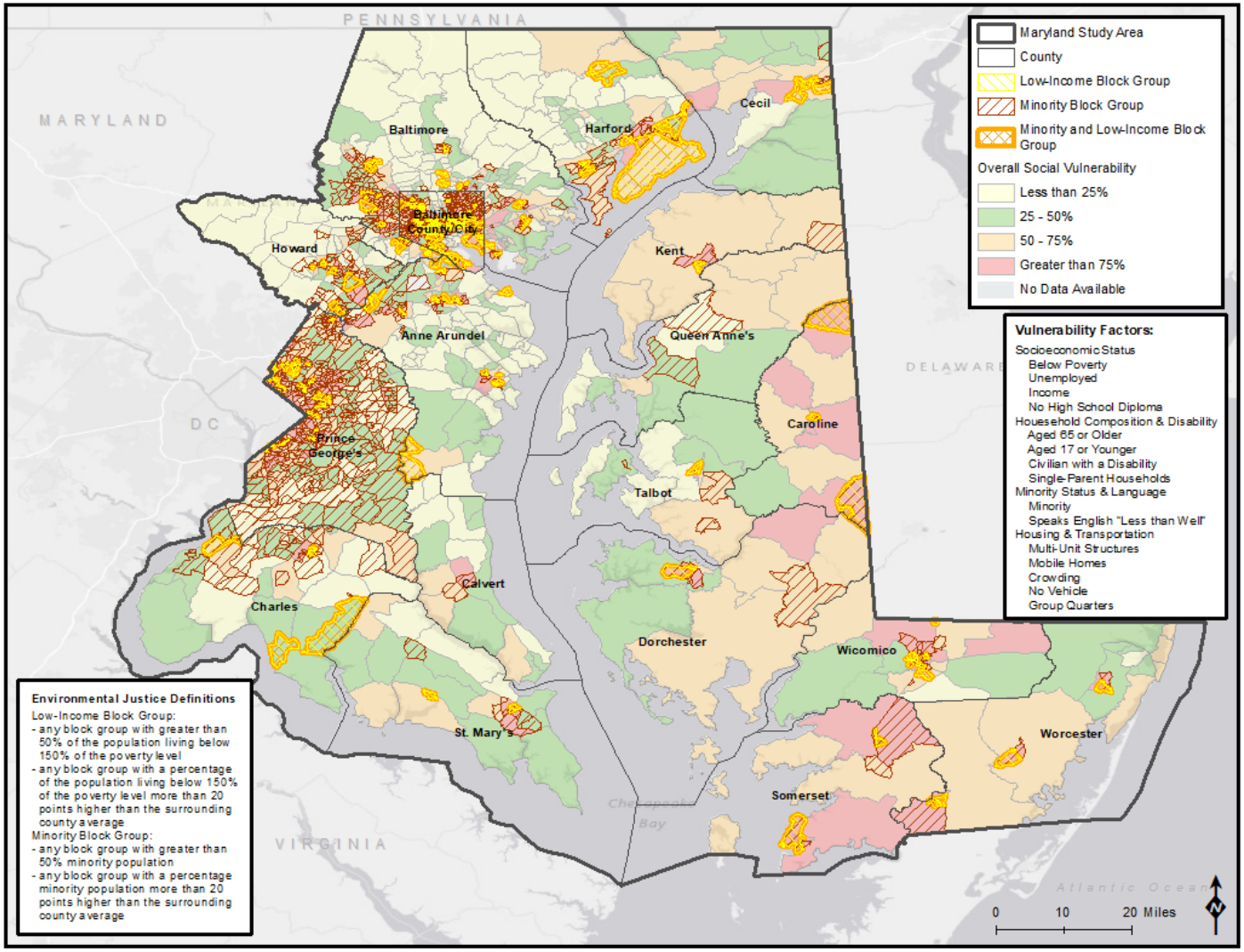
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 11-42 combines the CDC SoVI index (as shown in Figure 11-41) with minority and low-income populations (as shown in Figure 11-40) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; particularly notable in Prince George's County and the city of Baltimore (USCB 2017r, CDC 2016).

Figure 11-43 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 11-43 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 11.2.2.2 above), are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.



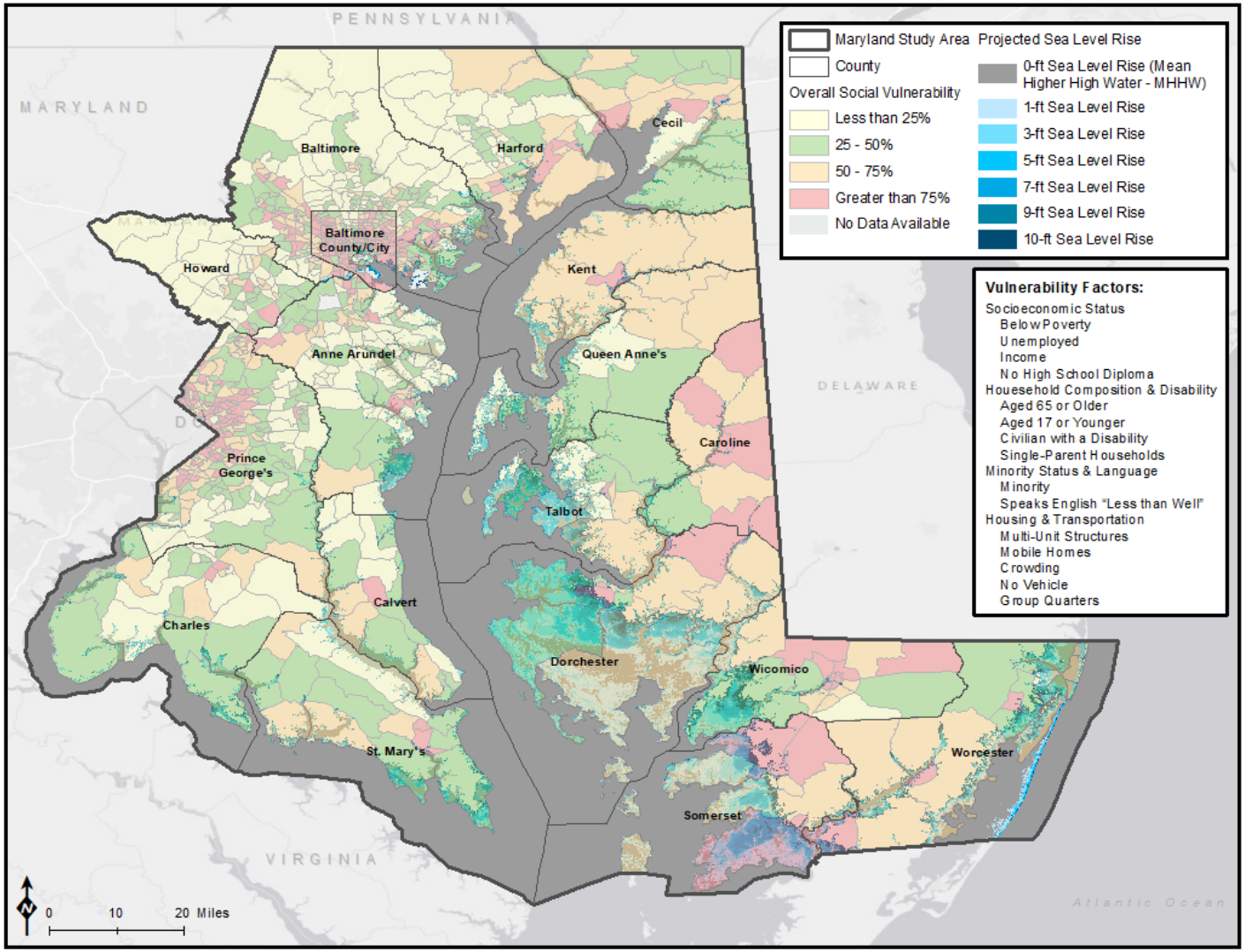
Source: CDC 2016

Figure 11-41. Overall Social Vulnerability using the CDC Social Vulnerability Index in the Maryland Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 11-42. Overall Social Vulnerability using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Block Census Group in the Maryland Study Area



Sources: CDC 2016, NOAA 2018a

Figure 11-43. Overall Social Vulnerability using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Maryland Study Area by Census Tract

As discussed in Chapter 11.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist in Somerset County and along the coasts of the Study Area (CDC 2016).

11.4.5.3 Resource-Dependent Populations

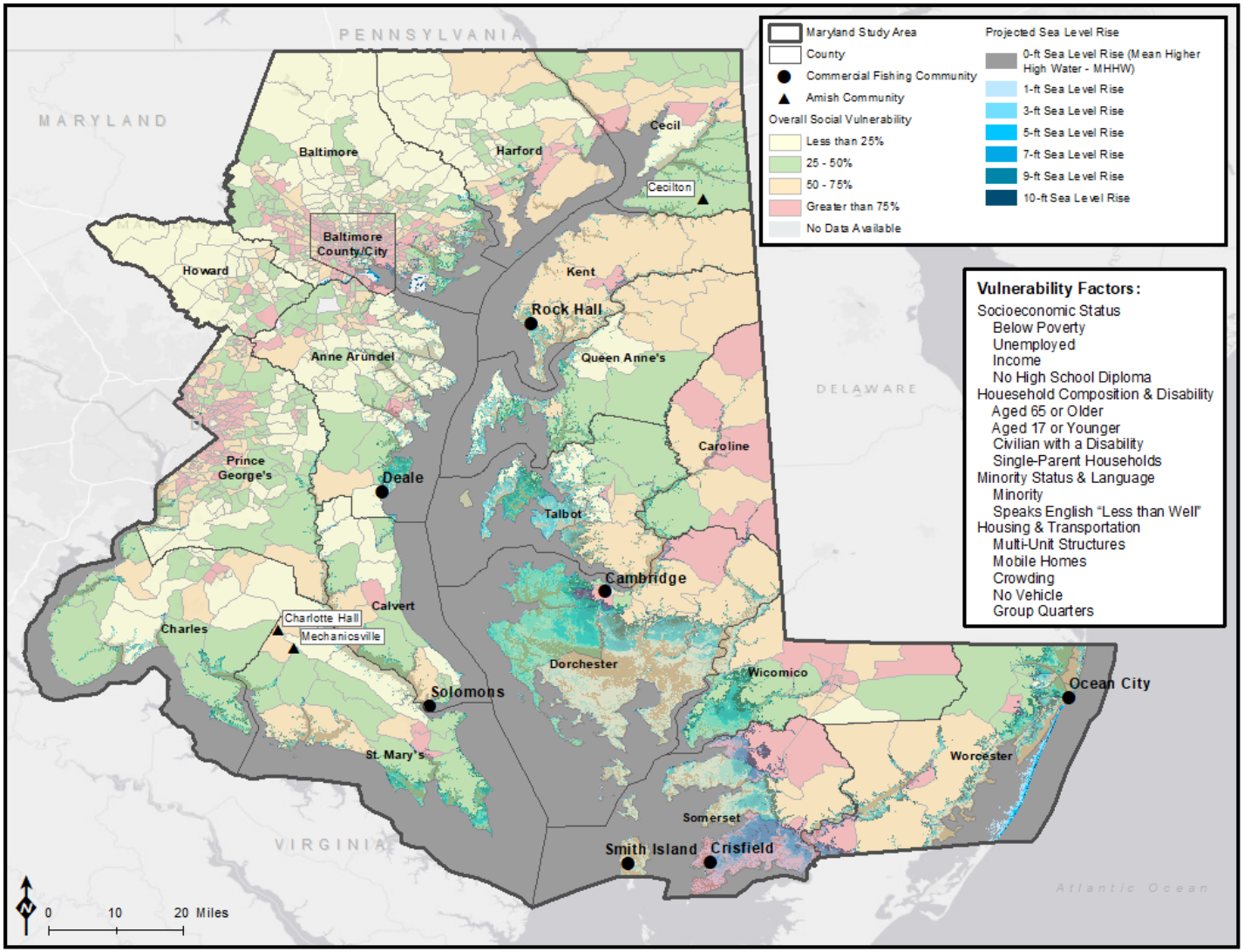
Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.

11.4.5.3.1 Fishing Communities

There are 7 fishing communities in the Study Area, most of which are located on the Chesapeake Bay coast, as illustrated in Figure 11-44. The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Cambridge, Dorchester County
- Crisfield, Somerset County
- Deale, Anne Arundel County
- Ocean City, Worchester County
- Rock Hall, Kent County
- Smith Island, Somerset County
- Solomons, Calvert County

As can be seen on Figure 11-44, all 7 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 11.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, that the location of fishing communities be included in the analysis of OCS-related projects. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a National effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of Environmental Impact Statements required under NEPA Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d).



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 11-44. Potential Vulnerable Communities in the Maryland Study Area by Census Tract

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

11.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on *Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 11-44). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

11.4.5.3.3 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3.

Approximately 1,580 Amish live in Maryland. Three Amish settlements are present within the Study Area (Young Center 2019b). As illustrated in Figure 11-44, two settlements are located in St. Mary's county (near Charlotte Hall and Mechanicsville) within 50 miles of Washington DC, and one in Cecil's County (Cecilton) on the Eastern Shore. The Charlotte Hall and Mechanicsville settlements were founded in 1939 and 1940, respectively, by migrating families from Pennsylvania seeking cheaper land for

growing families, and more liberal education policies (Jones 2012, Amish America 2010). Cecilton was founded in 1999 (Amish America 2011b).

Proximity of unique religions populations to prospective sites for OCS-related development should be considered in analysis. For example, in the Study Area, it is unlikely industrial areas, supporting services, or a local workforce would be located within an Amish or Mennonite community. These communities also may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources. Evaluating the locations of such communities can inform the development process for various projects.

11.4.5.4 Tribes

Maryland has five federally recognized tribes and three State0recognized tribes with historical ties to the Study Area (NCSL 2019, HUD 2019b). The Maryland Commission on Indian Affairs reported in 2018 that they serve three State-recognized tribes as well as four other indigenous tribal communities in Maryland (MCIA 2018). Historically, Maryland was once comprised of many tribes and indigenous groups(HUD 2019b). Table 11-15 lists the federally and State-recognized tribes with historical ties to Maryland and indigenous tribal communities supported by Maryland Commission on Indian Affairs.

Table 11-15. Federally and State-Recognized Tribes with Historical Ties to Maryland

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes in the Study Area			
Acconannock Indian Tribe	State	Yes	Tribal members in Maryland currently reside in Somerset County.
Piscataway Indian Nation	State	Yes	Tribal members in Maryland currently reside in Anne Arundel, Calvert, Charles, Prince George's, St. Mary's and Wicomico Counties.
Piscataway Conoy Tribe	State	Yes	Tribal members in Maryland currently reside in Anne Arundel, Calvert, Charles, Prince George's, St. Mary's Counties.
Federally and State-Recognized Tribes Outside the Study Area			
Delaware Nation, Oklahoma	Federal	Yes	Tribal members currently reside outside Maryland, primarily in Oklahoma, but have historical ties to all counties in the Study Area.
Delaware Tribe of Indians	Federal	Yes	Tribal members currently reside outside Maryland, primarily in Oklahoma, but have historical ties to all counties the Study Area.
Eastern Shawnee Tribe of Oklahoma	Federal	Yes	Tribal members currently reside outside Maryland, primarily in Oklahoma, but have historical ties to the Study Area (Cecil and Harford Counties).
Seneca-Cayuga Nation	Federal	Yes	Tribal members currently reside outside Maryland, primarily in Oklahoma, but have historical ties to the Study Area (Baltimore, Harford, and Howard Counties).
Tuscarora Nation	Federal	No	Tribal members currently reside outside Maryland, primarily in New York, North Carolina, and Ontario.
Special Interest Organizations			
Assateague People of Delmarva	Neither	Yes	Tribal members lived on the Eastern Shore.

Table 11-15. Federally and State-Recognized Tribes with Historical Ties to Maryland

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Nause-Waiwash Band of Indians	Neither	Yes	Members currently reside in Dorchester and are descendants of the Nanticoke Indians, whose home remains on the Eastern Shore of Maryland. Based in Dorchester County, Maryland, the Nause-Waiwash are the remnants of Nanticoke, Choptank and Pocomoke tribes who fled into the marshes in the 1700s.
Pocomoke Indian Tribe	Neither	Yes	Members currently reside in the Study Area (Somerset and Worcester Counties) and lands extended into northern Accomack County, Virginia. Except for surviving villages at river necks the Pocomoke were driven onto reservations including Askiminikansen, near Snow Hill (Worcester County).
Youghiogheny River Band of Shawnee Indians	Neither	Yes	Members in Maryland currently reside in Garrett County in the northwest corner of the State.

Sources: Maryland State Archives 2019, Assateague People of Delmarva 2020, Nause-Waiwash Band of Indians 2019, Pocomoke Indian Nation 2014

There are three State-recognized tribes that live in the Study Area. The Acconannock Indian Tribe was a subtribe of the Powhatan Nation and is one of the oldest tribes in Maryland. They originally inhabited the territory that is now the Eastern Shore of Maryland and Virginia. The territory included villages on the Annemessex River in Somerset County, on the Accohannock Creek in Virginia, and on the islands in the Chesapeake Bay. Today, only a few descendants of the Accohannock Indian Tribe are able to continue the traditional occupations of their ancestors using traditional skills and technology and "living off the land and water" (AAA Native Arts 2020). The Tribal office is in Somerset County (AAA Native Arts 2020). The Piscataway Indian Nation and the Piscataway Conoy Tribe was a Confederacy of Tribes that extended from the Chesapeake Bay in Virginia, including all the land from the southern tip of St. Mary's County in Maryland, up to Baltimore and Anne Arundel County. The Piscataway Indian Nation is a descendant of the Piscataway people who were one of the most populous and powerful tribes in the Chesapeake Bay region, with a territory north of the Potomac River; however, their population declined rapidly due to colonization, disease, and warfare. Today, tribal members live throughout southern Maryland where their ancestors lived, including Calvert, Charles, Prince George's, and St. Mary's Counties. In 2012, the Piscataway Indian Nation and Piscataway Conoy Tribe became State-recognized tribes (Wikiwand 2020, Piscataway Conoy Tribe n.d.).

There were also several other tribes in the Maryland and Virginia regions that were Algonquin, Iroquois, and Siouan tribes. Many of the smaller tribes (or band) would eventually assimilate with local tribes. The Algonquin included several smaller tribes including the Assateague, Delaware (Lenape), Matakeapke, Mattapanient, Pocomoke, Shawnee, and Powhatan Confederacy (Accohannock, Nanticoke, and Pamunkey). Most Iroquois tribes were centered in the States north of Maryland, stretching into New England and Canada and consisted of three tribes: the Massawomeck in western Maryland, the Susquehannock in the northern counties, and the Tuscarora. During the mid-1700s, three Sioux tribes (Monacan, Saponi, and Tutelo) emigrated from Virginia and North Carolina through Maryland to New York, and some remained behind, or merged with other tribes. By the 1740s, a small number of Saponi

settled in Dorchester County, but eventually assimilated with local Nanticoke bands (Maryland State Archives 2019).

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 11-43. Overall social vulnerability for Anne Arundel, Calvert, Charles, and St Mary's Counties is mostly less than 25% to 50%, with only a few small areas that range from 50 to greater than 75%. Overall social vulnerability for Prince Georges mostly ranges from less than 25 to 50, but the western part of the county ranges from 50% to greater than 75%). Wicomico County is mixed and ranges from 50% to greater than 75%. Sommerset County is at greatest risk with overall social vulnerability ranging from 25% to greater than 75% (CDC 2016). Also shown in Figure 11-43 is NOAA sea level rise data, indicating that all the counties in which tribal populations are present are subject to some level of potential sea level rise vulnerability including inundation risk.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

11.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 11-16 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. In Maryland and the Study Area, 18.0% and 14.2% of the population do not speak English at home, respectively. The Washington Suburban Region has the highest percentage (24.3%) of this population within the Study Area. Spanish is the language spoken by the majority (251,507 people or 6.2%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 138,078 people (3.4%) of non-English speakers at home within the Study Area population (USCB 2017e).

Table 11-16. People who Speak a Language Other than English at Home in the Maryland Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Baltimore	Anne Arundel	529,604	58,040	11.0	28,270	13,007	11,976	4,787
	Baltimore City	579,017	54,918	9.5	23,279	15,148	8,584	7,907
	Baltimore	779,541	109,122	14.0	31,854	37,910	23,055	16,303
	Harford	236,131	16,503	7.0	6,808	5,167	3,078	1,450
	Howard	293,872	74,155	25.2	15,375	21,504	30,441	6,835
	Total Baltimore Region	***2,418,165***	***312,738***	***12.9***	***105,586***	***92,736***	***77,134***	***37,282***
Washington Suburban	Prince George's	***845,327***	***205,274***	***24.3***	***122,099***	***29,777***	***22,408***	***30,990***
Southern Maryland	Calvert	85,950	3,858	4.5	1,727	1,465	581	85
	Charles	146,488	11,242	7.7	4,890	2,748	2,602	1,002
	St. Mary's	103,789	7,162	6.9	2,741	2,309	1,799	313
	Total Southern Maryland Region	***336,227***	***22,262***	***6.6***	***9,358***	***6,522***	***4,982***	***1,400***
Upper Eastern Shore	Caroline	30,775	2,157	7.0	1,647	315	139	56
	Cecil	96,620	4,739	4.9	2,430	1,301	838	170
	Kent	18,824	1,033	5.5	586	290	114	43
	Queen Anne's	46,582	2,273	4.9	1,243	668	258	104
	Talbot	35,754	2,699	7.5	1,706	501	452	40
	Total Upper Eastern Shore Region	***228,555***	***12,901***	***5.6***	***7,612***	***3,075***	***1,801***	***413***

Table 11-16. People who Speak a Language Other than English at Home in the Maryland Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Lower Eastern Shore	Dorchester	30,464	1,807	5.9	1,219	305	227	56
	Somerset	24,571	2,091	8.5	565	497	512	517
	Wicomico	95,854	10,880	11.4	4,174	4,314	1,531	861
	Worcester	49,342	2,548	5.2	894	852	532	270
	Total Lower Eastern Shore Region	***200,231***	***17,326***	***8.7***	***6,852***	***5,968***	***2,802***	***1,704***
	Study Area Total	**4,028,505**	**570,501**	**14.2**	**251,507**	**138,078**	**109,127**	**71,789**
	Maryland	**5,629,329**	**1,016,077**	**18.0**	**436,910**	**248,751**	**211,132**	**119,284**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 11-45 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Howard (25.2%), Prince George's (24.3%) and Baltimore (14.0%) (USCB 2017e). As seen in Figures 11-41 and 11-43, parts of the city of Baltimore and Somerset County are ranked as over 75% vulnerable and impacted by rising sea levels.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

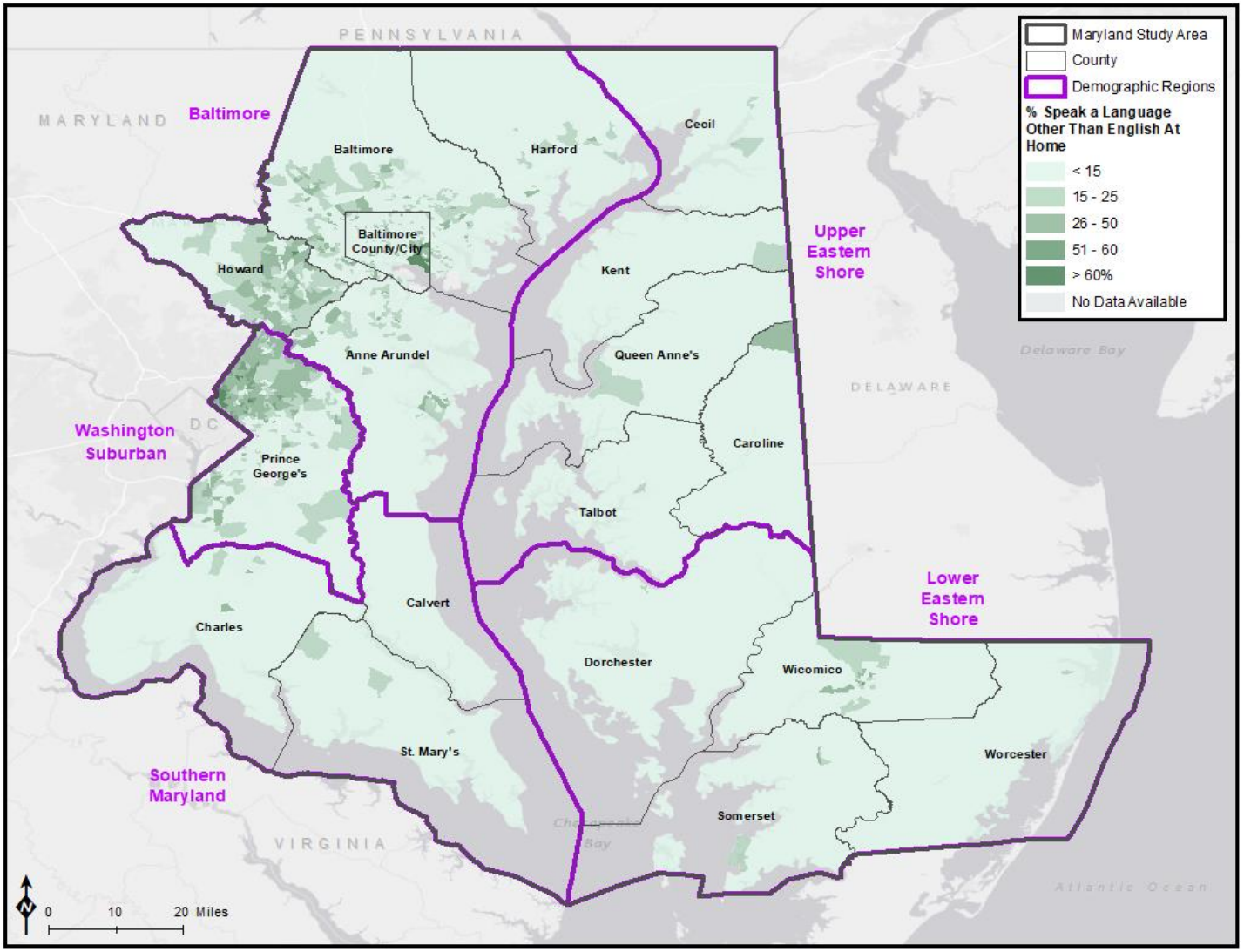
Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

11.4.6 Summary – Demographics and Socioeconomics

Maryland is growing, but slower than the Nation. While Maryland is affected by the Nationwide trend of aging population, the State still gains population from natural increase as well as international migration, which mostly offset population loss as a result of domestic out-migration. In 2018, the majority of migrating residents moved to Virginia, Pennsylvania, Florida and Washington DC (USCB 2017c). Top reasons for relocation are job related, retirement, and family reasons (Collman 2019). A contraction in Federal spending was identified as a likely reason for residents leaving Maryland and neighboring Virginia, home to many government employees in the wealthy suburbs close to Washington DC (Murse 2019, UVA 2019c, UVA 2019a). People moving out of the City of Baltimore due to its high crime rate as well as high city income and property tax rates is another likely reason for the city's out migration (Placher 2018a).

The Study Area represented 71.6% (4.3 million residents) of the overall State population of 5.9 million in 2017. Overall, the population of the Study Area grew 3.5%. Between 2010 and 2017, 12 out of 18 geographic units in the Study Area gained population, while six lost population. The city of Baltimore was the only geographic unit that lost population on Maryland's western shore; the other five (Somerset, and the rural counties of Kent, Talbot, Caroline, and Dorchester) were located on Maryland's Eastern Shore (Delmarva Peninsula) (USCB 2017a, USCB 2017d, USDA 2013).

Population clusters around the five metropolitan areas located within the Study Area. Population densities in the Study Area ranged from 59 persons per square mile in Dorchester County (located in the sparsely-populated Lower Eastern Shore Region) to 7,656 persons per square mile in the city of Baltimore (located within the populous Baltimore Region, in the Baltimore metropolitan area, and in proximity to the Washington and Philadelphia metropolitan areas (USCB 2017d, USCB 2017c, Data.gov 2017).



Sources: USCB 2017r, USCB 2017e

Figure 11-45. Percent of People Who Speak a Language Other than English at Home in the Maryland Study Area by Census Block Group

Population in the Study Area is projected to increase 12.4% (4.8 million residents) by 2040, slower than the State (14.0%) and Nation (16.4%). Strongest growth is projected in the Southern Maryland (32.6%) region as younger families move to suburbs in Charles and St. Mary's Counties in search of relatively cheaper housing and less crowded schools (Olivio 2018). Strong growth is also projected for the Upper and Lower Eastern Shore Regions (26.1% and 21.5%, respectively). Slowest growth is projected in the City of Baltimore (3.8%) (MDP 2017).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area, but they are not present in significantly greater or smaller numbers than the State or Nation (USCB 2017b). Decreasing percentages of young children and increasing percentages of elderly relative to the general population are the result of the aging of the population. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 6.1% in Maryland and 6.1% in the Study Area. Projections by the year 2040 indicate this group's decline in the Nation (to 5.7%); the State (to 6.0%) and the Study Area (to 5.9%).

According to 2017 estimates shown in Table 11-9, the elderly represented 14.9% of the U.S. population; 14.2% in Maryland, and 14.0% in the Study Area. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 21.2% in the State, and 20.8% in the Study Area (USCB 2017b, USCB 2018b, MDP 2017).

Housing utilization is an important consideration for potential future projects to determine if a region can support the proposed project workforce. Often during the construction stage, workers need to migrate temporarily into the area, either from nearby locations or from outside of the region. These individuals typically occupy hotels or rental properties. Employees that are part of the operational workforce may either purchase or rent homes if intending to stay in the area after construction. Additionally, workers hired to operate any major facilities will need permanent housing options. Therefore, understanding the current, and future projected changes in housing utilization and vacancy rates can assist the decision-making process during the planning process.

Homeownership in Maryland was 66.8%, higher than the Nation (63.8%) and the Study Area (66.0%). Renters comprised approximately 33.2% of the State population in 2017, more than the Study Area (34.0%) but less than the Nation (36.2%) (USCB 2017m). The percentage of owner-occupied housing was highest in the Southern Maryland Region, which may be attributed to older, more established populations with families working in the Washington DC area or elderly populations who prefer to own their home rather than rent. The percentage of owner-occupied housing was lowest in the Washington Suburban Region, which may be attributed to younger populations (millennials) working in the Washington DC metropolitan area preferring to rent.

Median home values were higher in the State ($296,500) than the Study Area ($272,900) and the Nation ($193,500). According to Zillow, home values are increasing in all metropolitan areas. Housing affordability for low- and moderate-income workers is a problem in Maryland. A large proportion of the State (24%) is considered extremely low income, and of these households, 72% have a severe cost burden due to housing costs (National Low Income Coalition 2018).

Home vacancy rates in Maryland (10.1%) in 2017 were lower than the Nation (12.2%) and the Study Area (11.5%). The sparsely populated Lower Eastern Shore Region had the highest vacancy rate (32.2%) in 2017, which may be attributed to vacation homes and/or investment properties used as short-term rentals in popular summer tourist destinations (CityLab 2019, USCB 2017g).

The Study Area had a total employment of 2.2 million jobs in 2017, representing approximately 71.0% of the total jobs in Maryland, and 1.4% of the total jobs in the U.S. The dominant employment sectors in the

Study Area are educational services, and health care and social assistance (24.6%), professional, scientific, and management, and administrative and waste management (14.1%), public administration (11.3%) and retail trade (9.9%) (USCB 2017p). The greater portion of jobs are located near the high-density MSAs of Baltimore-Columbia-Towson and Washington-Arlington-Alexandria, DC-VA-MD-WV. The Study Area had 102,475 maritime jobs, representing 98.5% of total maritime jobs in the State (NOAA 2016b, USCB 2017i).

Median and per capita income in the Study Area were higher than the State at $71,163 and $35,848, respectively (USCB 2017k, USCB 2017n).

The average unemployment rate in the Study Area was 6.4%, higher than the State (6.1%) but less than the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area, unemployment rates ranged from 3.7% in Queen Anne's County (Upper Eastern Shore Region) to 10.2% in Summerset County (Lower Eastern Shore Region) in 2017 (USCB 2017h).

In the Study Area, 27.3% of the working-age population earned a only high school diploma; 38.4% earned a college or advanced degree (USCB 2017t). The Study Area had similar high school graduation rates and more college or advanced degrees as compared to the National average of 27.7% and 36.9%, respectively (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 4,291,804 people living in the Study Area, approximately 2,196,879 (51.2%) are minority. Of the 2,835 block groups in the Study Area, approximately 49.4% (1401 block groups) are considered minority populations. Each of the demographic regions contain census block groups with minority populations. The Southern Maryland, Baltimore and Washington Suburban Regions have high percentages of minority block groups at 31.7%, 44.1%, and 93.3%, respectively(USCB 2017f).

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 4,185,301 people for whom poverty status is determined living in the Study Area, approximately 703,244 (16.8%) individuals have incomes less than 150% of the poverty level. Of the 2,835 census block groups in the Study Area, approximately 10.4% (296 block groups) are considered low-income populations. The Lower Eastern Shore Region had the highest percentage of low-income block groups at 12.7%. The Baltimore Region has the next highest percentage, at 11.9% (USCB 2017o). Several counties contain large areas of low-income census block groups. They are Caroline, Harford and Charles counties (USCB 2017o).

Resource-dependent populations include fishing communities, subsistence populations, and religious populations present in the Study Area. There are seven fishing communities, most of which are located on the coast of the Chesapeake Bay (NOAA Fisheries 2019g). There are three State-recognized American Indian tribes in the Study Area and several additional tribes that have interest in the State and may still have individuals living within the State. Approximately 1,580 Amish live in Maryland within settlements located in St. Mary's county (near Charlotte Hall and Mechanicsville) within 50 miles of Washington D.C., and in Cecil's County (Cecilton) on the Eastern Shore (Amish America 2010, Jones 2012). These communities also may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources. Evaluating the locations of such communities can inform the development process for various projects.

The output of the CDC SoVI indicates that Caroline, Wicomico, and Somerset Counties (all located in the Upper and Lower Eastern Shore Regions) have high vulnerability ranking within the Study Area. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; particularly notable in Prince George's County and the city of Baltimore. Many communities along the coast of the Study Area are at risk for sea level rise and other coastal

hazards. Concentrations of populations with high overall social vulnerability exist in Somerset County and along the coasts of the Study Area (CDC 2016, USCB 2017f, USCB 2017o).

Populations that speak a language other than English are present within the Study Area. In the Study Area, 14.2% of the population do not speak English at home. The Washington Suburban Region has the highest percentage (24.3%) of this population within the Study Area. Spanish is the language spoken by the majority (251,507 people or 6.2%) of non-English speakers at home within the Study Area population. Counties with the highest percentages of these populations were Howard (25.2%), Prince George's (24.3%) and Baltimore (14.0%) (USCB 2017e). Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise and storm surge are felt at the local level(by changing drainage, patterns of land use, etc.) (Siegel et al. 2001).

11.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

11.5.1 Regional Observations

The Chesapeake Bay is the largest estuary in the U.S. The Bay essentially bisects the State with counties located on each side of the Bay, much like in the State of Virginia. The geographical configuration of the Bay limits transportation between portions of the State. It also influences population distribution, land use, the presence of various businesses and industry, and land cover, most especially along the Eastern Shore. The Chesapeake Bay has faced historical issues with pollution and the Chesapeake Bay Foundation has been working diligently to maintain the health of the estuary. Land subsidence is a factor throughout the southern Chesapeake Bay Region as a result of glacial isostatic adjustment in response to the melting of the ice sheets following the last ice age 18,000 years ago. Contributions to land subsidence from continuing glacial isostatic adjustment are probably not uniform and estimated at about 0.04 inches per year (Eggleston and Pope 2013). Further, Maryland's position on the mid-Atlantic Coast is considered a "hot spot" of higher sea level due to subsidence and also a slowing down of the flow of the Gulf Stream or other changes in ocean currents. Groundwater withdrawals from Maryland's Coastal Plain aquifer system can also contribute to subsidence issues in the Study Area. Subsidence contributes to greater impacts in association with sea level rise and storm surge.

Evidence of accelerated sea level rise in Maryland is already apparent, including nuisance tidal flooding, shoreline erosion, deterioration of tidal wetlands, and saline contamination of low-lying farm fields. Nuisance flooding from tidal events has increased from a few days per year in Annapolis in the 1950s to 40 or more days per year currently (Boesch et al. 2018). Areas on the southern end of Maryland's Eastern Shore that previously held maritime forest have slowly become marshes dotted with dead white tree trunks as a result saltwater intrusion from Chesapeake Bay. In other places such as Smith Island, rapidly eroding shorelines are obvious indicators of sea level rise (Chesapeake Quarterly 2014).

The region is also susceptible to nor'easters, tropical storms, and hurricanes. Hurricanes can drive storm surge which, when combined with rising sea level can contribute to increased regional flooding impacts. Climate Central scientists report that in Maryland alone, more than 55,000 people live in homes less than

five feet above the local hightide line. This zone holds 41,000 homes and $19.6 billion in property value (Chesapeake Quarterly 2014). These residents and this property could be impacted by rising sea levels and flooding, especially if exasperated by increased storm surge.

Maryland's Eastern Shore is less developed than the rest of the State, this is largely attributable to the presence of the Chesapeake Bay bisecting the State. Most of the larger urban areas are in the western part of the State, with the heaviest development centered around the City of Baltimore and adjacent to the District of Columbia.

Overall, Maryland's population is growing, though Maryland also is subject to a large domestic outmigration for various reasons. Some of those migrating away from the State relocate to Washington DC or Virginia whereas others relocate to further distances.

Maryland has a shortage of approximately 118,810 rental homes affordable and available to extremely low-income households. Maryland also has both minority and low-income populations scattered around the Study Area with some higher concentrations in the City of Baltimore and other urban areas.

11.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- The Chesapeake Bay is the largest estuary and essentially bisects the State with counties located on each side of the Bay. The Chesapeake Bay has faced historical issues with pollution and the Chesapeake Bay Foundation has been working diligently to maintain the health of the estuary. The impact of potential future projects on the health of the Chesapeake Bay will need to be considered during project analysis.
- Maryland's mainland areas are likely better suited than the Eastern Shore for future industrial development due to the existing infrastructure and transportation networks as well as more heavily developed urban areas.
- Coastal projects should consider Maryland's Climate Change and Coast Smart Construction: Infrastructure Siting and Design Guidelines, which provides guidance for using the 2013 sea level rise projections for projects characterized as short-term (design life less than 25 years), medium-term (design life less between 25 and 50 years), long-term (design between 50 and 100 years), and very long-term (design life over 100 years) (Boesch et al. 2018). Projects should also consider regional variations within Maryland (Boesch et al. 2018).
- In Maryland, local jurisdictions have land use planning authority through the Land Use Article of the Maryland Annotated Code in all non-charter counties and all incorporated municipalities, except for Montgomery and Prince George's Counties and some of their jurisdictions. The Maryland Department of Planning works closely with Maryland's counties and municipalities in guiding future development and reviews comprehensive plans for consistency with the State's Smart Growth and growth management laws. Analysis of potential future projects will need to consider the project's compatibility and compliance with the State's Smart Growth and growth management laws and appropriate county or State plans once site-specific details are known.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Business incentives are largely directed by the Maryland Department of Commerce and aim to encourage and promote current and new business in Maryland. Most incentives that could

potentially benefit future businesses are related to building in under-served areas that would benefit in investments in both their workforce and infrastructure. Applicability of these incentives should be considered during future project analysis.

- Cultural resources and protected areas will need to be considered during the analysis for future projects to consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance. In particular, impacts to the Chesapeake Bay will need to be evaluated as the entire bay is a protected area.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis are presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 12

DISTRICT OF COLUMBIA

12 District of Columbia

12.1 Introduction

This chapter presents the coastal land use baseline analysis for the District of Columbia to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

The District of Columbia Study Area (Study Area), located near the Mid-Atlantic Planning Area, is a capital district separate from any U.S. State, although the States of Maryland and Virginia each donated land to form the Federal district. The District of Columbia is a unique geographical unit in the Mid-Atlantic Planning Area as a primarily urban center with no coastline, although it is situated on the Potomac River. The District of Columbia is separated by the Commonwealth of Virginia to the southwest by the Potomac River and comprises 43,744 acres bounded by Maryland to the northwest, northeast, and southeast. In 2017, the population of the District of Columbia was 672,391 (ESRI 2019a), which includes highly diverse populations in regard to demographics (age, income, and race/ethnicity), exhibits a range of land ownership (Federal, State, local, and private), and includes many national landmarks, which are vacation destinations for travelers from around the world.

The Study Area is shown in Figure 12-1. The Study Area is a solitary geographic unit and does not contain any counties.

12.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the District of Columbia are described below.

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- District of Columbia Office of the Chief Technology Officer
- Metropolitan Washington Council of Governments
- Washington Metropolitan Area Transit Authority

The metadata database for District of Columbia data sources is included in Appendix A.

12.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

Source: ESRI 2019a

Figure 12-1. District of Columbia Study Area

12.2.1 Water Resources

The District of Columbia's water resources include the rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

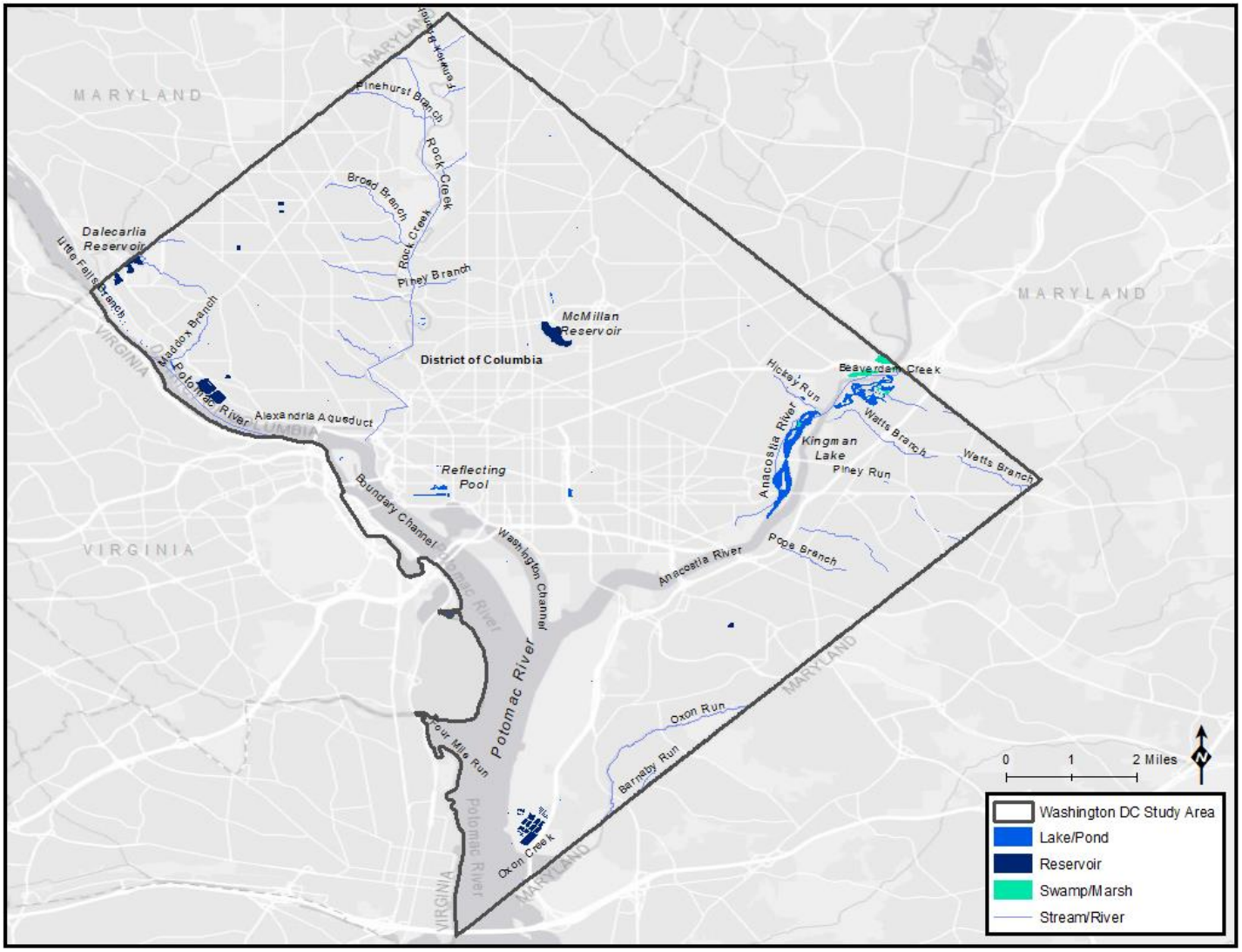
12.2.1.1 Rivers

Within the Study Area are the Potomac River, with two major tributaries: the Anacostia River and Rock Creek, which eventually flow into the Atlantic Ocean. Figure 12-2 shows the major surface water bodies within the Study Area.

The headwaters of the Potomac River are in the Allegheny Mountains of West Virginia. The river marks the border between Virginia and Maryland and is fed by tributaries from both States, including the Anacostia, Shenandoah, and Monocacy Rivers. The Potomac River covers 380 miles from West Virginia to the tidewater at Point Lookout, Maryland where it enters the Chesapeake Bay. Historically, pollution and degradation of the river were a problem. The Potomac River was designated as an American Heritage River in 1998, which enabled communities along the river to utilize Federal funds for revitalization efforts (American Rivers 2019). The Potomac Conservancy nonprofit land trust was established in 1993 with a purpose of stewarding conservation easements along the river (Potomac Conservancy 2019). The Conservancy has noted pollutants such as nitrogen, phosphorous, and suspended sediments are declining in the river over time. As a result, various fish species that have been previously impacted are showing signs of recovery. Urban runoff remains an issue (American Rivers 2019).

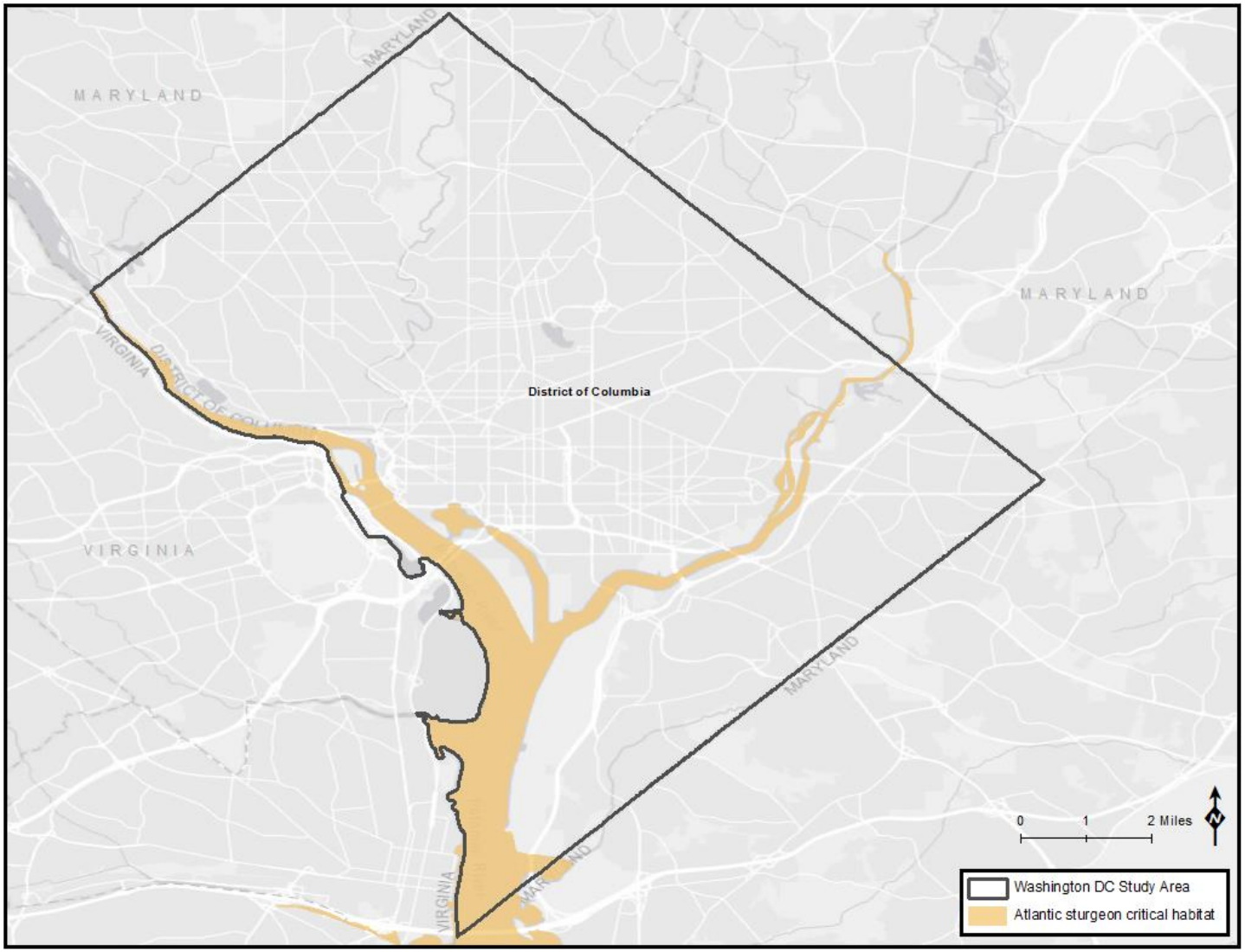
As shown in Figure 12-3, the District of Columbia Study Area includes designated critical habitat for the Chesapeake Bay distinct population segment of the Atlantic sturgeon. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In the District of Columbia, the designated critical habitat of the Atlantic sturgeon is in the Potomac River (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

The Anacostia River watershed originates in Maryland and flows into the District of Columbia before emptying into the Potomac River at Hain's Point. The majority of the river is surrounded by the suburban and urban environment around and within the District of Columbia. As a result, over time the river has been impacted by urbanization including clearing of forests, wetlands, and pollution such as trash, sewage, and runoff, which may contain toxins, oils, heavy metals, etc. (USEPA 2019, Ecological Cities Project 2006). In 1987, the Anacostia Watershed Restoration Partnership was formed by the District of Columbia, the State of Maryland, and the Maryland Counties of Montgomery and Prince George. The members of the Partnership collaborate on a variety of restoration projects to revitalize the Anacostia River (Ecological Cities Project 2006, AWRP 2019). Additional agencies working toward restoration of the river include the Leadership Council for a Cleaner Anacostia and the Urban Waters Federal Partnership (USEPA 2019).



Source: USGS 2019e

Figure 12-2. Hydrography in the District of Columbia Study Area



Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j

Figure 12-3. Critical Habitat within the District of Columbia Study Area

Rock Creek flows through the western portion of the District of Columbia. The 1,754-acre area surrounding the creek within the boundary of the District of Columbia became the Nation's third national park in 1890 (NPS 2018c). The Rock Creek watershed spans over 77.4 square miles of land. The headwaters of the creek are springs near Laytonsville, Maryland. There are over 30 tributaries to Rock Creek. Rock Creek enters the District of Columbia in Chevy Chase, Maryland near Boundary Bridge and enters the Potomac River near Thompson's Boathouse. Within the boundaries of the district, the watershed includes both the designated park property and extends into the surrounding urban environment. The main stem of the creek flows 33 miles from the headwaters in Maryland to the Potomac River. The last quarter mile of Rock Creek is tidally influenced, as is the Potomac River (Rock Creek Conservancy 2020).

Rock Creek water quality is currently an issue within the District's boundaries. Weekly testing shows failed bacterial tests. There are five stormwater outfalls that empty into the river within the District. In other areas, there is a combined sewage overflow discharge into the river. DC Water has proposed a Green Infrastructure Plan to address sewer separation, permeable pavement, and other methods to reduce impacts on the river and improve water quality by 2030 (Khademian 2019).

12.2.1.2 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area. As shown in Figure 12-4, floodplains comprise a moderate portion of land area in the Study Area. Table 12-1 details the flood zone acreage within the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

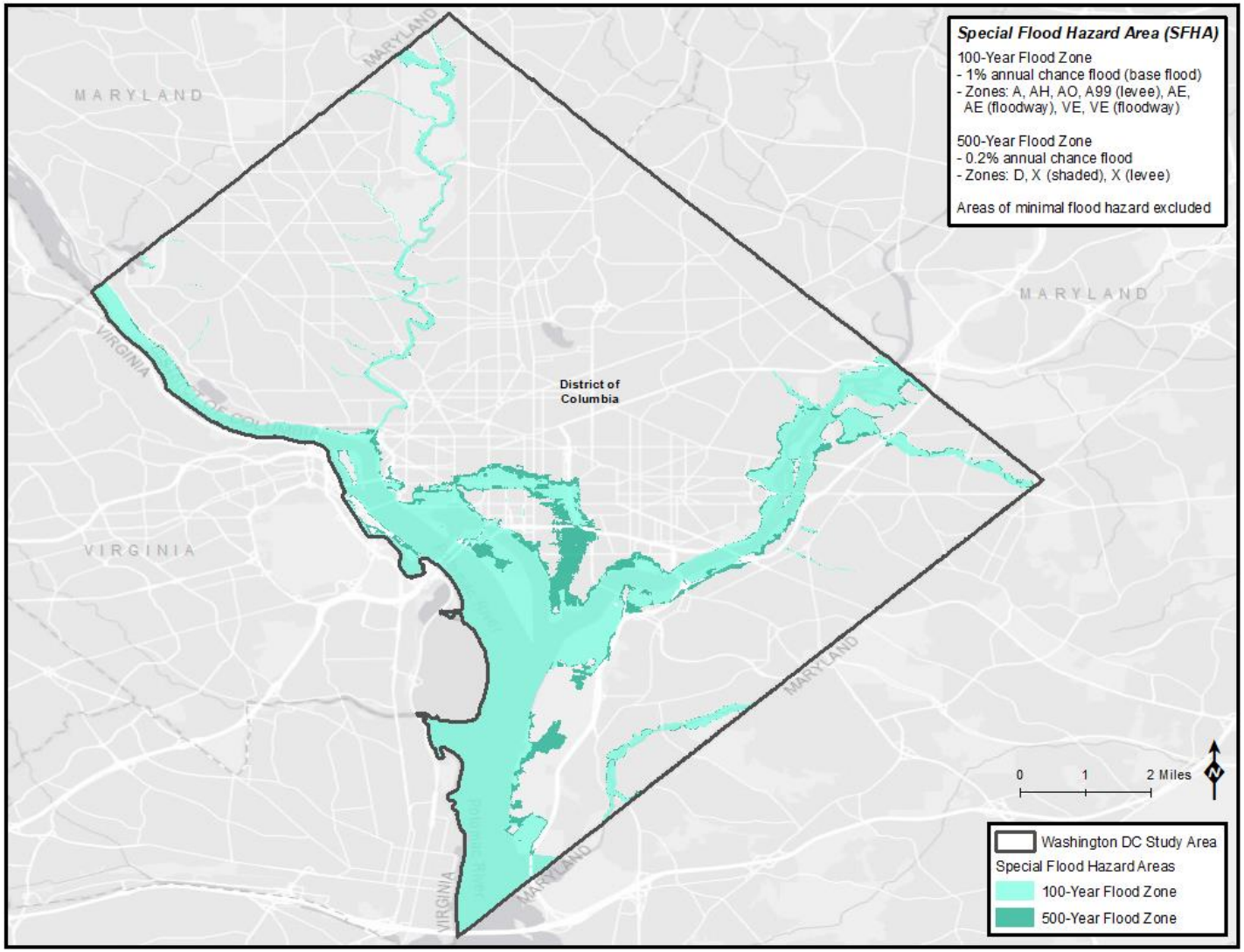
Table 12-1. Floodplains in the District of Columbia Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
District of Columbia	7,602	19.4	977	2.5

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

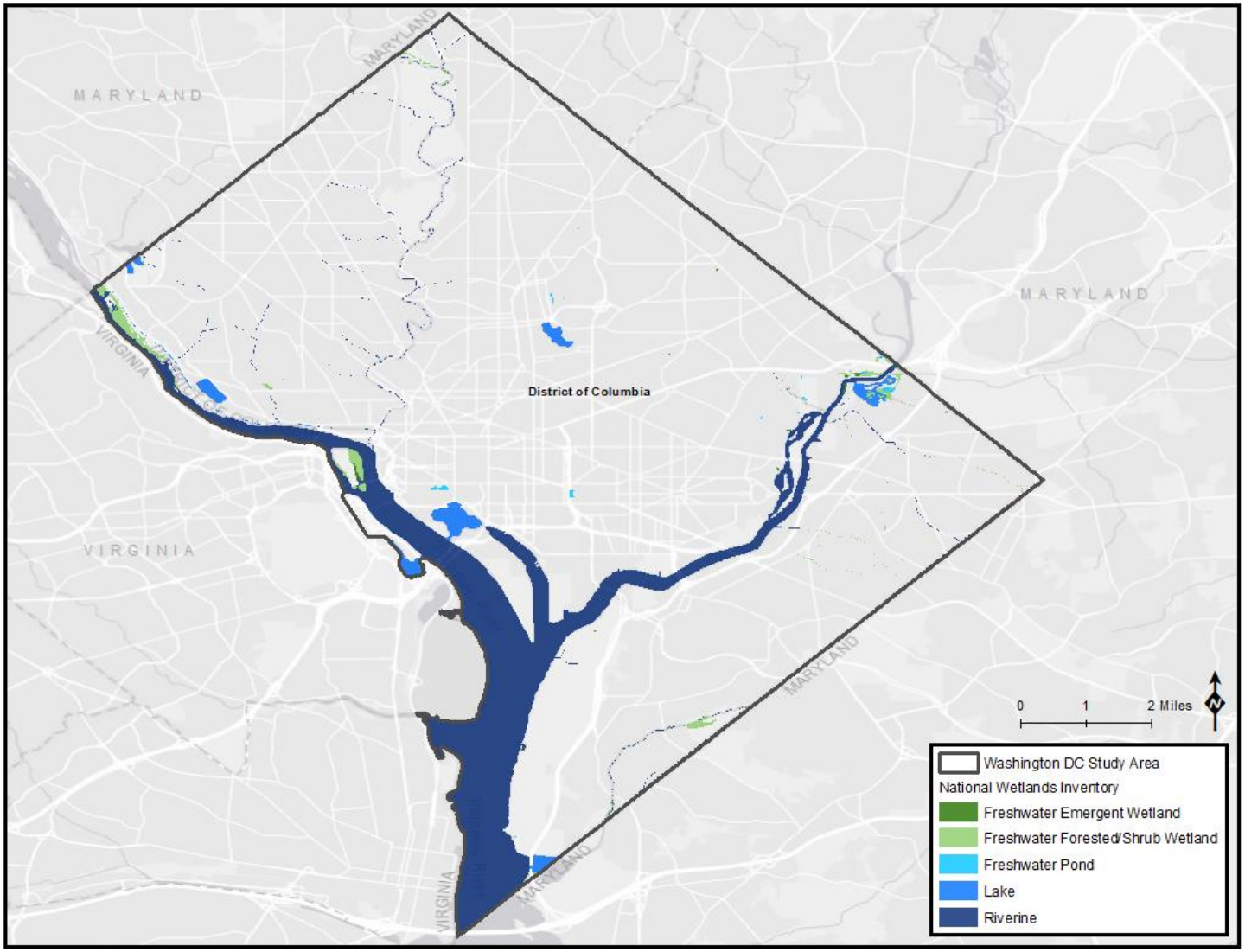
12.2.1.3 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 14.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 12-5, wetlands are a small portion of the land area in the Study Area.



Source: FEMA 2019b

Figure 12-4. Floodplains of the District of Columbia Study Area



Source: USFWS 2018a

Figure 12-5. Wetlands in the District of Columbia Study Area

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). **Error! Not a valid bookmark self-reference.** details the wetland acreage in the Study Area along with other water resources (FGDC 2013, USFWS 2019c).

Table 12-2. Wetlands in District of Columbia Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
District of Columbia	4,826	0	13	210	0	358	26	4,219

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

The Emergency Wetlands Act enacted in 1986, along with the CZMA and amendments, encourage wetland protection through funding incentives. The Emergency Wetland Resources Act requires States to include wetland protection in their Comprehensive Plans in order to qualify for Federal funding for recreational land. The NPS provides guidance for the wetland section of the Comprehensive Plan. Coastal States that adopt coastal zone management programs and plans approved by NOAA are eligible for Federal funding and technical assistance through the CZMA. In 2019, a bill to amend the CZMA was introduced to include the District of Columbia in the definition of a coastal State with all the rights thereto. The bill has passed the house and has moved on to consideration by the Senate (norton.house.gov 2019) .

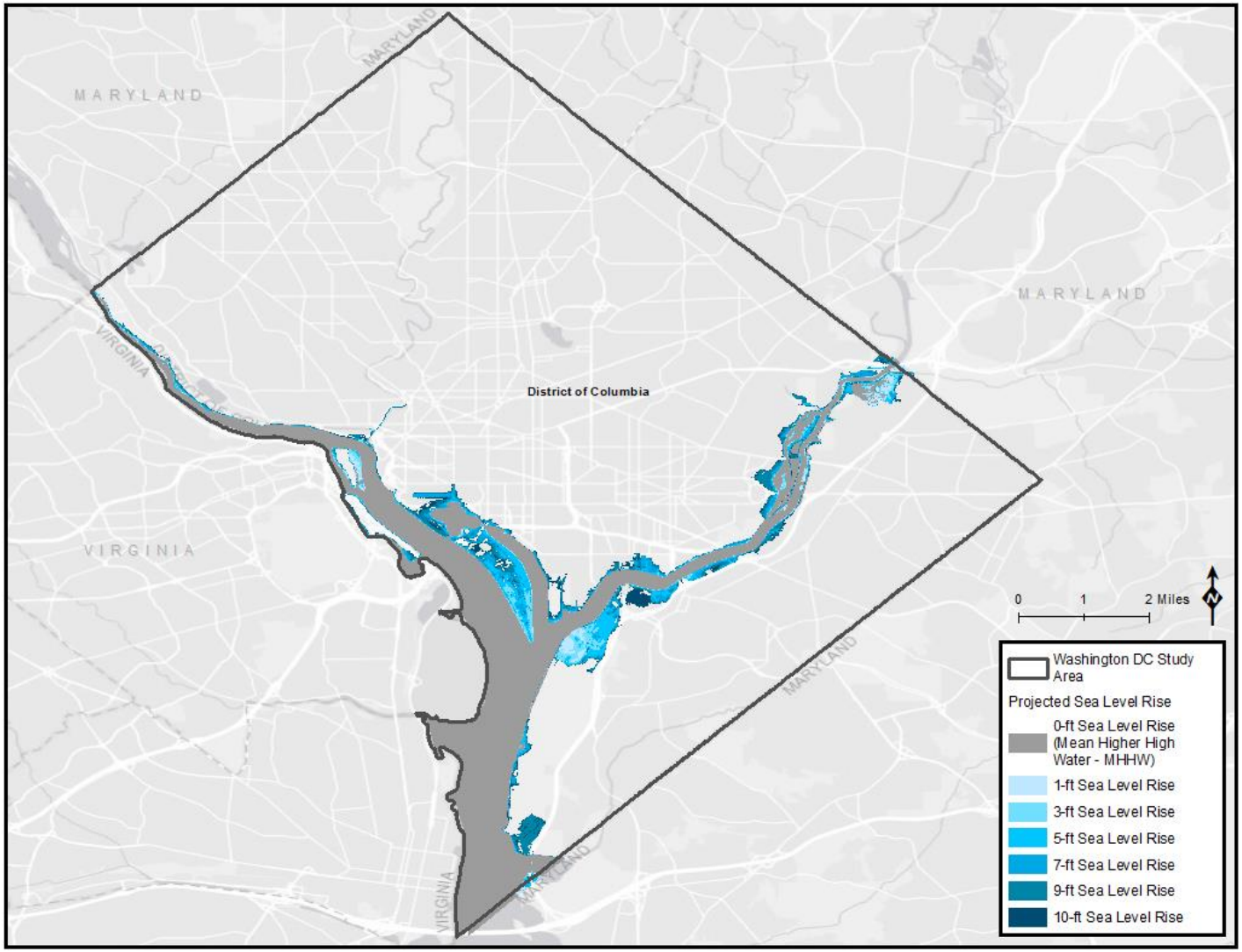
12.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

12.2.2.1 Sea Level Rise

Figure 12-6 shows NOAA’s results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.

The District of Columbia was founded at sea level on the Potomac River and also contains the Anacostia and the now-buried Tiber Creek (Fenston 2019, Poon 2019). Although the Study Area is not on the immediate coast, both the Potomac and Anacostia Rivers are tidally influenced. Further, much of the Study Area was built on filled marshes and creeks associated with the Potomac River. Included in these filled areas are land south of Constitution Avenue, west of the Washington Monument, the Reflecting Pool, the Lincoln Memorial, East Potomac Park, east of the Pentagon, and nearly all of Reagan National Airport (O'Donnell 2017).



Source: NOAA 2018a

Figure 12-6. Projected Sea Level Rise throughout the District of Columbia Study Area

Regional factors contribute to variation in relative sea level rise within the Study Area. The District of Columbia's position on the mid-Atlantic Coast is considered a "hot spot" of higher sea level due to subsidence and also a slowing down of the flow of the Gulf Stream or other changes in ocean currents (Boesch et al. 2018). Another factor contributing to subsidence in the area is glacial isostatic adjustment, the flexing of the Earth's crust in response to ice loading or melting. The Earth's crust flexes downward from the weight of the overlying ice causing the surrounding area (the glacial forebulge) to flex upward. The area in which the District of Columbia is located was in the forebulge area during the last ice age and, since the ice sheet started melting 18,000 years ago, the region continues adjusting slowly downward. Contributions to land subsidence from continuing glacial isostatic adjustment are probably not uniform and estimated at about 0.04 inches per year (Eggleston and Pope 2013). The rate of subsidence ranges within the Study Area from about 1.5 to 2.5 millimeters per year, which is greater than the regional rate for land surfaces around the Chesapeake Bay estuary within Maryland of 1.5 millimeters each year (Chesapeake Quarterly 2014). The increased rate of subsidence in the Study Area can be attributed to sinking of a previously filled floodplain along and in the Potomac River (O'Donnell 2017). As such, the most vulnerable areas to sea level rise within the Study Area are areas located along the Potomac River, the Washington Channel, and the Anacostia River (Montgomery 2014, NOAA 2018a).

The Potomac River has risen roughly 1 foot since 1749, which is a historic rate of 0.044 inches/year (Fenston 2019). Water levels in the Potomac and Anacostia Rivers have risen roughly 11 inches in the past century, which is an increased rate of 0.11 inches/year (O'Donnell 2017). Historical flooding events recorded in the Study Area since 1931 indicate an average flooding height of less than 6 feet above the local high tide line. The recorded record was 7.9 feet above the local high tide line caused by severe rain throughout the Potomac basin in 1942. Other flooding events of note include 7.4 feet in 1936 (severe rain), 7.1 feet in 2003 (Hurricane Isabel), and 6.9 feet in 1933 (Potomac-Chesapeake Hurricane) (Climate Central 2015).

Sea levels are rising at an accelerating rate, and the scientific community is confident that global warming is the most important cause. Higher sea levels translate to more and higher coastal floods. Based on current projections, which are highly dependent on hard-to-predict scenarios of global climate change, the Study Area may experience flooding more than 6 feet above the local high tide line by 2030 (best-case scenario), record flooding by 2040 (mid-range scenario), and likely flooding above 10 feet by the end of century (worst-case-scenario) (Climate Central 2015). As a result, District of Columbia planners consider a rise of 6 feet within this century (Fenston 2019). The latest research, according to the Federal government's most recent National Climate Assessment, shows worst-case, sea level rise in the District of Columbia could raise the rivers 11 feet by 2100, which is a rate of 1.59 inches/year (Fenston 2019, Hayhoe et al. 2017). This is compared to the likely rate (mid-range scenario) of relative sea level rise in the State of Maryland of 0.288 inches/year between 2000 and 2050 (Boesch et al. 2018). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.13 inches/year (NOAA 2019b).

Effects of accelerated sea level rise in the Study Area are already apparent, especially nuisance tidal flooding, which will increasingly impact property and infrastructure. On July 8, 2019, nearly 4 inches of rain fell in just 1 hour in the Study Area. River gauges in nearby Alexandria reported a rise of 11 feet. The July 2019 rain event overwhelmed stormwater systems, forced road closures, shut down public transportation, and caused power loss in at least 8,000 households (Poon 2019). Within the Study Area, there are 1,350 acres of land, 21 miles of road, two military facilities, one hospital, one museum, and 12 U.S. Environmental Protection Agency (USEPA)-listed sites such as hazardous waste dumps and sewage plants on property at an elevation of 6 feet above the high tide line. This same area holds 1,400 people in 400 homes, accounting for $4.6 billion in property value.

12.2.2.2 Storm Surge

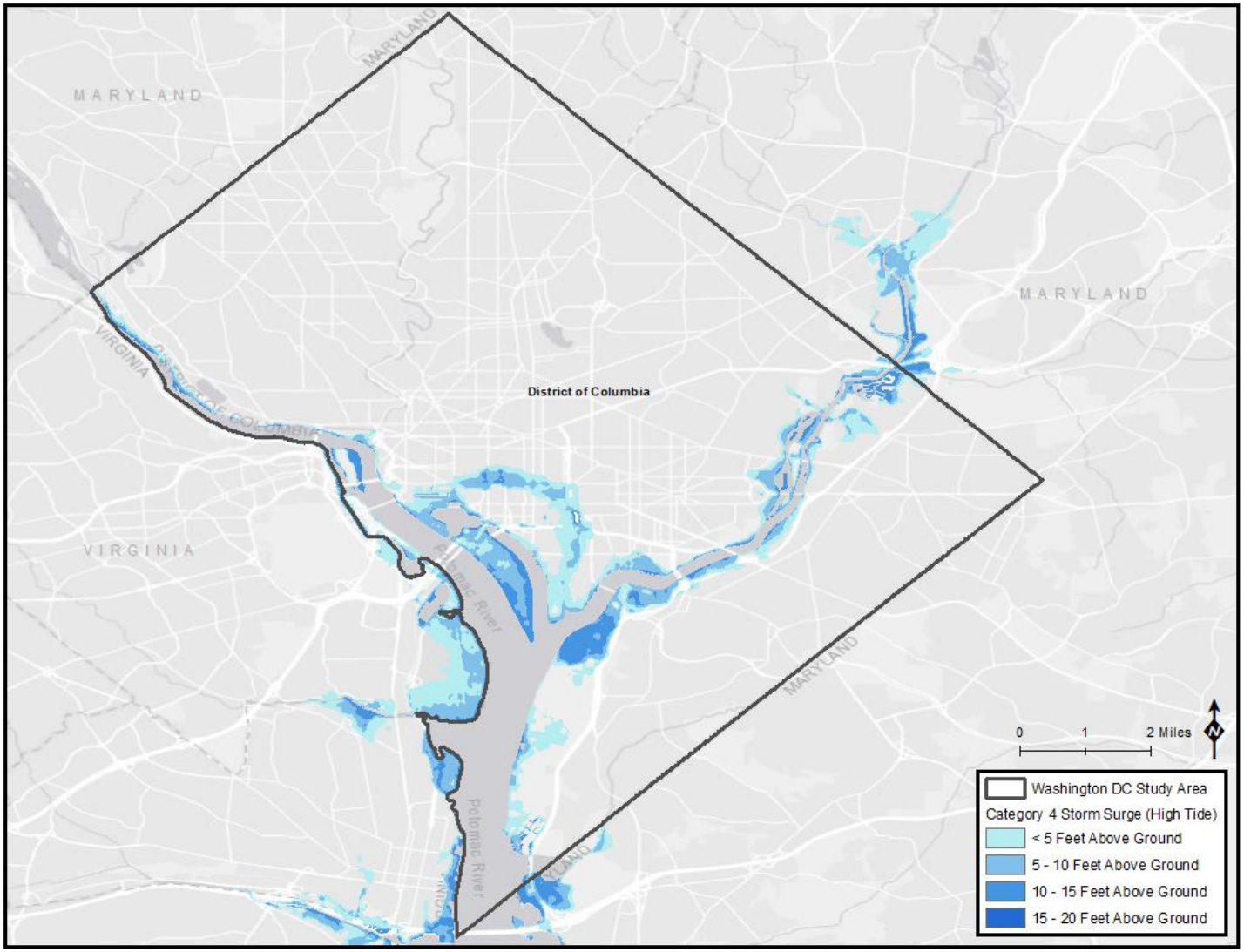
Figure 12-7 shows NOAA's projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Study Area. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario. The most vulnerable areas to storm surge within the Study Area are areas located along the Potomac River, the Washington Channel, and the Anacostia River (Montgomery 2014).

The District of Columbia can experience both nor'easters, occurring with highest severity between September and April, and tropical storms and hurricanes, occurring May-December; these storm systems are described in greater detail in Chapter 1.4.2.2. Within the Study Area, the recorded record flood height was 7.9 feet, although it was not from a storm surge. Recorded flooding records from storm surges include 7.1 feet from Hurricane Isabel in 2003 and 6.9 feet from a hurricane in 1933 (Climate Central 2015). It is important to note that impacts from Hurricane Isabel (Category 5) were more concentrated in Baltimore because the hurricane made landfall in North Carolina (Thompson 2015). A direct hit to the Study Area would likely experience flooding above record levels, approaching predicted worst-case scenario flooding levels of 10 feet above high tide. Facilities at risk with 10-foot flooding include 2,500 acres of land, 46 miles of road, four military facilities, one hospital, three museums, Reagan National Airport, much of the National Mall, Federal buildings downtown, and 26 USEPA-listed sites (Climate Central 2015, Fenston 2019). This area holds 4,833 people residing in 1,900 homes, accounting for $9 billion in property value (Climate Central 2015).

12.2.3 Summary – Physical Characteristics

Water resources in the District of Columbia include the Potomac and Anacostia Rivers and Rock Creek. All three are important natural and historic resources for the area. All three have experienced historical pollution and impacts associated with urbanization activities. As a result, conservation and restoration programs and organizations are actively engaged in projects to revitalize all three water bodies with increasing success.

The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Sea level rise rates in the Study Area have gone from a historic rate of 0.044 inches/year from 1749 to present (Fenston 2019) to 0.11 inches/year within the last 100 years (O'Donnell 2017), and are projected up to a worst-case-scenario rate of 1.59 inches/year before 2100 (Fenston 2019, Hayhoe et al. 2017). The District of Columbia currently plans for sea level rise to 6 feet above current high tide, which would impact 1,350 acres of land, public infrastructure, and 400 homes, accounting for $4.6 billion in property value (Climate Central 2015). Past severe rain events and storm surges have reached almost 8 feet above high tide. Storm surges from a hurricane making landfall in the Study Area could reach flooding levels of 10 feet above high tide (Climate Central 2015, Fenston 2019). The most vulnerable areas to sea level rise and storm surge within the Study Area are areas located along the Potomac River, the Washington Channel, and the Anacostia River (Montgomery 2014, NOAA 2018a, NOAA 2020a).



Source: NOAA 2020a

Figure 12-7. Projected Storm Surge throughout the District of Columbia Study Area for a Category 4 Hurricane

12.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

12.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available.

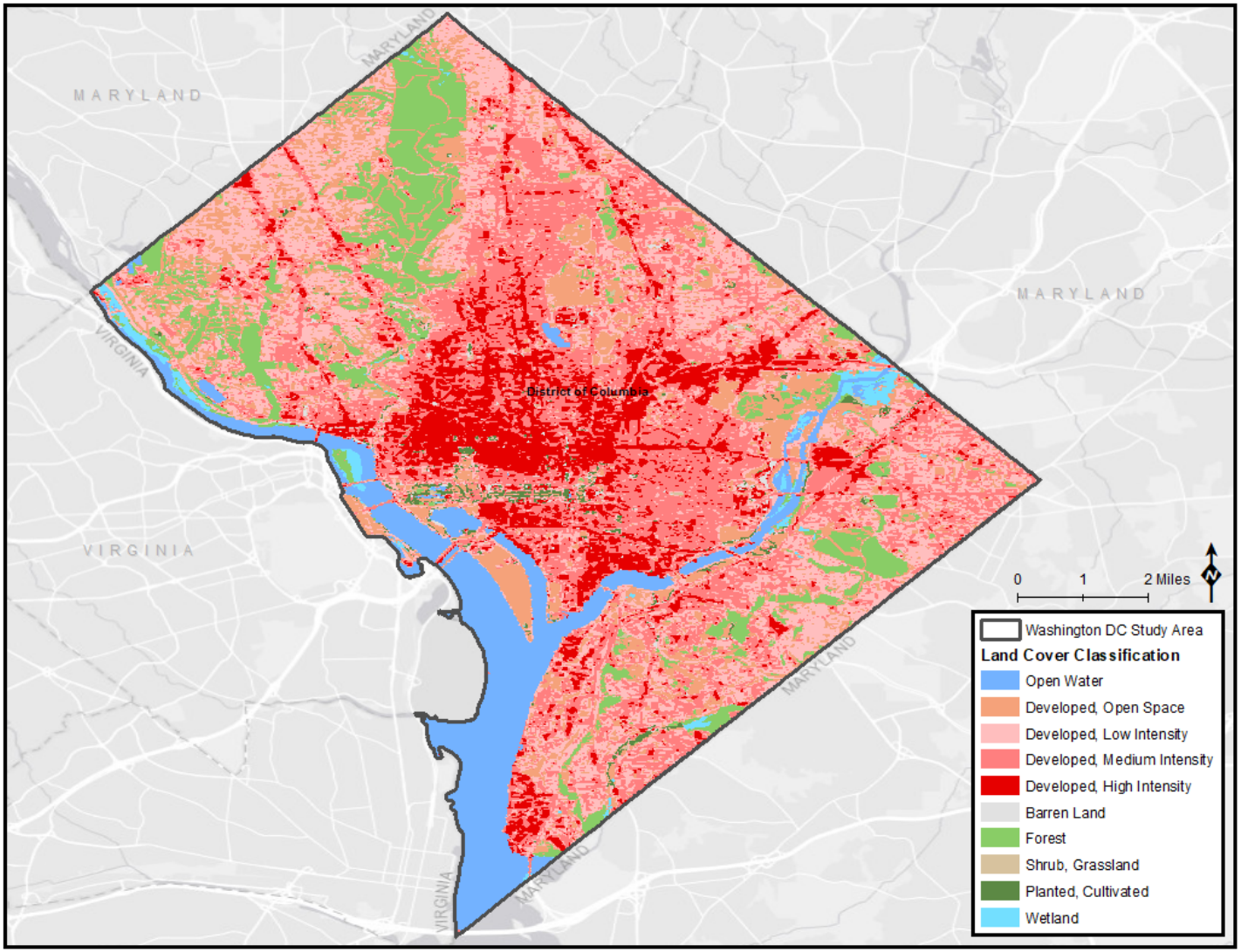
Figure 12-8 illustrates the NLCD data for the Study Area based on the 2016 data release. Table 12-3 presents the NLCD data for the Study Area by acreage as well as by percentage and overall land cover when open water land cover is excluded (e.g., rivers, lakes, ponds, ocean). Open water land cover was excluded from the calculated percentages because this land cover would not be considered for future industrial development. The following section discusses the key findings of this analysis.

Table 12-3. Acres and Percentage of Land Cover by NLCD Classifications and Predominant Classification in the District of Columbia Study Area

Land Cover	Acres of Land Cover (acres)	Percentage Land Cover (excluding open water) (%)
Total Acres (land and water)	43,744	100.0
Land Acres (land only)	39,504	100.0
Developed, Open Space	6,538	16.6
Developed, Low Intensity	9,964	25.2
Developed, Medium Intensity	12,516	31.7
Developed, High Intensity	5,279	13.4
Total Developed	34,297	86.8
Barren Land	219	0.6
Forest	4,025	10.2
Shrub/Grassland	111	0.3
Planted/Cultivated	381	1.0
Wetland	471	1.2
Open Water	4,240	Excluded
Predominant Land Cover Type	Developed	

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2016a

Figure 12-8. National Land Cover in the District of Columbia Study Area

Based on information in Table 12-3, the primary land cover in the Study Area is developed land making up 86.8% of the total land cover in the Study Area. Of the 86.8% of developed land, 16.6% is open space, 25.2 is low-intensity development, 31.7% is medium-intensity development, and 13.4% is high-intensity development.

The NLCD 2016 documents land cover change in the lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In the District of Columbia, 2% of the land cover in the Study Area changed at least once. Figure 12-9 and Table 12-4 show the land cover change within the Study Area from 2001 to 2016. The majority of this change was changed from one type of developed land use to another (MRLC 2016).

Table 12-4. Land Cover Change in the District of Columbia Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
District of Columbia	43,744	872	2.0

Source: NLCD 2001-2016

It is likely that future industrial development activities will be limited in the Study Area due to the large proportions of medium- and high-intensity development (45.1%) as compared to other land use types. Further, most, if not all areas of developed open space or forest land cover in the Study Area are areas protected by local and Federal historic preservation laws, as discussed later in Chapters 12.3.2.5 and 12.3.2.6.

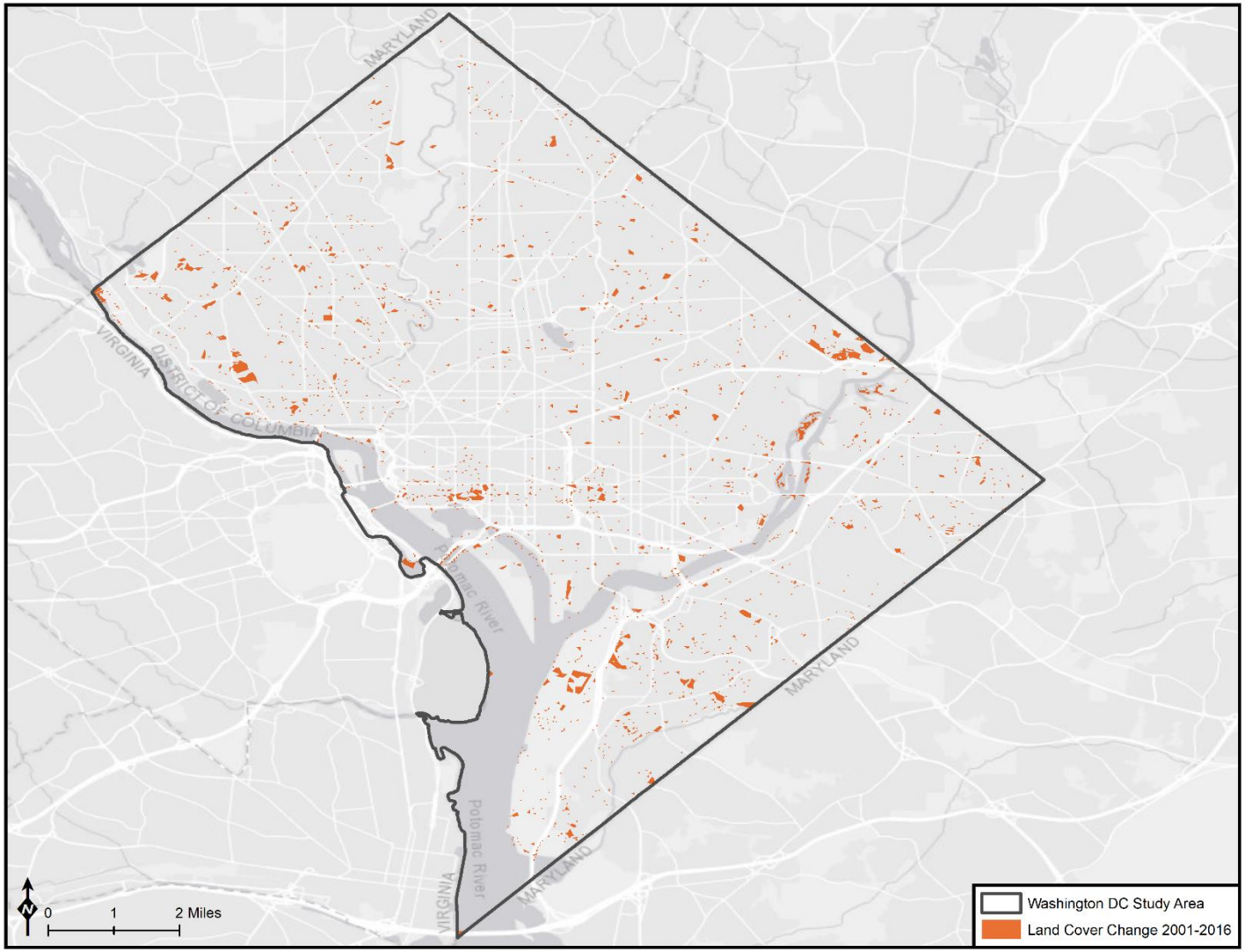
12.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

12.3.2.1 Existing and Future Land Use

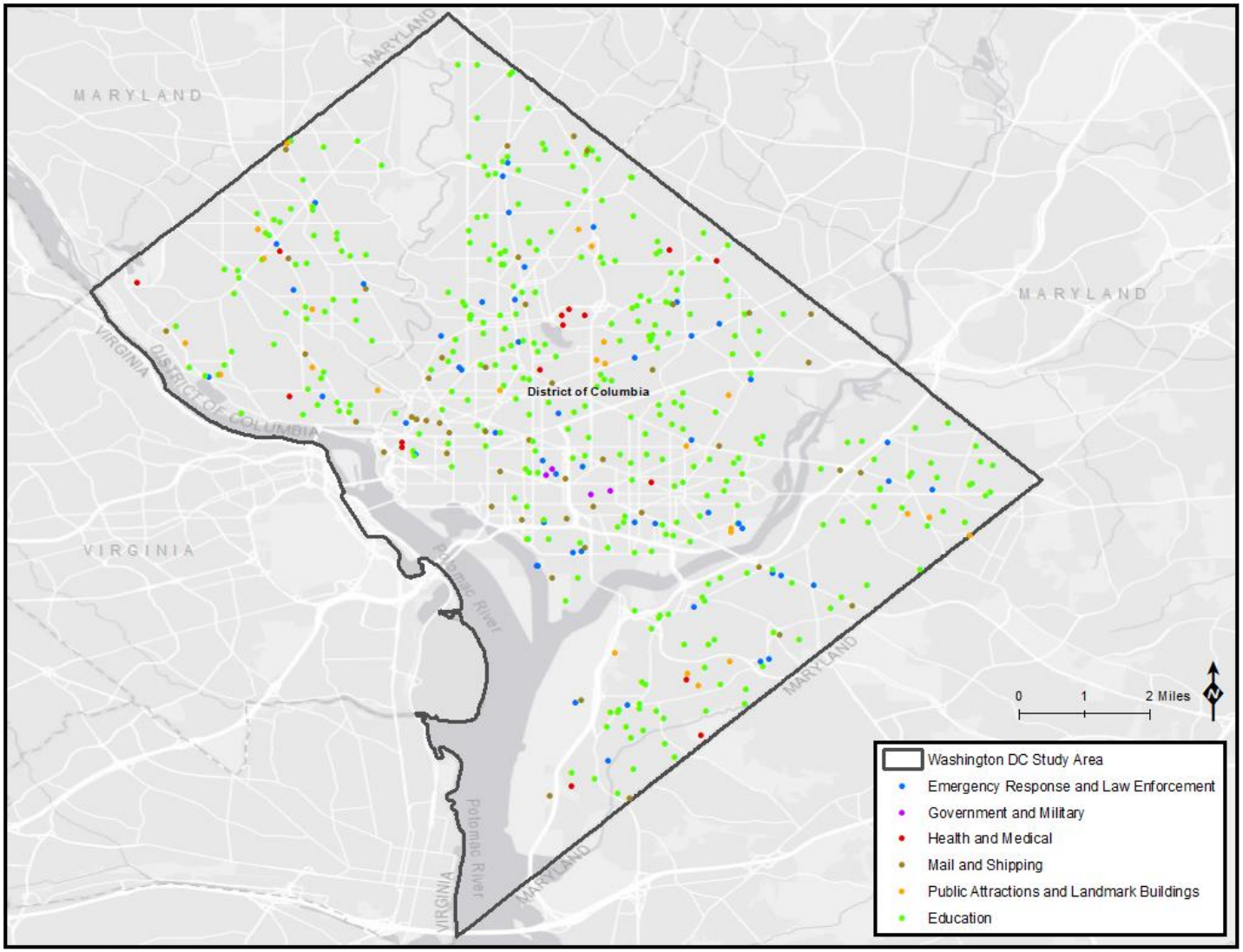
The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 12-10 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 12-11 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 12.3.1, and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

The existing land use maps for the Study Area indicate that (1) existing land uses are fairly distributed throughout the Study Area, except for the northwest region, which is forest land cover (i.e., parks), and (2) impervious surfaces are directly related to urban development, of which highest intensity development is in the center of the Study Area.



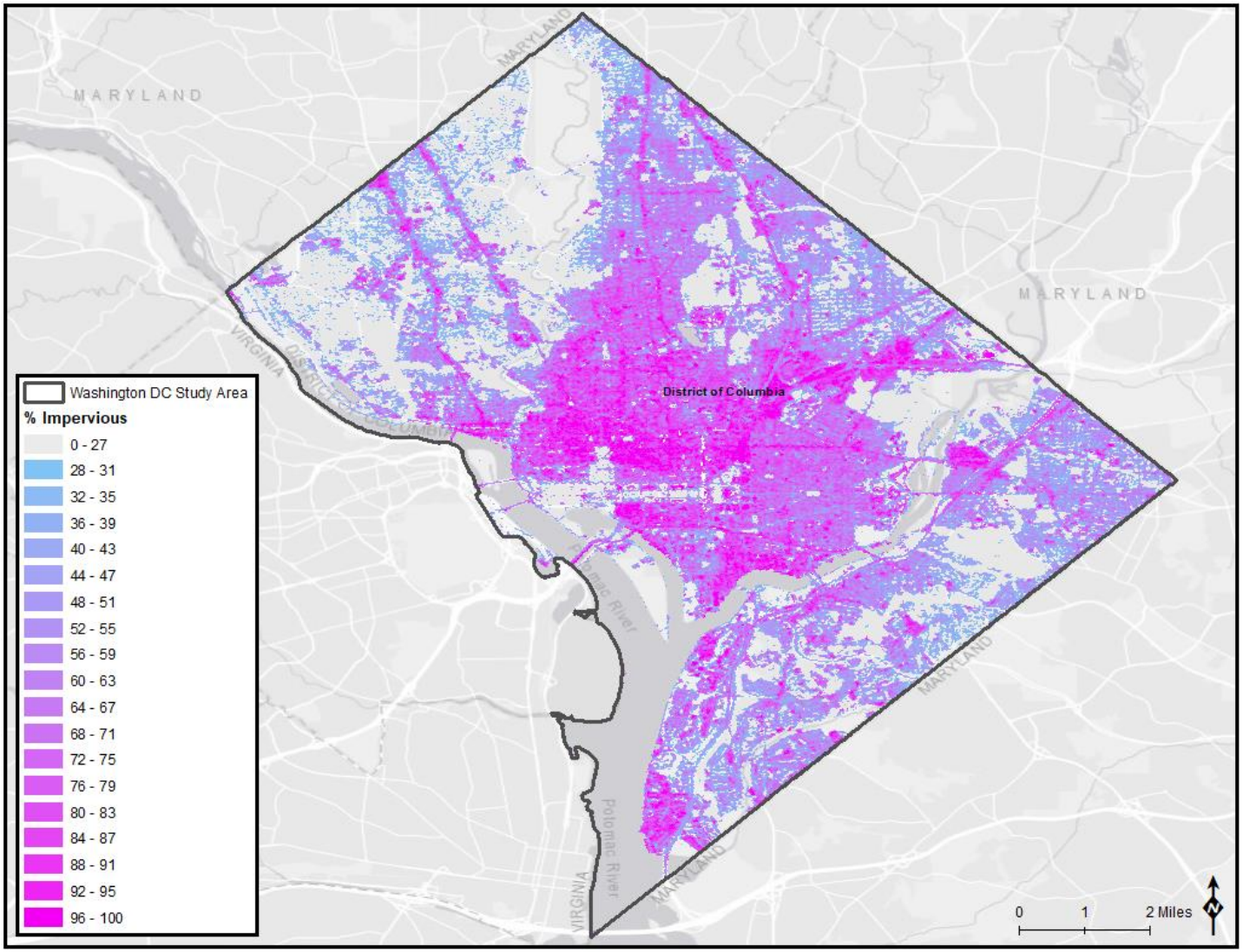
Source: NLCD 2001-2016

Figure 12-9. Land Cover Change in the District of Columbia Study Area



Source: USGS 2017

Figure 12-10. Select Existing Land Uses within the District of Columbia Study Area



Source: NLCD 2016b

Figure 12-11. Impervious Surfaces within the District of Columbia Study Area

For future land use planning, the District of Columbia has prepared a Comprehensive Plan meant to guide future growth and development. The Comprehensive Plan is a 20-year framework that was adopted in 2006 and amended in 2011. It addresses topics such as land use, economic development, housing, environmental protection, historic preservation, and transportation. The District of Columbia's Office of Planning is currently working to amend the Comprehensive Plan a second time to ensure that it meets the changing conditions and needs of the community. The Comprehensive Plan and the Mayor's Draft Comprehensive Plan Proposal with the second proposed amendment can be found on the District of Columbia's Office of Planning website (Plan DC 2019a). Appendix B includes links to relevant planning documents.

According to the 2019 DC Flood Prevention Act (H.R. 2185), the District of Columbia is the only coastal entity in the U.S. besides tribal communities that is not eligible to participate in the CZMA. However, H.R. 2185 would amend the CZMA to make the District of Columbia eligible to receive grants and technical assistance from NOAA to develop and implement a local costal management program (Congress.gov 2019).

Future Project Developers of onshore components associated with OCS-related activities or projects should consult the District of Columbia's Comprehensive Plan as well as other associated laws and regulations that may be applicable to the proposed activities. The District of Columbia will be more likely to support projects that fit within planned future land uses identified in the respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

The District of Columbia is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. The District's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 25 census tracts identified as Opportunity Zones in the State, several of which are located in District. An interactive map of opportunity zones is located at https://dcgis.maps.arcgis.com/apps/webappviewer/index.html?id=5e1edb3877c947f88041069123bd0fe0 (DMPED 2020).

Future OCS-related projects would likely be better received if they are proposed within the Opportunity Zones that have already targeted areas for potential development and/or are compliant with and/or show consideration of local comprehensive plans (or equivalent). The District is more likely to support projects that fit within planned future land uses identified the respective planning documents. Early examination of such planning documents during OCS-related project analysis will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

12.3.2.2 Zoning

In the District of Columbia, there are un-zoned districts and various types of zoning districts including residential, mixed-use and neighborhood mixed-use, downtown, special purpose, and industrial zones. The Zoning Commission for the District of Columbia has published a Zoning Handbook that contains the 2016 Zoning Regulation, including a description of all the zoning districts, important zoning concepts, and recently enacted changes to the Zoning Regulations (DCOZ 2020a). Specifically, Title 11 Subtitle A of the 2016 Zoning Regulations contains information on administrative and zoning regulations and enforcement, while Subtitle C outlines General Rules for items such as nonconformities, subdivisions, tree protection, pervious surfaces, green area ratio, waterfront, and retaining walls.

The District of Columbia's Office of Zoning provides both interactive and static maps showing zoning information for every property in the District of Columbia (DCOZ 2020b). On the interactive Official DC Zoning Map, the zones are shown, defined, and bounded. The interactive map is updated daily to ensure consistency with zone changes and other property data. The static maps, which are PDF extracts of the interactive map, are updated quarterly and published on the Office of Zoning's website. When viewing the interactive Official DC Zoning Map, information is provided on the zone district; whether there is a planned unit development or campus plan; if there are any historic landmarks in that area; whether the zoning region is part of an historic district; if it is a downtown subarea or credit trade area; and the premise's address, owner name, and owner address. Also provided on the Official DC Zoning Map is a link that directs users to static Future Land Use Map Plans for the District of Columbia. These maps do not show the lands as they are being used today but how District Officials intend the land to be used in the future (Plan DC 2020).

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the District of Columbia's Office of Zoning. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

12.3.2.3 Industrial Incentives

The District of Columbia has several financial and business incentives administered through different agencies or organizations at the Federal and district level. The following are financial and business incentives compiled by the Office of the Deputy Mayor for Planning and Economic Development and offered by other agencies or organizations that could potentially benefit future business developers or companies.

The Department of Employment Services offers an On-The-Job Training program for companies with over 100 employees. This program develops opportunities for companies to hire and train individuals to meet the specific workforce need of the company. The Department of Employment Services can assist in sourcing candidates for the program (DC 2020).

The Department of Energy and Environment offers the Voluntary Cleanup Program, which provides services to incentivize the cleanup and redevelopment of brownfield sites. This program helps the investing company or developers in the legal and practical practices to assist in the redevelopment of the contaminated area (DC 2020).

The Washington DC Economic Program offers the Accelerate District of Columbia Program which serves to encourage and build on economic development in the District. The Washington DC Economic Program acts as a go between for businesses and the public sector to provide opportunities and build partnerships in the area (DC 2020).

12.3.2.4 Industry

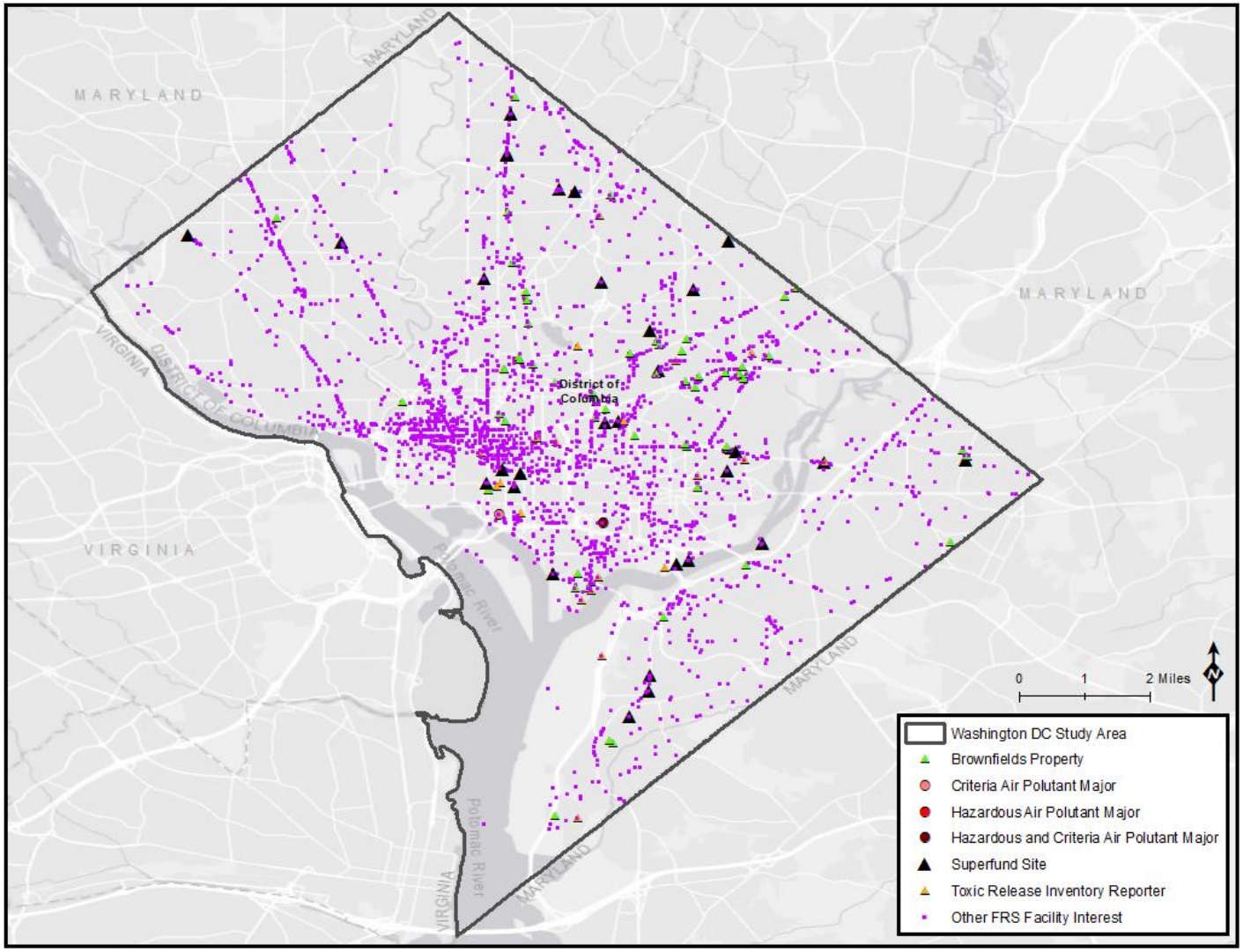
The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 12-12 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory-listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 12-12, industry is concentrated in the center of the Study Area, directly east of the Potomac River. Chapter 12.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

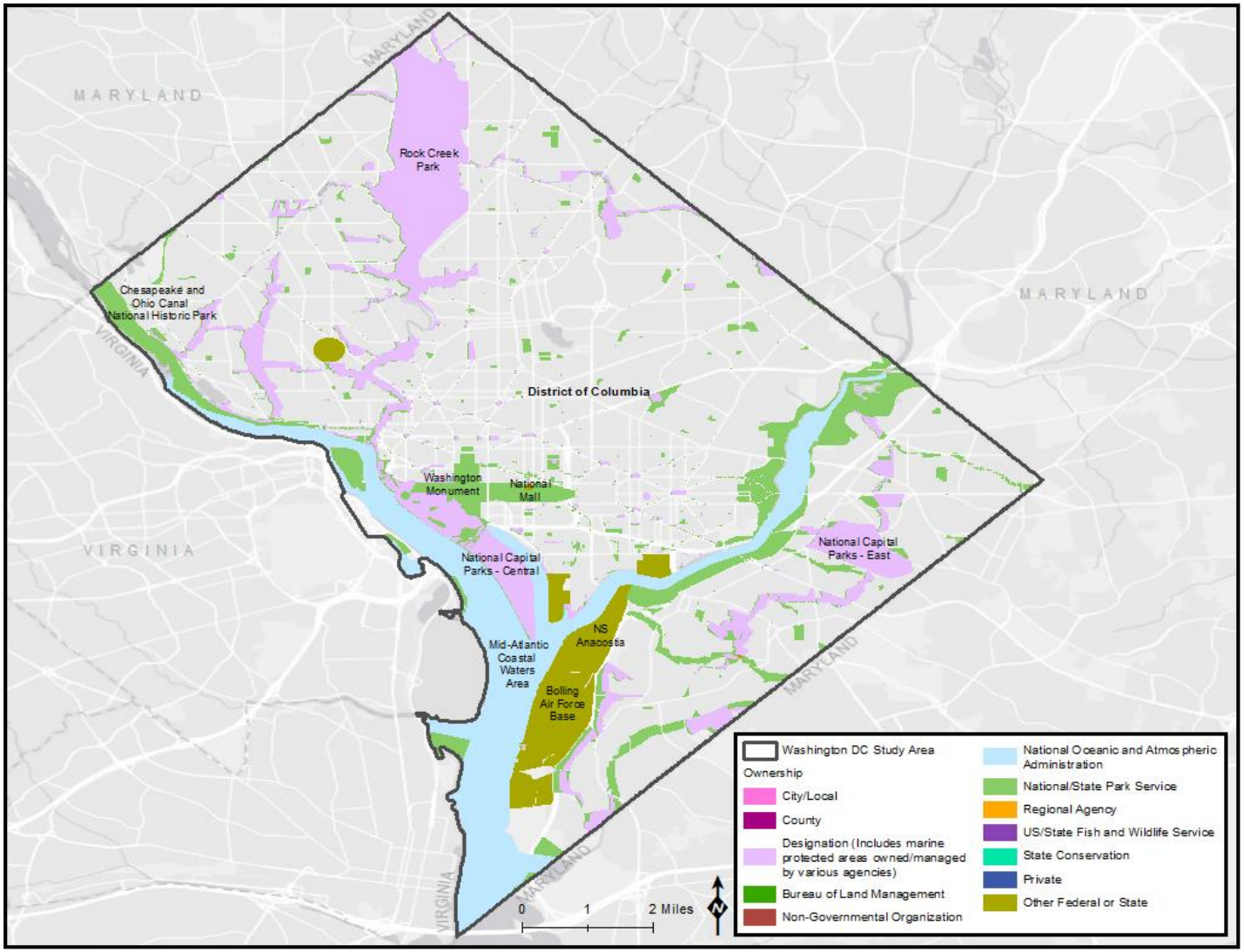
12.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS, 2019). This will also aid in better understanding land use change over time. Figure 7-15 presents the protected areas within the Study Area. The “designation” category in the PAD-US database includes marine protected areas that are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.



Source: USEPA 2018a

Figure 12-12. USEPA Facility Register Service Record for the District of Columbia Study Area



Source: USGS 2019f

Figure 12-13. Protected Areas within the District of Columbia Study Area

As can be seen in Figure 7-15, protected lands in the Study Area include military bases, national and local parks, and State historic or cultural areas. Military bases in the southern region of the Study Area include Anacostia and Bolling Airforce Base, the Naval Research Laboratory, Navy Yard, Coast Guard Headquarters, Fort McNair Army Base, Marine Barracks, and the U.S. Naval Observatory (MilitaryBases.com 2019). National parks within the Study Area and along the Potomac River include the Chesapeake and Ohio Canal National Historical Park, George Washington Memorial Parkway, National Capital Parks East, the National Mall and surrounding Memorial Parks (i.e., National Capital Parks Central), President's Park, and Rock Creek Park. Additional information on these national parks can be found on the NPS's website (NPS 2019n). The Potomac and Anacostia Rivers flow south from the west and east sides of the Study Area, respectively. These rivers are also protected areas, as they are part of Chesapeake Bay, the first estuary in the Nation funded by Congress for restoration and protection (Chesapeake Bay Foundation 2019).

There are also hundreds of cultural and historical objects, monuments, sites, buildings, structures, and districts in the Study Area that are protected by both local and Federal historic preservation laws. As of 2009, there were 500 historic landmark designations covering more than 800 buildings, 150 historic landmark designations (e.g., structures, parks, and monuments), and 50 historic districts. The District government's list of officially designated historic properties are documented in the District of Columbia Inventory of Historic Sites (Plan DC 2019b, Plan DC 2019c).

Protected areas will need to be considered during analysis of potential future OCS-related projects. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

12.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq.*, is described in detail in Chapter 1.5.2.6.

The history and founding of the District of Columbia is different from that of the original colonies and states. The District of Columbia is not a state, nor is it part of any state. The purpose of the district is to serve as the seat of government for the United States of America. On July 16, 1790, as a result of the Residence Act, the District of Columbia was established to serve as the Nation's capital. The land for the capital was ceded to the government by the States of Maryland and Virginia. This location was chosen because it was on the Potomac River between two well-established colonial port cities (Georgetown, Maryland and Alexandria, Virginia). It was also a location that was centered between the northern and southern states (Washington.org 2016, Fogle 2020). For information about native populations originally present in the area which became the District of Columbia, refer to Chapters 11.3.2.5 and 11.4.5.4 in Chapter 11 (Maryland), and Chapters 13.3.2.5 and 13.4.5.5 in Chapter 13 (Virginia).

Article 1 of the Constitution states that the District of Columbia cannot exceed ten miles square. Therefore, the 100-square mile district was surveyed by Andrew Ellicott and Benjamin Banneker. The city was designed and planned by French-born American engineer and designer, Pierre Charles L'Enfant (Smithsonian.com 2007). In December 1800, Congress moved from Philadelphia to the District of Columbia. At the time, though the capital buildings were near completion, there were few finished residences or amenities for the first several years (Fogle 2020).

During the War of 1812, on August 24, 1814, the British invaded the District of Columbia and set fire to several Federal buildings and residences, including the White House and U.S. Capital, causing significant damage (Fogle 2020). The White House was reconstructed by 1817 and Congress' Capitol building was

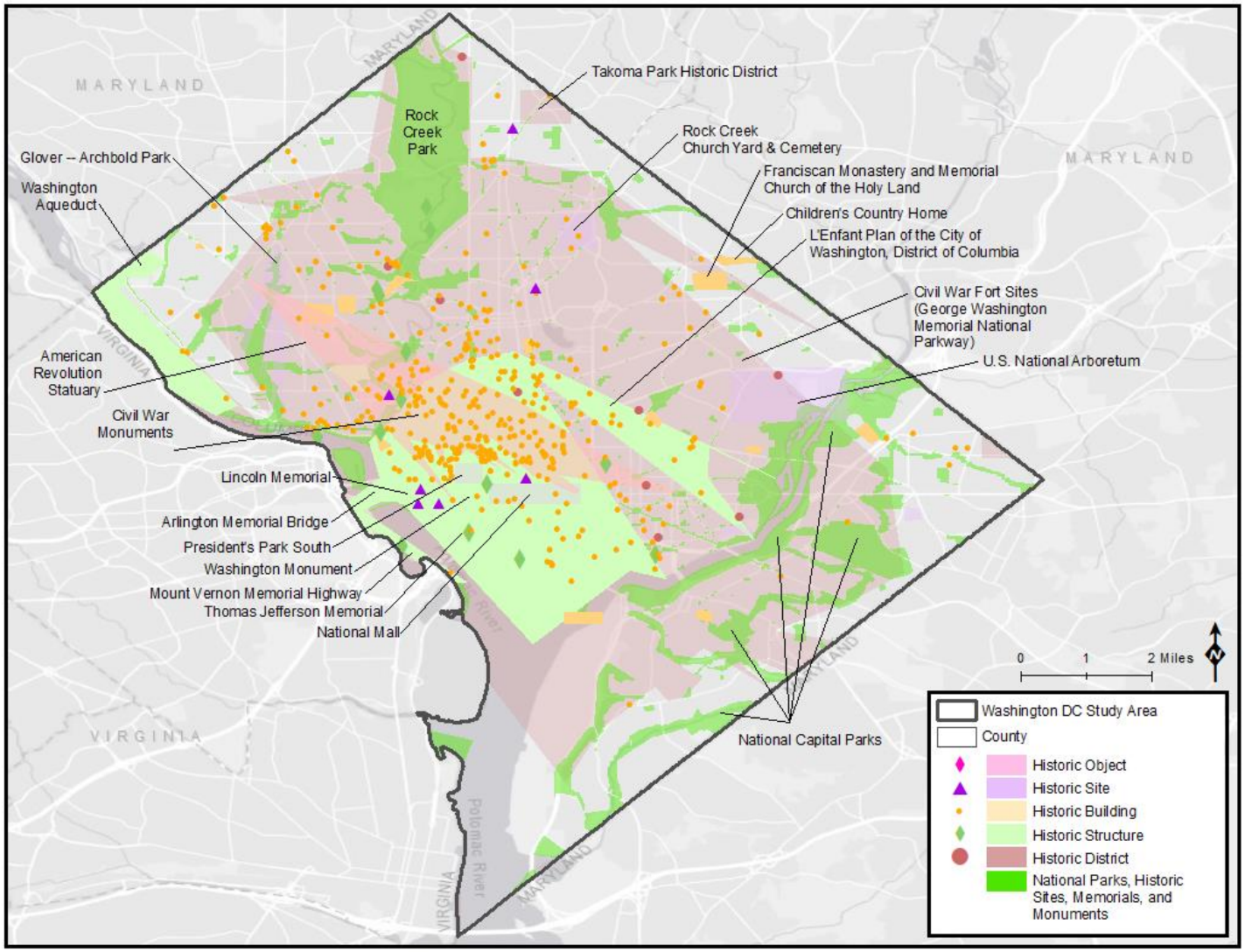
built in 1819. Today, the Supreme Court Building stands at the location where Congress conducted business prior to building the Capitol in 1819, known as the Old Brick Capital Building (Fogle 2020).

The introduction of railroads in the 1830s brought new interest in the city from tourists and an influx of congressional spouses, which ultimately changed the social scene in District of Columbia. Several major buildings that were constructed in the 1830's (e.g., Department of the Treasury, General Post Office, and Patent Office), are still standing today and are part of the Smithsonian Institution (Fogle 2020). However, the Civil War broke out shortly after Abraham Lincoln became President in 1861. During the Civil War (1861-1865), several battles were fought near the District of Columbia, in part because it is near Richmond, Virginia, which at the time was the capital city of the Confederate States. On April 16, 1862, slaves owned in the District of Columbia were emancipated, and on January 1, 1863, the Emancipation Proclamation took effect, freeing all slaves in states that were not under Federal control (History 2020). Lincoln won reelection in 1864, but was assassinated on April 14, 1865, by John Wilkes Booth at the Ford's Theater, which is a National Historic Site today.

After the Civil War, many freed slaved moved to the city, including abolitionist Frederick Douglass, (Washington.org 2016). After the first self-government was granted for Washingtonians in 1870, and with an immigration of affluent people and lobbyists, several city improvement projects were initiated. Initial projects included the construction of modern schools and markets, paving of city streets, installation of outdoor lighting, construction of sewers, and planting of over 50,000 trees throughout the city. Additional monumental buildings were constructed including the Washington Monument in 1884 and the Library of Congress in 1897 (Fogle 2020). In 1901, the National Mall was redesigned and expanded, completing Pierre Charles L'Enfant's original designs for the city (Washington.org 2016).

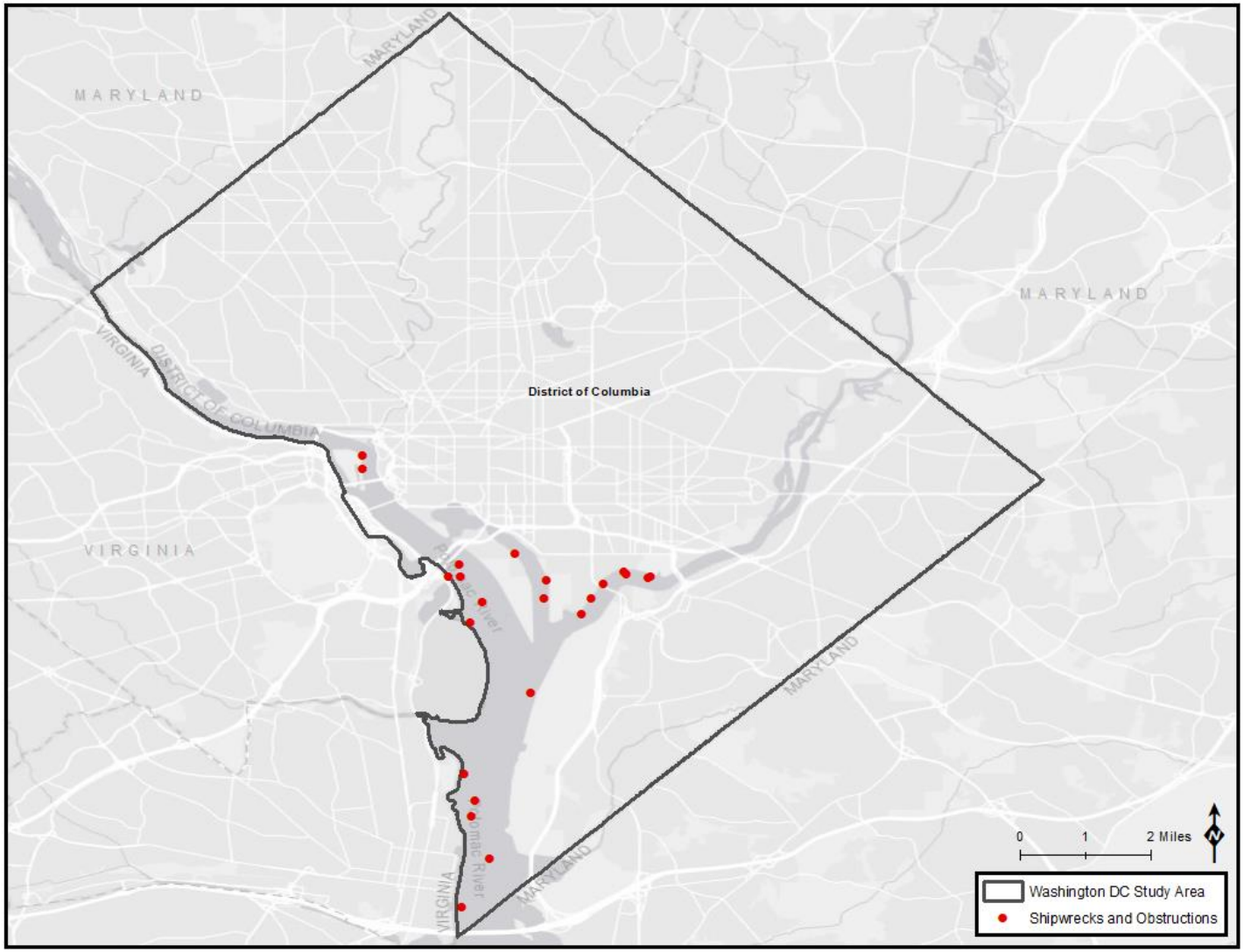
Following World War I (1914-1918), art galleries, museums, concert halls, clubs and formal societies grew in popularity. The Commission of Fine Arts, established in 1910, advised city planners on the appropriate design and placement of memorials and Federal buildings. Their first project, the Lincoln Memorial, was completed in 1922. The Federal Triangle was built from 1927-1940, includes 10 large city and Federal office buildings, and is now part of the Pennsylvania Avenue National Historic Site. However, certain areas of the city continued to have issues (e.g., riots and unrest) which intensified during the Great Depression of 1930s (Fogle 2020). These riots and civil unrest continued throughout the Vietnam War (1955-1975) and Civil Rights Era (1954-1968) and resulted in many residents leaving inner city areas for the suburbs (Washington.org 2016). Thus, the metro subway system was constructed between 1969-1973, to increase accessibility around the city and revitalized various parts of the District of Columbia (Fogle 2020).

Historic sites and historical museums in the Study Area, in addition to cemeteries and archaeological sites, include sites and artifacts associated with the War of 1812, American Civil War, slavery and the abolitionist movement, World Wars I and II, and the Civil Rights Movement. As a result of the District of Columbia being the Nation's capital, it is a major tourist destination rich in history. Figure 12-14 and Figure 12-15 present a summary of many of these locations, including maritime sites and shipwrecks located in the Potomac River.



Source: NPS 2014

Figure 12-14. Cultural and Historic Sites within the District of Columbia Study Area



Source: NOAA 2016a

Figure 12-15. Shipwrecks and Obstructions within the District of Columbia Study Area

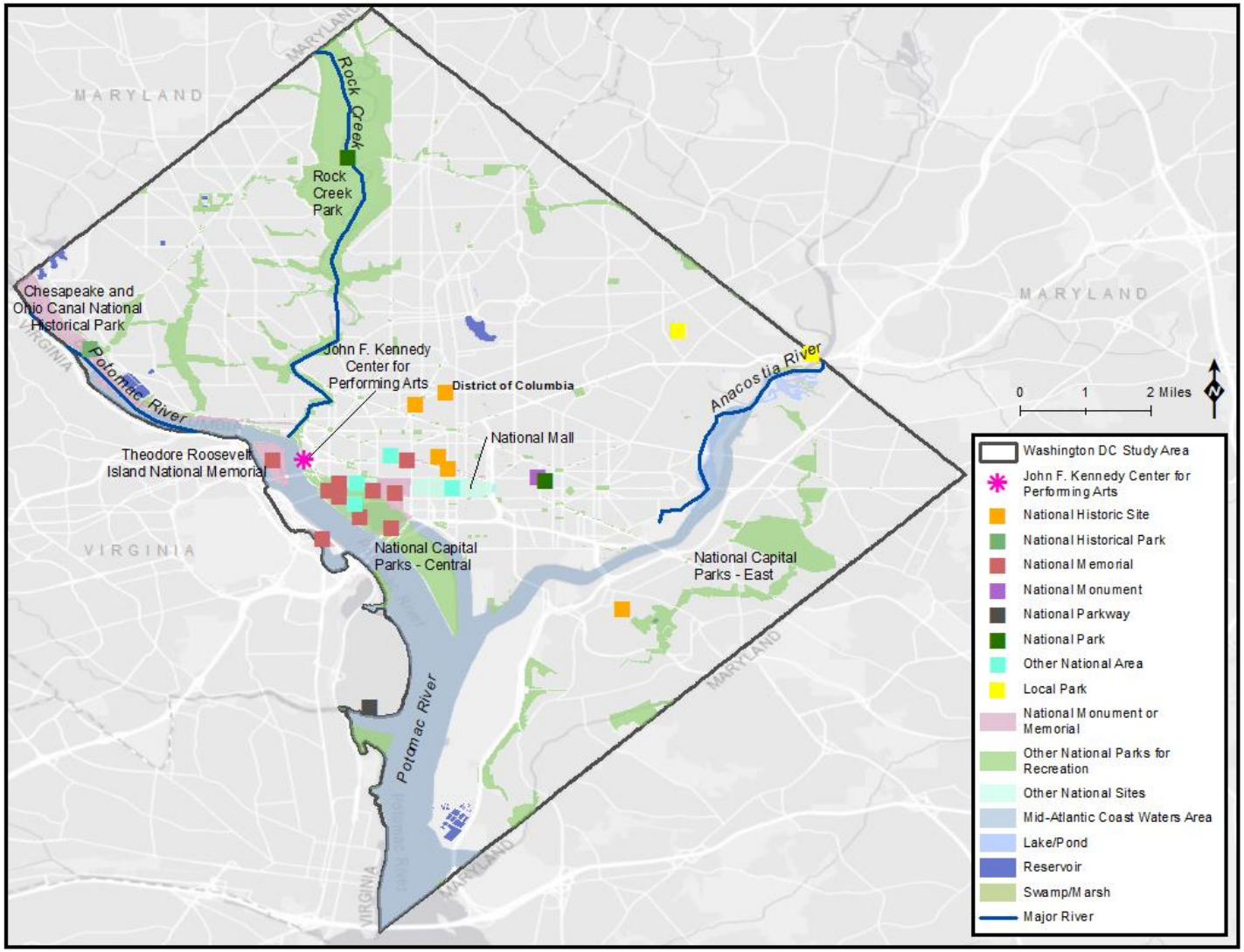
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. The District of Columbia was excluded from this study because it has no open coast, but data collected from surrounding states (Virginia and Maryland) may be applicable because, within defined visual areas of potential effect, concern for cultural and historic sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area have been previously identified as shown in Figure 12-14 and Figure 12-15; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the National Register of Historic Places criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of the District of Columbia's cultural and historical resources, detailed cultural resource surveys of proposed project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

12.3.2.7 Recreation

The Study Area has numerous recreational activities primarily related to national parks and exploring cultural and historic landmarks, buildings, and districts. A selection of major recreation resources in the Study Area is shown in Figure 12-16. Many of the protected areas shown in Figure 7-15, and the cultural and historic resources shown in Figure 12-14 are also recreational resources. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 12.3.2.6), transportation (Chapter 12.3.2.8), tourism employment (included in Chapter 12.4.4), and rental housing (included in Chapter 12.4.3).

In 2018, it was estimated that 23.8 million people visited the District of Columbia, spending over $7.8 billion dollars and supporting 76,522 local jobs (Destination DC 2019a). There are hundreds of historical objects, sites, buildings, structures, and districts in the District of Columbia that can be considered recreational resources. As of 2009, there were 500 historic landmark designations covering more than 800 buildings, 150 historic landmark designations (e.g., structures, parks, and monuments), and 50 historic districts. The District government's list of officially designated historic properties are documented in the District of Columbia Inventory of Historic Sites (Plan DC 2019b, Plan DC 2019c).



Sources: USGS 2019f, NPS 2014, USFS 2019b

Figure 12-16. Select Recreational Resources within the District of Columbia Study Area

Popular tourist attractions in the Study Area managed by the NPS include the Franklin Delano Roosevelt Memorial, Korean War Veterans Memorial, Lincoln Memorial, Martin Luther King, Jr. Memorial, National Capital Parks East, National Capital Parks Central (which includes the National Mall and surrounding Memorial Parks), Thomas Jefferson Memorial and Vietnam Veterans Memorial, President's Park and the White House, and the World War II Memorial. All these attractions are within walking distance of each other, and millions of people visit these landmarks every year (NPS 2018a). Rock Creek Park (1,754-acre park) and the Chesapeake & Ohio Canal National Historical Park are areas where visitors can go hiking, biking, camping, boating, fishing, and horseback riding (NPS 2019o). In 2018, it was estimated that almost 1.1 million people visited the Chesapeake & Ohio Canal National Historic Park in the Study Area (NPS 2018a). Visitors to Rock Creek Park can also play tennis or golf; visit the nature center, planetarium, and historical landmarks; and attend plays, concerts, festivals, or the Citi Open Tennis Tournament at the 4,200-seat Carter Barron Amphitheatre (NPS 2019p, Destination DC 2019b). In 2018, it was estimated that almost 2.4 million people visited Rock Creek Park and that almost 1.1 million people visited the Chesapeake & Ohio Canal National Historic Park in the Study Area (NPS 2018a).

The Study Area has several professional sports teams, including the Washington Nationals (baseball), Washington Redskins (football), Washington Capitals (hockey), DC United (soccer), Washington Wizards (basketball), Washington Mystic (women's basketball), Washington Spirit (women's soccer), and the Washington Kastles (tennis).

Popular annual events in the Study Area include the National Cherry Blossom Festival (March-April), Passport DC (May), DC Jazz Festival (June), Smithsonian Folklife Festival (June-July), DC Independence Day Celebration (July), National Memorial Day Celebration and Parade (May), National Christmas Tree Lighting (December), Citi Open Tennis Classic (July-August), Washington Auto Show (January), By the People Festival (June), Metropolitan Washington Restaurant Week (January), DC Bike Ride (November), H Street Festival (September), National Book Festival (September), White House Easter Egg Roll (April), St. Patrick's Day Parade (March), Rock 'n Roll USA Marathon (March), Marine Corp Marathon (October), Blossom Kite Festival (March), Capital Pride (May-June), National Capital Barbecue Battle (June), International Horse Show (October), Washington Craft Show (November), and Black Family Reunion Celebration (November) (Top Events USA 2020d, Destination DC 2019c).

In summary, most of the recreational attractions are also cultural and historical landmarks (Figure 12-14) that are protected by both local and Federal historic preservation laws. Because the Study Area is also the Nation's capital, domestic and international tourists visit the area year-round. There is no peak recreational season, and festivals and events are held throughout the year. Therefore, travel costs will be high year-round. The potential impacts on recreation from potential future OCS-related projects should be considered during analysis by checking relevant tourism websites, but there will likely be limitations for development in the Study Area due to all the protected lands and waters that are also used for recreation.

12.3.2.8 Transportation Resources

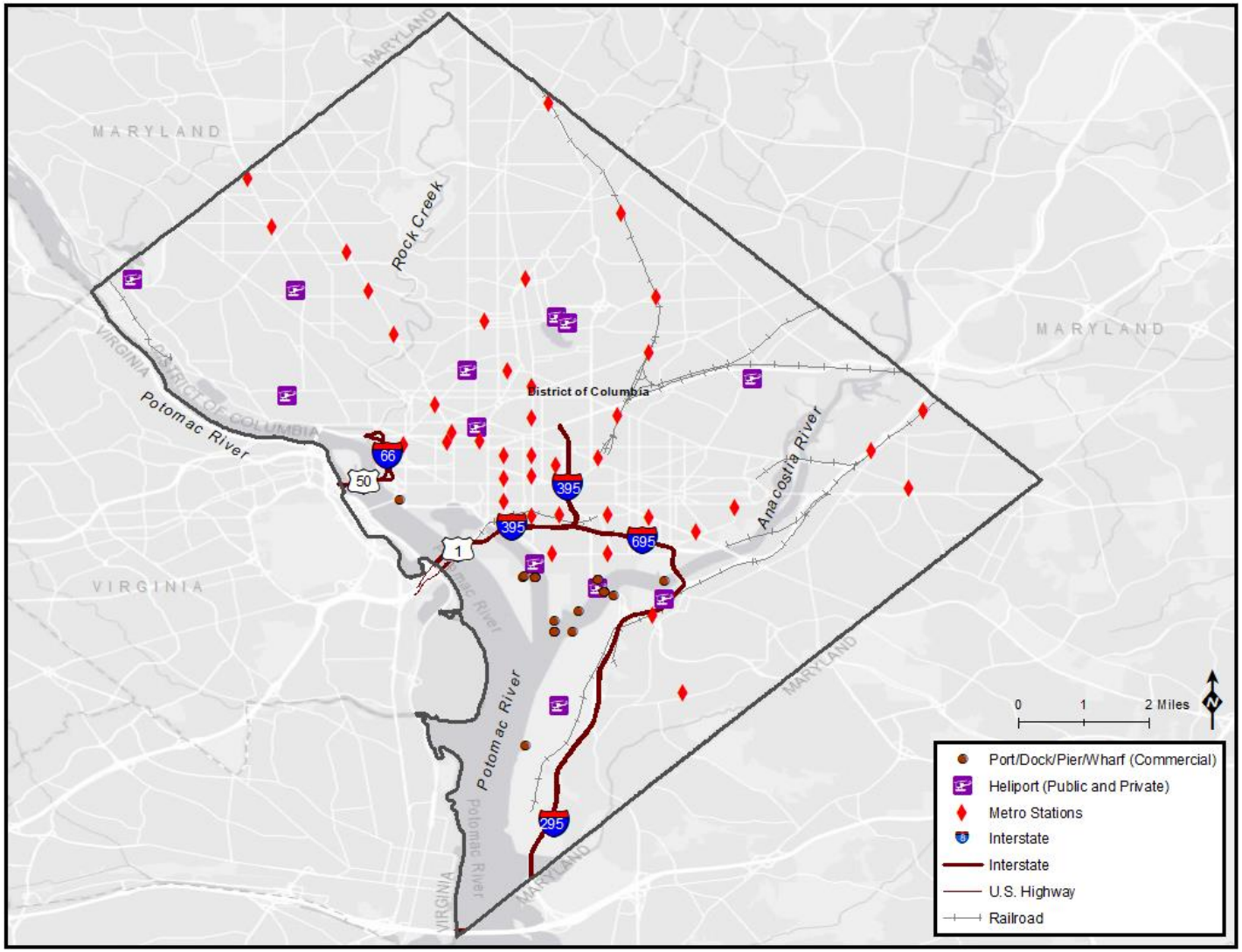
The District of Columbia is a dense urban environment with a diverse mixture of land uses that place significant demand on the city's transportation infrastructure. Its role as an employment center for the region creates a high volume of commuter traffic in peak hours, while the consumer-driven economy generates significant demand for freight movement. Population growth and the subsequent demand for housing, employment, and goods and services have created increasing pressure on the city's transportation network. Commodity movements into the District of Columbia dominate compared to movements within and out of the District of Columbia, and truck is the dominant mode. Overall, freight traffic in the District of Columbia is expected to grow by 74% from 2011 to 2040 in terms of tons and 159% in terms of value (DDOT 2017). The District Department of Transportation (DDOT) is the agency

responsible for transportation infrastructure and operations within the District of Columbia. The vast majority of the District of Columbia's streets are controlled by the DDOT; however, several significant corridors are under the control of another entity. Constitution Avenue NW, Independence Avenue SW, and Rock Creek Parkway carry substantial commuter traffic and are controlled by the NPS. Streets surrounding the Capital are under the control of the Architect of the Capital. Some of these serve an important role in serving multimodal operations and provide access to critical transportation facilities such as Union Station (DDOT 2014).

Figure 12-17 shows the transportation resources throughout the District of Columbia Study Area. Inbound and outbound truck traffic is heavily concentrated to the east and south of the District. Truck routes in the District of Columbia are generally assigned to corridors with large-vehicle-compatible roadway geometry, fair traffic conditions, and good network connectivity. More than 40% of inbound trucks enter the District of Columbia from the northeast on routes such as US Highway 1 and US Highway 50. The eastern part of the District of Columbia, and the areas of Maryland east of the District of Columbia, are home to many warehouses and transfer points, particularly along New York Avenue and in the Landover and Lanham, Maryland areas. Additionally, truck traffic from Baltimore and other locations on the Eastern Shore enters the District of Columbia from the east. Similarly, for outbound traffic, over 75% of trucks leave via the District's eastern and southern borders with Maryland (DDOT 2017). Passenger vehicle traffic congestion is also an issue within the District. In August 2019, the Washington Post reported the results of a Texas A&M Transportation Institute study which reported that drivers in the District experience 102 hours of traffic delays annually. Thus, traffic congestion in the District ranks as the third highest out of the Nation's large metropolitan areas. The congestion is also growing worse with longer periods of traffic delays over time (Hedgpeth 2019, Texas A&M Transportation Institute 2019).

Freight rail in the District of Columbia plays an important role in the regional freight network. The District of Columbia does not own any railroads but is served by two Class I and one Class III (switching or terminal) railroads, including CSX Transportation's major north-south freight rail line. The other freight railroad operating in the District of Columbia is Norfolk Southern Railway. National Southern Railway does not own railroad lines but has leased the trackage rights from CSX Transportation. Two freight rail yards are in the District of Columbia – Washington Terminal Rail Yard, which is adjacent to Union Stations, and the Benning Rail Yard. The District of Columbia is a bottleneck for freight rail operations due to tunnel and overhead clearance restrictions. However, sections of the existing freight railroad are undergoing a major infrastructure improvement program called the National Gateway project. The District of Columbia's freight railroads also carry passenger and commuter rail service. This service operates on freight railroad corridors through operating agreements between the commuter railroads, Amtrak, and freight railroad owners (DDOT 2017).

The Washington Metropolitan Area Transit Authority was created in 1967 to establish a regional transportation system within the District of Columbia. Construction of the Metrorail began in 1969 and became operational in 1976. The Metro services 91 stations over 117 miles of track. Metrobus systems were acquired in 1973 and the fleet currently consists of 1,500 buses. Combined, the Washington Metropolitan Area Transit Authority systems serve approximately 4 million passengers within a 1,500-square mile area connecting the District of Columbia to cities in Maryland and Virginia (WMATA 2019).



Sources: Open Data DC 2019, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 12-17. Transportation Resources within the District of Columbia Study Area

No airports are located within the District of Columbia, but three major airports serve the Washington Region – Ronald Reagan Washington National Airport, Baltimore Washington International Thurgood Marshall Airport Baltimore Washington International Thurgood Marshall Airport, and Washington Dulles International Airport. The top air cargo carrier hubs providing goods to the District are FedEx, United Parcel Service, and DHL. Air cargo accounts for a very small percentage of the region's total inbound (less than 0.001%) and outbound freight (0.02%) and a slightly higher percentage in terms of value (0.09% and 2.32% for inbound and outbound traffic, respectively). Washington Dulles International Airport ships the largest volume of freight by far, with 49.3 million tons in 2012, as compared to 20.9 million tons at Baltimore Washington International Thurgood Marshall Airport and 1 million at Washington National Airport (DDOT 2017).

In addition to Washington National Airport, Baltimore Washington International Thurgood Marshall Airport, and Washington Dulles International Airport, many air cargo shippers, receivers, and air forwarders truck air cargo to and from major international passenger and cargo gateways located within a 24-hour drive from the District of Columbia metro area. The following hubs also facilitate cargo shipments into or out of the District:

- John F. Kennedy International in New York
- Newark Liberty International in New Jersey
- Philadelphia International in Pennsylvania
- Chicago O'Hare International in Illinois

Although the District of Columbia boundary encompasses two major rivers, neither is a significant source of freight movements due to the District of Columbia's service-based economy, the rivers' lack of accessibility, and lack of shipping infrastructure (DDOT 2017). The region's major rivers – the Potomac, Anacostia, and Occoquan – are part of a Federal initiative known as the Marine Highway Program. This initiative provides financial incentives for investment that increases waterborne freight and reduces highway demands. This is known as the M-495 Marine Highway Crossing. There is also a small U.S. Army Corps of Engineers maritime operation along the Anacostia River at the edge of a property that used to be a Washington Gas manufacturing plant. The U.S. Army Corps of Engineers uses this small section for debris collection boats that patrol the Anacostia and Potomac Rivers.

The District of Columbia's multimodal transportation network faces several challenges and constraints, including aging infrastructure, congestion, and climate impacts. Congestion is one of the largest challenges. Increasingly, freight-carrying commercial vehicles compete for limited roadway space with passenger vehicles, buses, bicycles and pedestrians. The District of Columbia Region perennially ranks as experiencing one of the highest levels of traffic congestion in the Nation. While trucks are not the main cause of congestion, they are a contributor. Freight movements in the District of Columbia are likely to double by 2040. To maintain an adequate level of mobility and accommodate such levels of growth, the District of Columbia is seeking ways to increase the efficiency, safety, and overall condition and performance of its freight network (DDOT 2017).

Vulnerabilities from climate impacts (see Chapter 12.2.2) also contribute to transportation constraints. The District of Columbia has experienced several extreme weather events in recent years, including several days of snow, intense winds, rain, flooding, and storm surge. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., sea level and an increase in the frequency and intensity of large storm systems). Changing climate conditions play an important role in the planning, design, and maintenance of transportation infrastructure in the District. Recognizing the need to prepare itself for

more intense weather events, the DDOT developed its *Climate Change Adaptation Plan* to adapt its transportation system to climate change (DDOT 2013).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Transportation needs of potential future OCS-related projects will need to be considered during analysis. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Therefore, an understanding of the integrated transportation network will be essential for future project development.

12.3.3 Summary – Land Cover and Land Use

The District of Columbia is over 85% developed land cover types, and development appears to be continuing within the District as well as the surrounding region. Land use throughout the District is varied, though as the Nation's capital, much of the land use is dedicated to government and/or businesses and industries that are government-focused.

In the District of Columbia, there are un-zoned districts and various types of zoning districts, including residential, mixed-use and neighborhood mixed-use, downtown, special purpose, and industrial zones. The Zoning Commission for the District of Columbia has published a Zoning Handbook that contains the 2016 Zoning Regulation (DCOZ 2020a). The District of Columbia's Office of Zoning provides both interactive and static maps showing zoning information for every property in the District of Columbia (DCOZ 2020b). Also provided on the Official DC Zoning Map is a link that directs users to static Future Land Use Map Plans for the District of Columbia. These maps do not show the lands as they are being used today but how District Officials intend the land to be used in the future (Plan DC 2020).

Industrial incentives, including business and financial incentives, in the District of Columbia are focused mainly on small business and minority business owners. Of the incentives directed at larger corporations or industrial-centered businesses, the incentives are aimed at redeveloping contaminated industrial locations or training and employing local individuals in the workforce (DC 2020).

Protected areas in the Study Area include military bases, national and local parks, and State historic or cultural areas. Military bases in the southern region of the Study Area include the Anacostia and Bolling Airforce Base, Naval Research Laboratory, Navy Yard, Coast Guard Headquarters, Fort McNair Army Base, Marine Barracks, and the U.S. Naval Observatory. National parks within in the Study Area and along the Potomac River include the Chesapeake and Ohio Canal National Historical Park, George Washington Memorial Parkway, National Capital Parks East, the National Mall and surrounding Memorial Parks (i.e., National Capital Parks Central), President's Park, and Rock Creek Park. The Potomac and Anacostia Rivers flow south from the west and east sides of the Study Area, respectively. These rivers are also protected areas, as they are considered part of Chesapeake Bay, the first estuary in the Nation funded by Congress for restoration and protection. There are also hundreds of cultural and historical objects, sites, buildings, structures, and districts in the Study Area that are protected by both local and Federal historic preservation laws. As of 2009, there were 500 historic landmark designations covering more than 800 buildings, 150 historic landmark designations (e.g., structures, parks, and monuments), and 50 historic districts. The District government's list of officially designated historic properties are documented in the District of Columbia Inventory of Historic Sites (Plan DC 2019b, Plan DC 2019c). Protected areas will need to be considered during analysis of potential future OCS-related projects. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

Historic sites in the District of Columbia include archaeological sites, cemeteries, and sites associated with the War of 1812, the American Civil War, slavery and the abolitionist movement, the Underground Railroad, World Wars I and II, and the Civil Rights Movement. Because of the direct significance related to U.S. history, as well as Federal government history in the District of Columbia, there are an abundance of historic sites that have national significance within the Study Area. Because of the importance of the District's cultural and historical resources, detailed cultural resource surveys of proposed project sites (and their immediate vicinity) to determine potential effects to these resources may be necessary during analysis of potential future OCS-related projects.

The protected areas and cultural and historic areas of the District of Columbia are also the primary recreation destinations for residents and tourists in the city. The recreation destinations and area festivals and events are held throughout the year.

The District of Columbia's multimodal transportation network faces several challenges and constraints including aging infrastructure, congestion, and climate impacts. Congestion is one of the largest challenges. Increasingly, freight-carrying commercial vehicles compete for limited roadway space with passenger vehicles, buses, bicycles, and pedestrians. The District of Columbia Region perennially ranks as experiencing one of the highest levels of traffic congestion in the Nation. While trucks are not the main cause of congestion, they are a contributor. As freight transport through the area is expected to continue to increase, the District of Columbia is seeking ways to increase the efficiency, safety, and overall condition and performance of its freight network. Vulnerabilities from climate impacts such as recurrent flooding and storm surge also contribute to transportation constraints. The DDOT has implemented its *Climate Change Adaptation Plan* to adapt its transportation system to climate change (DDOT 2013).

12.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

12.4.1 Population

As shown in Table 12-5, the population of the District of Columbia grew 11.7% since the 2010 Census, having added approximately 70,688 people. During the same period, the population of the U.S. grew just 4.0% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Table 12-5. 2010 and 2017 Total Population and Population Projections Through 2040 in the District of Columbia Study Area

Geographic Unit	Total Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Study Area/ District of Columbia	601,723	672,391	729,501	842,154	940,687	11.7	39.9
United States	308,745,538	321,004,407	332,639,000[4]	355,101,000[4]	379,392,779[4]	4.0	16.4

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - mwcog.org 2018; 4 - USCB 2018b

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While the District of Columbia is affected by the nationwide trend of aging population, it continues to grow due to natural increase and migration, both domestic and international. The U.S. Census Bureau's (USCB) 2018 estimates indicate that natural increase accounted for 60.7% of population increase between 2017 and 2018 (USCB 2019b). These values are USCB estimates. As estimates, they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

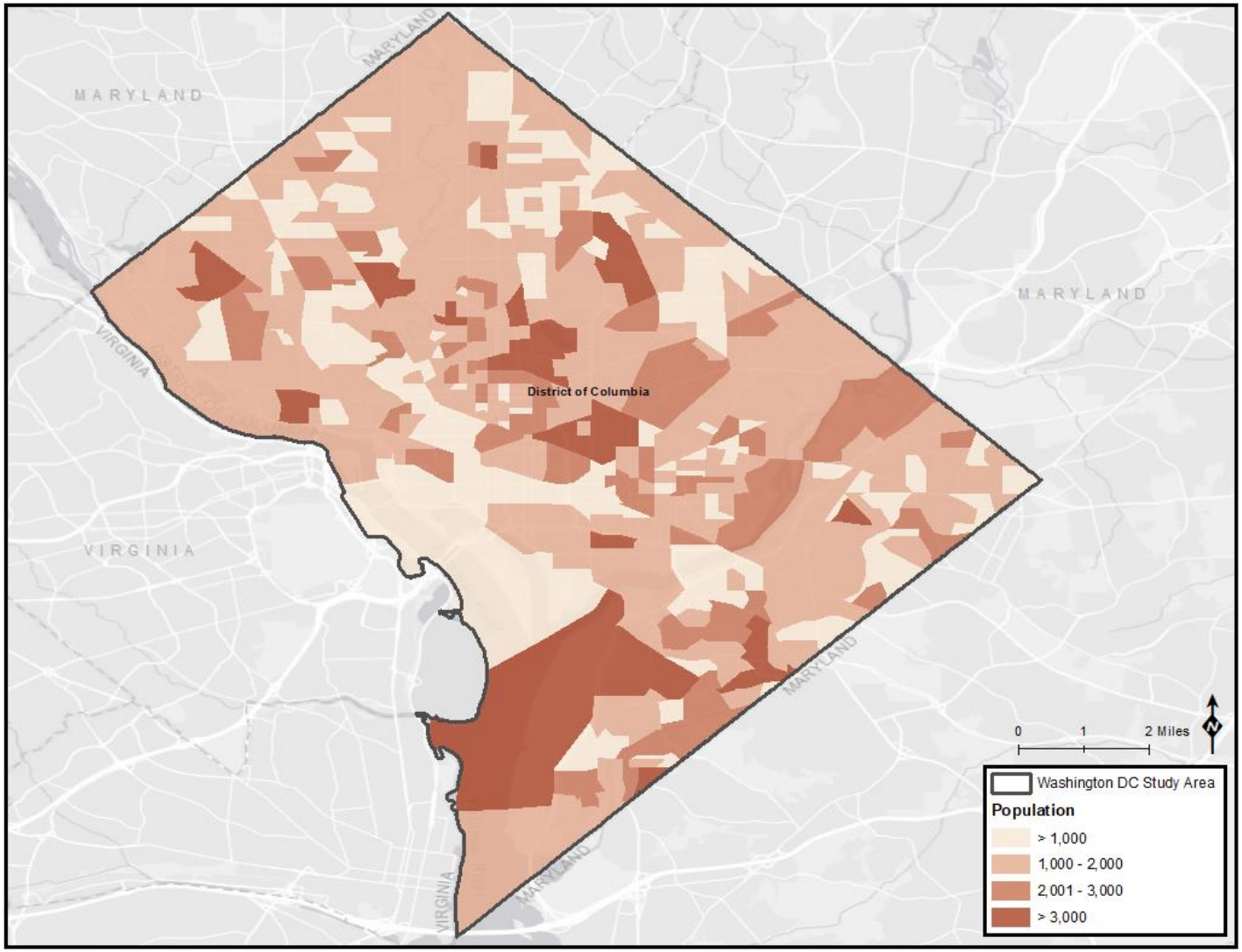
Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). According to 2018 USCB estimates, between 2017 and 2018, domestic migration accounted for 13.8% loss of population, with the largest domestic out-migration flows going to Maryland and Virginia (USCB 2019b). International migration accounted for 39.3% of the population gain during the same period (USCB 2019c).

12.4.1.1 Study Area Trends

The Study Area is comprised of the city of Washington, DC (or the "District"), which is not a State but a Federal territory bordering the States of Maryland and Virginia. The Federal government maintains jurisdiction over the District (Cooper 2009). It does not have counties but rather is divided into 8 wards and 37 Advisory Neighborhood Commissions within these wards. There are 127 named neighborhoods in the District (ballotpedia.org 2020).

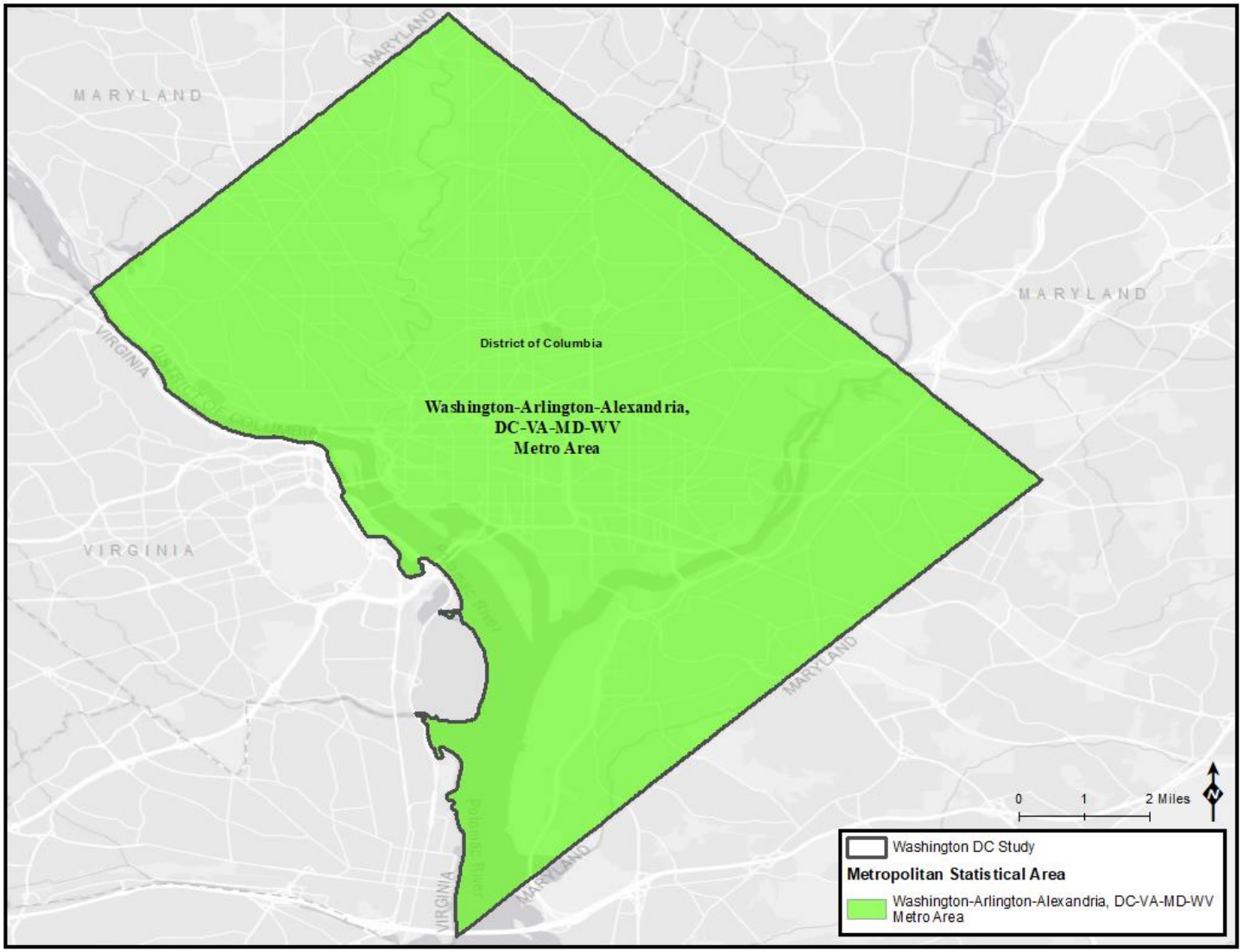
The District has seen significant changes in population and density. Population growth has slowed since its 2009 boom 10 years ago but still continues to climb (dcpolicycenter.org 2018). According to 2018 USCB estimates, the city officially passed the 700,000 mark in 2018 (USCB 2019a). While the District of Columbia's population has been at the same point twice in the past (most recently in the 1970s), the District is in a very different place than it was over 40 years ago. Since then, its demographic profile and economic trajectory have shifted, as residential areas expanded from downtown outward, households are smaller but more numerous, and the transit service known as the "Metro" changed transportation geography significantly (dcpolicycenter.org 2018). A large proportion of millennials work as well as reside in the Study Area (as opposed to nearby suburbs); their presence is a driving force of the District of Columbia's growth. According to the DC Office of Planning, millennials (18- to 34-year olds) comprised approximately 35% of the District of Columbia's population as compared to the U.S. (23%) in 2015. The District of Columbia is one of the few cities where growth is being driven by an influx of whites rather than by Latinos, Asians, or immigrants. More whites are moving into the District of Columbia while African American populations are moving out (Urban.org 2020). Table 12-5 shows population growth in the Study Area. International immigration and natural increase fueled the District's population growth.

Figure 12-18 shows population counts in census block groups within the Study Area. As illustrated in Figure 12-19, the MSA present in the Study Area is the Washington-Arlington-Alexandria, DC-VA-MD-WV Metro Area (Data.gov 2017). An MSA is defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010).



Source: USCB 2017r

Figure 12-18. Population in the District of Columbia Study Area by Census Block Group



Source: USCB 2017s

Figure 12-19. Metropolitan Statistical Areas Located in the District of Columbia Study Area

Within the limited space of the Nation's coasts, population density far exceeds the Nation as a whole. According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 12-20, which shows population per square mile in the Study Area. The figure illustrates geographic high-density concentrations in the MSA. As shown in Table 12-6, the population density of the Study Area was 10,998 persons per square mile in 2017, far greater than the Nation (90 persons per square mile) and all Study Areas within the 15 coastal states comprising the Project Area (USCB 2017d, USCB 2017c). The District of Columbia's daytime population is even larger during the workweek – estimated to be more than 1 million people – when considering the number of workers commuting from Virginia and Maryland (ggwash.org 2018).

Table 12-6. 2017 and 2040 Population Density in the District of Columbia Study Area

Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Study Area/ District of Columbia	672,391	940,687	61.1	10,998.4	15,386.9
United States	321,004,407	379,392,779	3,531,905	90.9	107.4

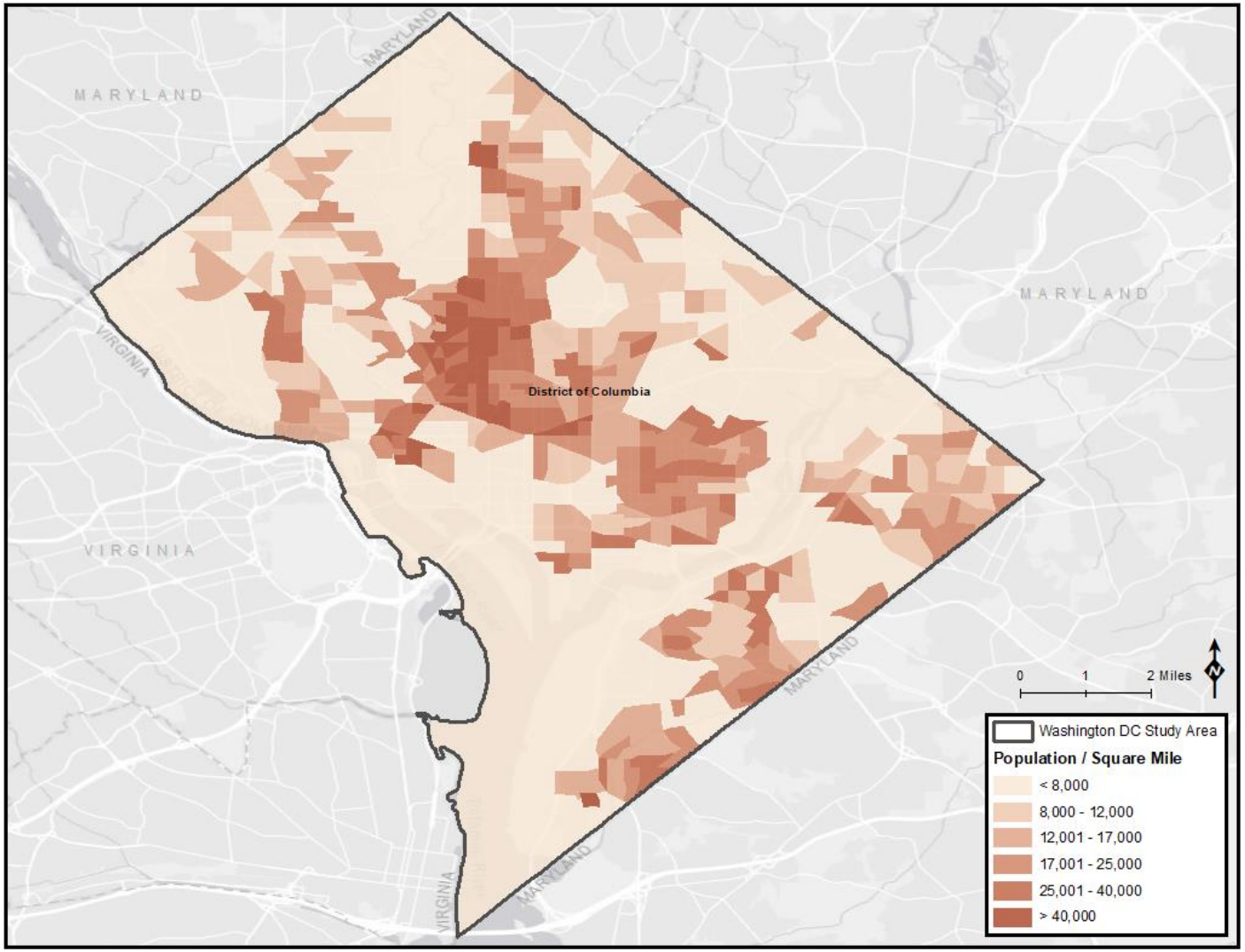
Sources: mwcog.org 2018, USCB 2017c, USCB 2017d, USCB 2018b

12.4.1.2 Population Projections

According to the Metropolitan Washington Council of Governments, the District of Columbia's population is projected to grow 39.9% (940,687 residents) by 2040. As shown in Table 12-5, the Nation's population is projected to grow 16.4% (373.5 million), significantly less than the Study Area during the same period (USCB 2017d, USCB 2017c, USCB 2018b). Figure 12-21 shows the overall projected percent change in population during the same period.

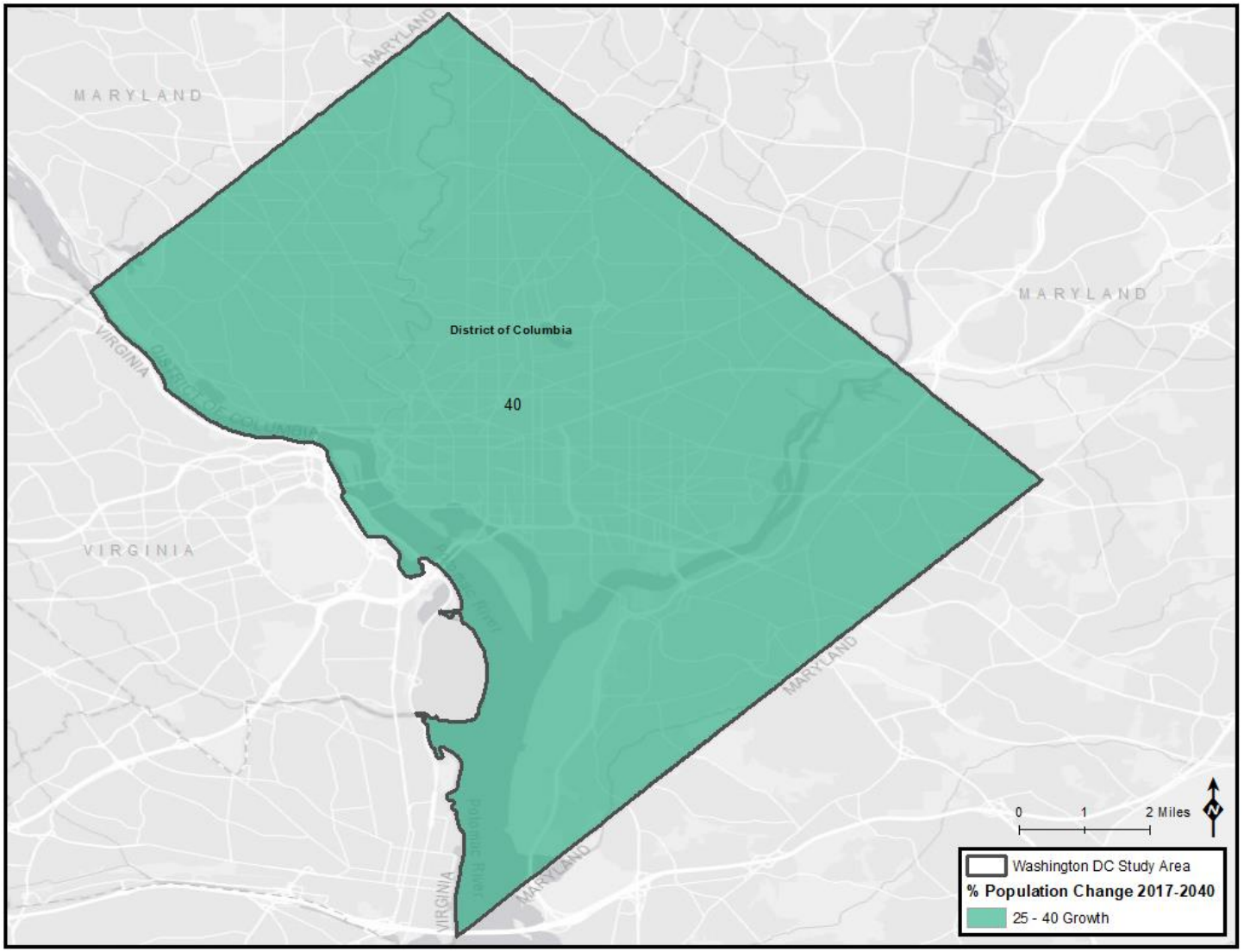
The District of Columbia population projections are based on retaining millennials as they start families, continued attraction of prime working-age migrating populations and highly skilled foreign labor, growth of job opportunities, and urban amenities such as entertainment, leisure, education, as well abundant choices for transportation, housing, health, and food (DCOP 2016a).

As shown in Table 12-6, population density in the District of Columbia is projected to increase from 10,998 persons per square mile to 15,387 persons per square mile between 2017 and 2040. Density in the U.S. is projected to increase from 91 in 2017 to 107 in 2040 during the same period (USCB 2017d, USCB 2017c, mwcog.org 2018). This will contribute to greater pressures on the resources within the Study Area, as well as contribute to increased congestion on the already stressed transportation network.



Source: USCB 2017r

Figure 12-20. Population Density in the District of Columbia Study Area by Census Block Group



Source: mwcog.org 2018

Figure 12-21. Overall Projected Population Change from 2017-2040 in the District of Columbia Study Area

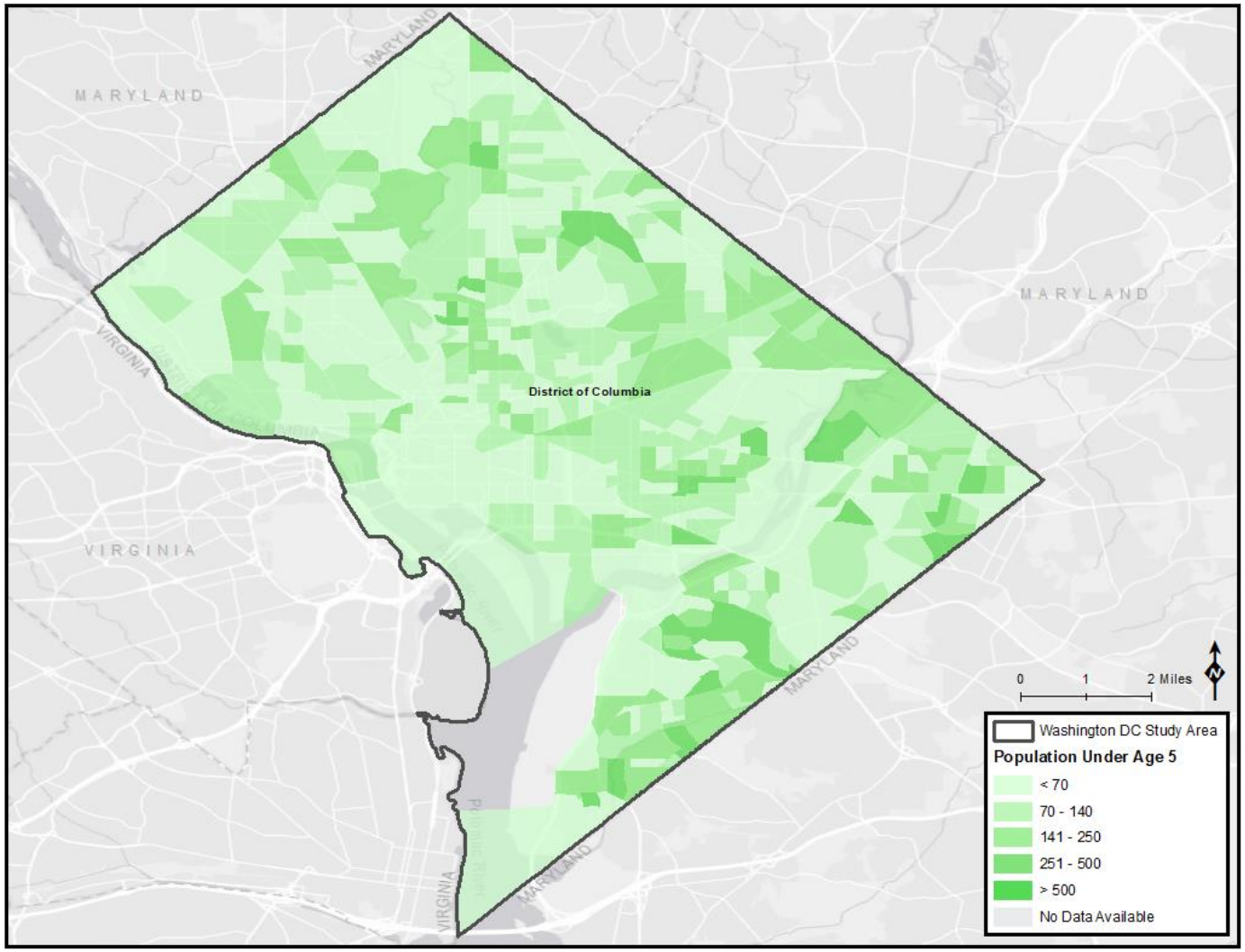
12.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact the Study Area but overall the city is growing younger due to shifts in population and demographics that are reshaping the city (Urban.org 2020).

Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 12-22 and Figure 12-23 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 12-24 and Figure 12-25 show the projected change in these groups by 2040. Table 12-7 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S. and Study Area (Brookings Institute 2018, USCB 2017b, mwcog.org 2018).

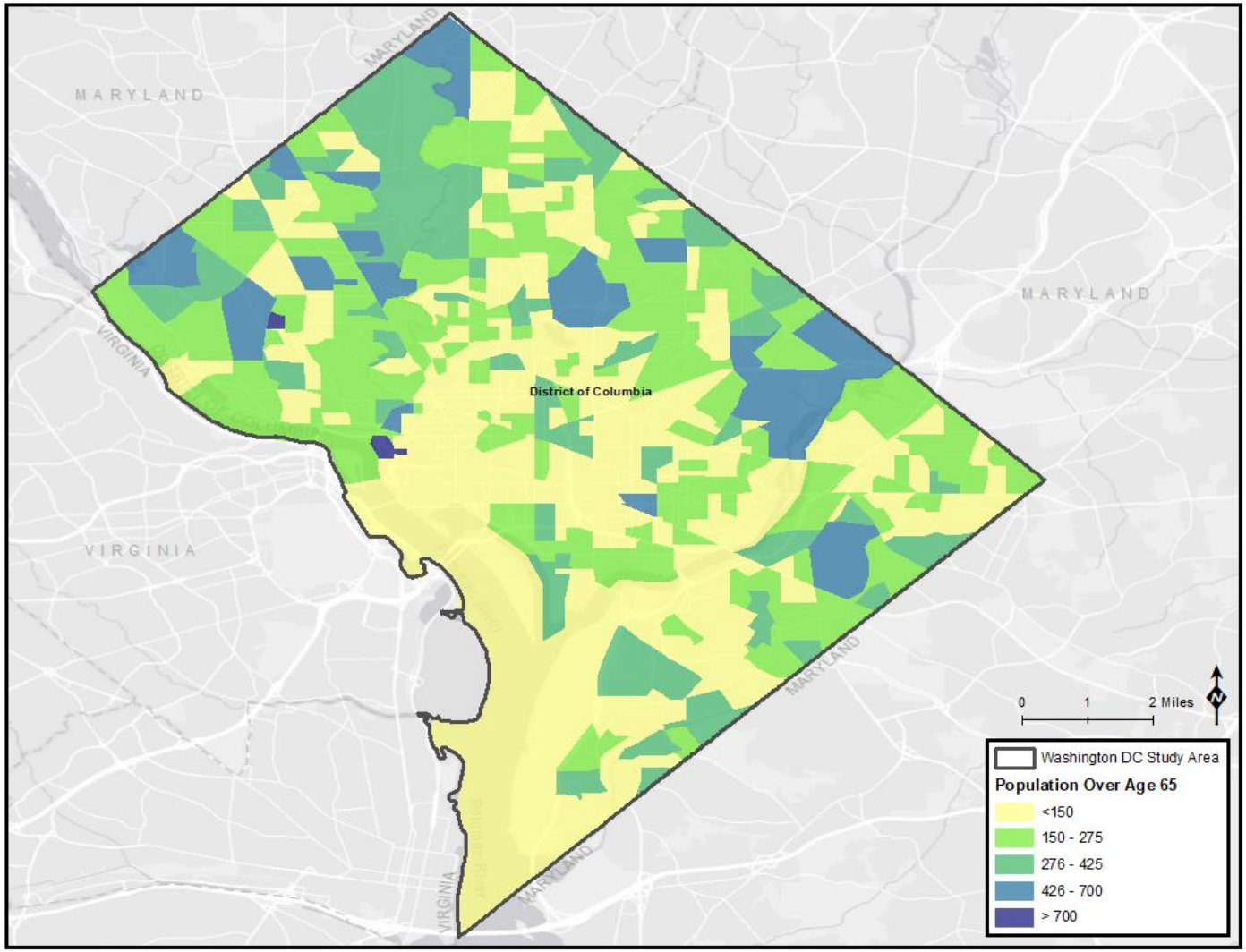
Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. The age distribution of the Study Area had a greater proportion of young children as compared to the Nation. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population and 6.5% in the Study Area. Contrary to nationwide trends described in Chapter 1.6.3, the Study Area is not aging but instead getting younger due to the high number of millennials who prefer to work as well as live in the District of Columbia, instead of nearby suburbs (Urban.org 2020). However, by 2040, population in the Study Area is expected to age, consistent with the national trend. Projections indicate that the number of young children will rise in the Nation and the Study Area, but the proportion of this group in comparison to the overall population is projected to decline in the Nation (5.7%) and the Study Area (6.0%). For the study area, this is an overall decline of 0.5% in the proportion of the population under age 5 from 2017-2036. This is due to declining natural increase (the difference between births and deaths), which suppresses population growth, resulting in the aging of the general population in the Nation, and to a lesser degree in the Study Area (USCB 2017b, USCB 2018b, mwcog.org 2018).

The age distribution of the Study Area had a lesser proportion of elderly as compared to the Nation. According to 2017 estimates shown in Table 12-7, the elderly represented 14.9% of the U.S. population and 11.9% of the Study Area. The population of elderly is projected to rise in the Nation and Study Area, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise in the Nation (21.6%); however, contrary to national trends, the group's percentage is projected to decline (11.5%) in the Study Area. For the study area, this is an overall decline of 0.4% in the proportion of the population over age 65 from 2017-2036 (USCB 2017b, USCB 2018b, mwcog.org 2018).



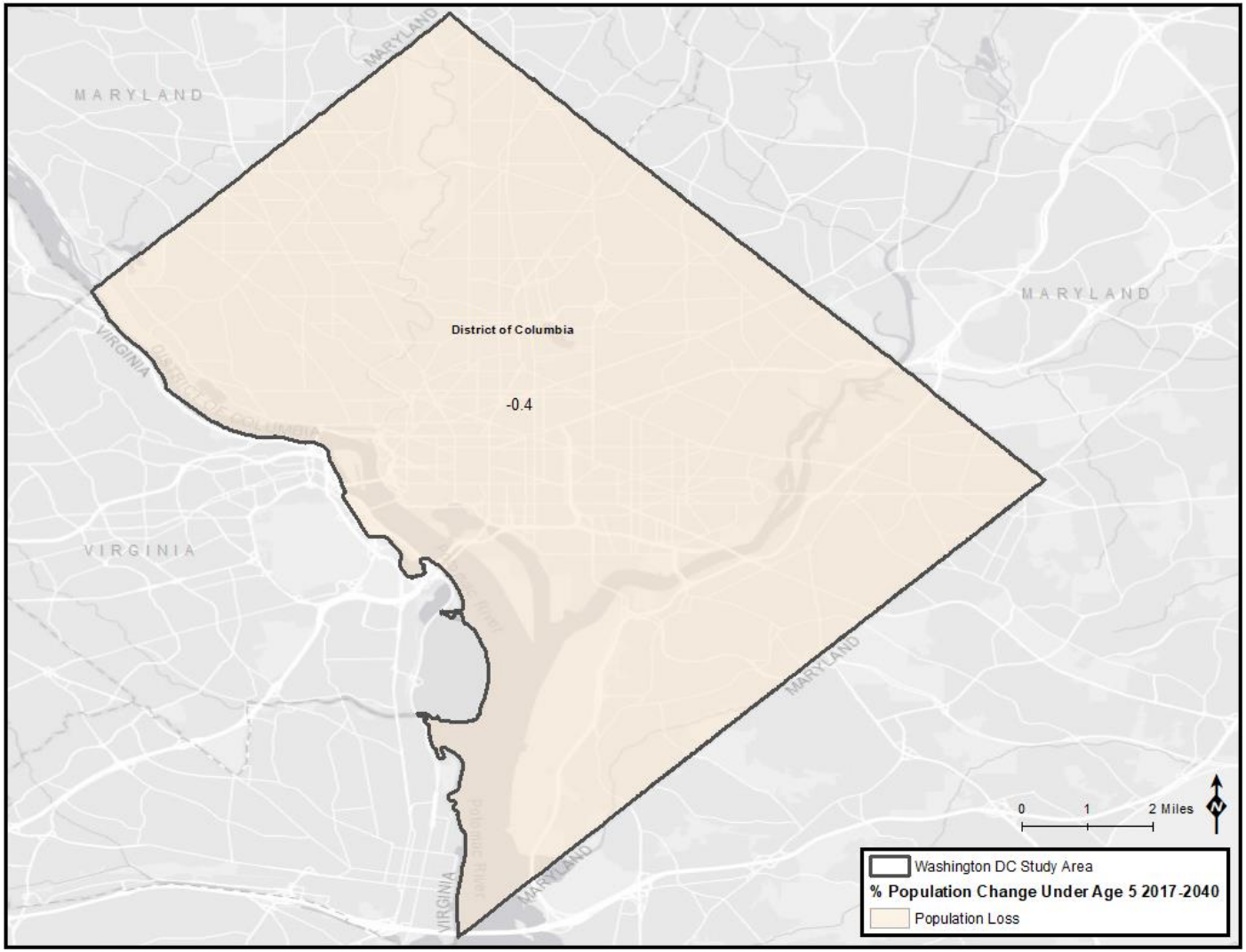
Source: USCB 2017r

Figure 12-22. Population Under Age 5 in the District of Columbia Study Area by Census Block Group



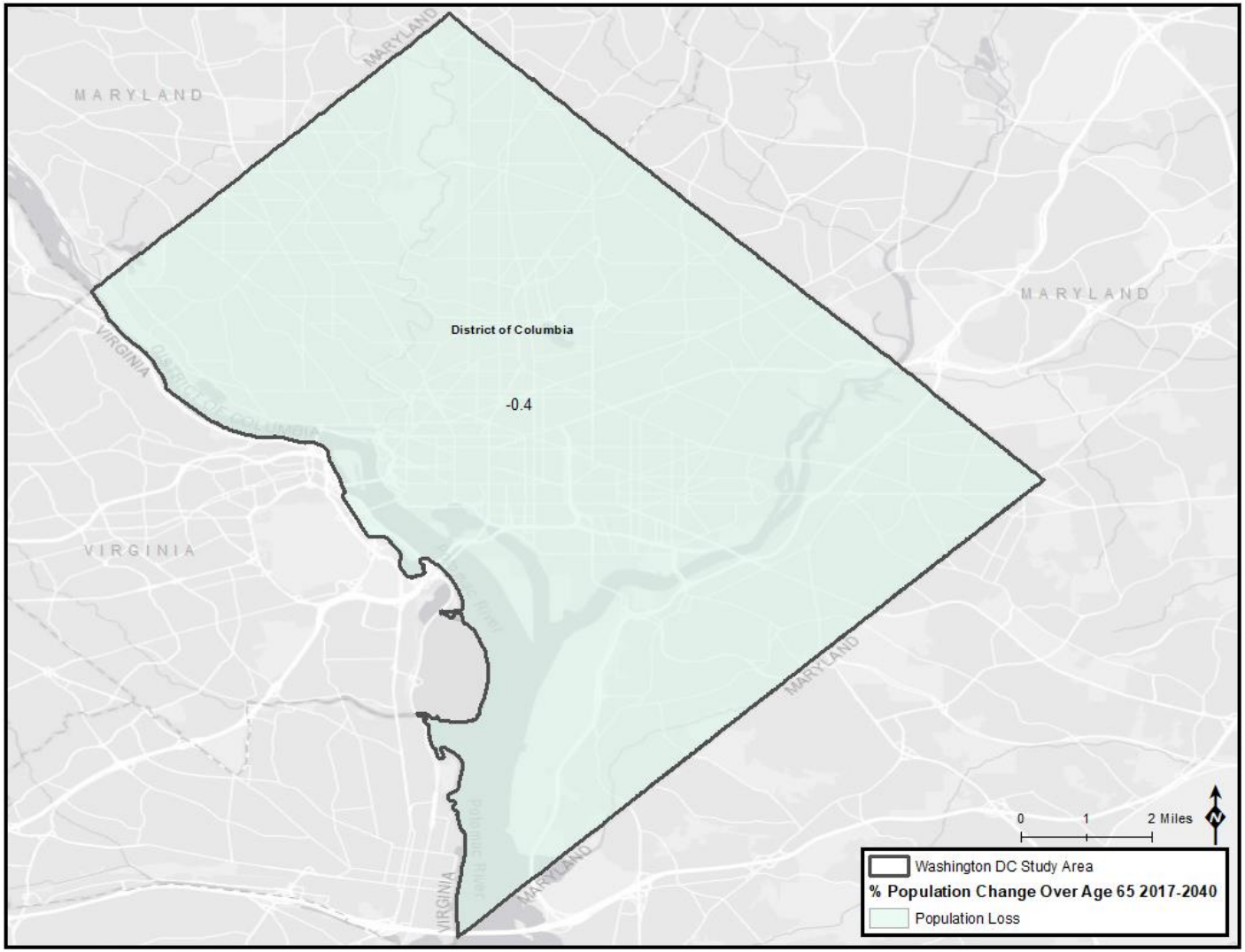
Source: USCB 2017r

Figure 12-23. Population Over Age 65 in the District of Columbia Study Area by Census Block Group



Source: mwcog.org 2018

Figure 12-24. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the District of Columbia Study Area by 2040



Source: mwcog.org 2018

Figure 12-25. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the District of Columbia Study Area by 2040

Table 12-7. Population Under Age 5 and Over Age 65 in the District of Columbia Study Area

Geographic Unit	Total Population (2017)	2017 Estimates				Projected 2036				
		Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Study Area/ District of Columbia	672,391	43,607	6.5	79,769	11.9	940,687	56,858	6.0	108,102	11.5
United States	321,004,407	19,853,515	6.2	47,732,389	14.9	373,528,000	21,106,000	5.7	80,827,000	21.6

Sources: mwcog.org 2018, USCB 2017b, USCB 2018b

12.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area are presented in Table 12-8.

As shown in Table 12-8, in 2017 homeownership in the Study Area was 41.7%, significantly lower than the Nation (63.8%). Renters comprised approximately 58.3% of the Study Area population in 2017, significantly higher than the national average (36.2%) (USCB 2017m). Figure 12-26 illustrates median home values in the Study Area. Median home value and median gross rent in the Study Area was $537,400 and $1,424, respectively, in 2017 (USCB 2017l). Home values have increased 2.7% during the 12-month period ending November 2019. The market temperature is characterized as warm, which indicates market conditions favorable to sellers (Zillow.com 2019gg). Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including the District of Columbia.

New residents – wealthier, mostly white workers, who are increasingly choosing the District over the suburbs as a place to live – have been moving into Study Area over the last 15 years (Hackman 2017). Growth is concentrated in a few areas, driving up home prices in places like Columbia Heights, Shaw, Logan Circle, the Waterfront, and Capitol Hill. High housing costs have helped make the District of Columbia one of the most expensive places in the country to live. Even at higher-income levels, many renters are paying more than 30% of their income on housing, and some find homeownership out of reach. Meanwhile lower-income residents, including those with limited English ability, are getting priced out of the market (Urban.org 2020).

These demographic changes set off a surge of new development as well as redevelopment of worn-out and under-utilized buildings. Maximization of site capacity under new zoning and PUD zoning for new neighborhoods on currently vacant or underutilized parcels of land allows for more production of multi-family rental units and greater density (DCOP 2016a).

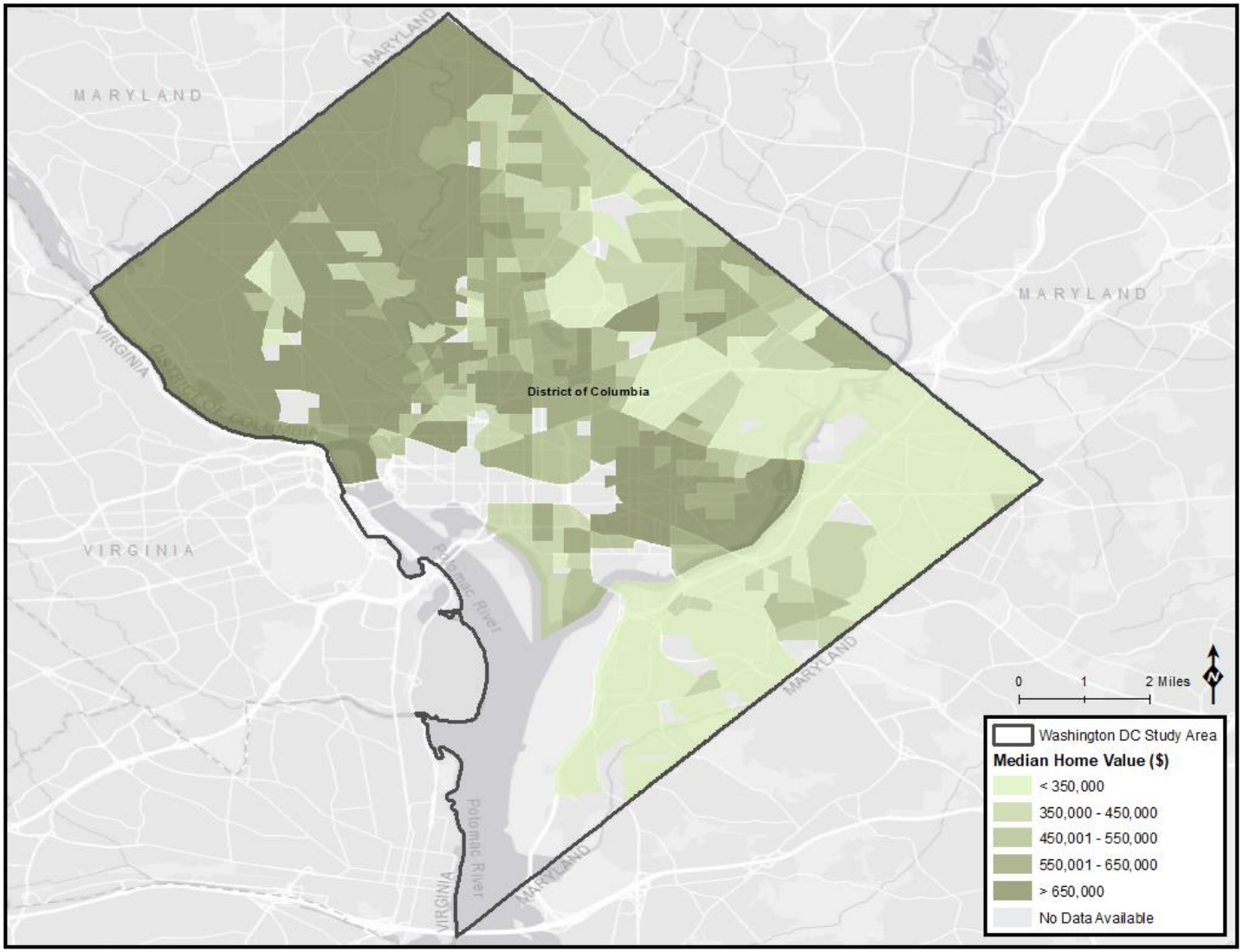
As a result, the area's assisted housing stock has been at risk of being demolished and replaced with high-cost, market-rate homes and apartments. From 2002 to 2013, the Chinatown/Penn Quarter/Mount Vernon Square area, home to many Blacks and Asians, saw a surge of new development. The number of condo units shot up from 830 in 2002 to 4,500 in 2013, the biggest increase of any District of Columbia neighborhood cluster. Other fast-growing neighborhoods like Shaw and Logan Circle have become expensive, putting subsidized housing at risk for African American, Chinese, and other minority groups, some of whom have limited English ability (Hackman 2017). The increased demand for housing in the District of Columbia area increases the risk that owners and developers may decide it is more lucrative to switch from providing assisted housing to providing luxury apartments or condominiums (Urban.org 2020).

According to the DC Planning Office, between 2010 and 2015, households increased citywide with the highest levels of growth in the following neighborhoods: Mount Vernon Triangle, Capital Riverfront, U Street, Columbia Heights, NoMa, Logan Circle and Foggy Bottom. Between 2015 and 2030, households are expected to continue to grow citywide with the highest levels of growth in NoMa, Capitol Riverfront, Florida Avenue Market, Fort Totten, Hill East, Lower Georgia Ave, Waterfront, Edgewood, and Brentwood (DCOP 2016b).

Table 12-8. Housing Utilization and Vacancy Rates in the District of Columbia Study Area

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Study Area/ District of Columbia	308,161	277,985	30,176	9.8	115,795	41.7	162,190	58.3	$537,400	$1,424
United States	135,393,564	118,825,921	16,567,643	12.2	75,833,135	63.8	42,992,786	36.2	$193,500	$982

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 12-26. Median Home Value in the District of Columbia Study Area by Census Block Group

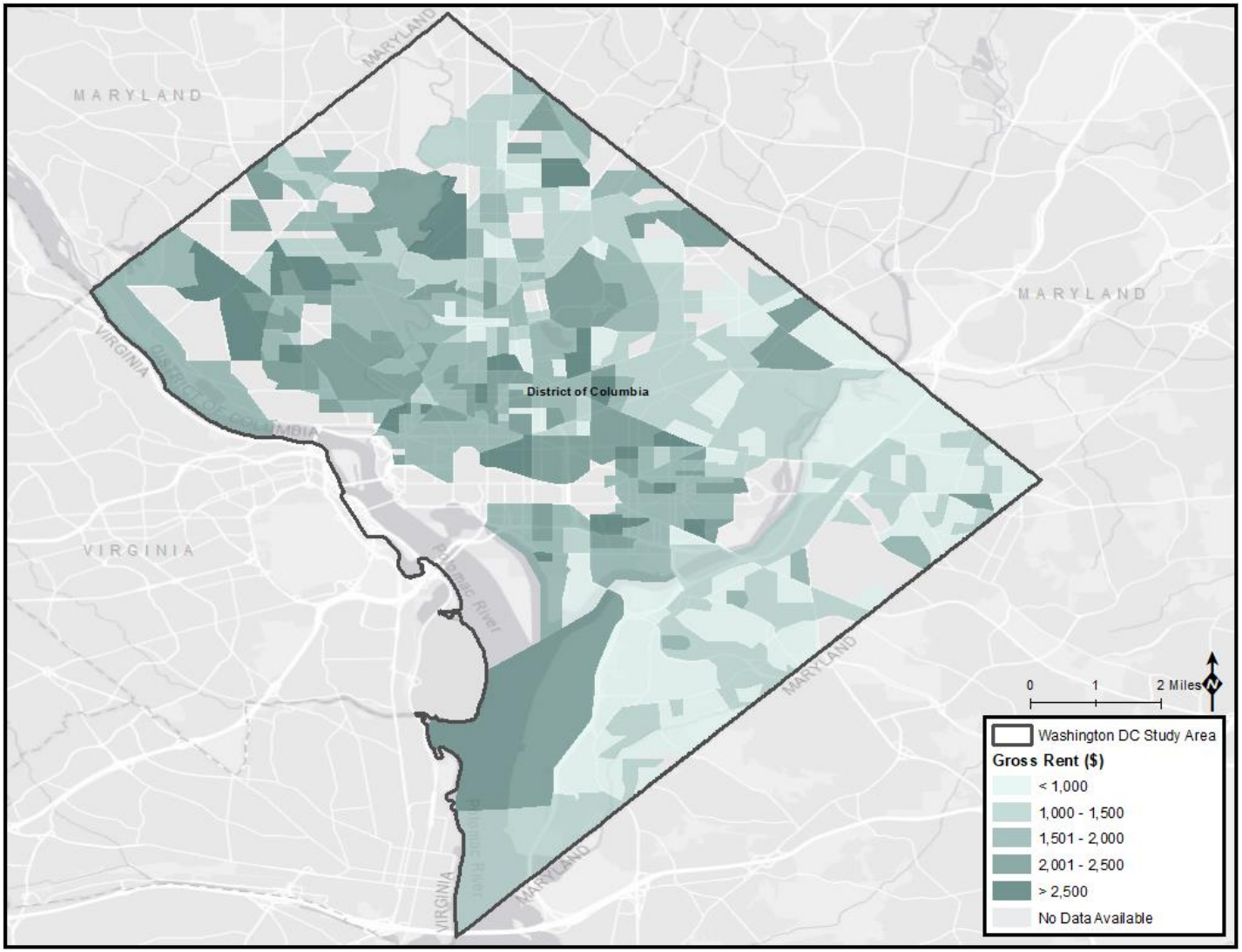
The District of Columbia is not alone, as the U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low-Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Figure 12-27 illustrates median gross rent in the Study Area. According to the National Low-Income Housing Coalition, as of 2019, throughout the District of Columbia, fair market rent for a two-bedroom rental unit is $1,665. In these conditions, a minimum wage worker would have to work approximately 91 hours a week in order to afford a two-bedroom fair market rate home. The District of Columbia has a shortage of approximately 30,438 rental homes affordable and available to extremely low-income households. Approximately 50,710 (31%) of renter households in the District of Columbia are considered extremely low income; approximately 33,975 (67%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (35%), single caregivers (29%), and disabled (22%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a).

The Housing Production Trust Fund and the DC Local Rent Supplement Program, which use local tax dollars to subsidize developers and providers of affordable housing, are critical to achieving the task force's goals. The District of Columbia's Inclusionary Zoning policy, implemented in 2009, also may prove to be an important tool to spur development of affordable housing and mixed-income communities. The policy requires that new residential buildings set aside a percentage of its units for low- and moderate-income households (Urban.org 2020). Over 9,000 affordable housing units have been produced using the Housing Production Trust Fund since 2001 (DHCD 2020).

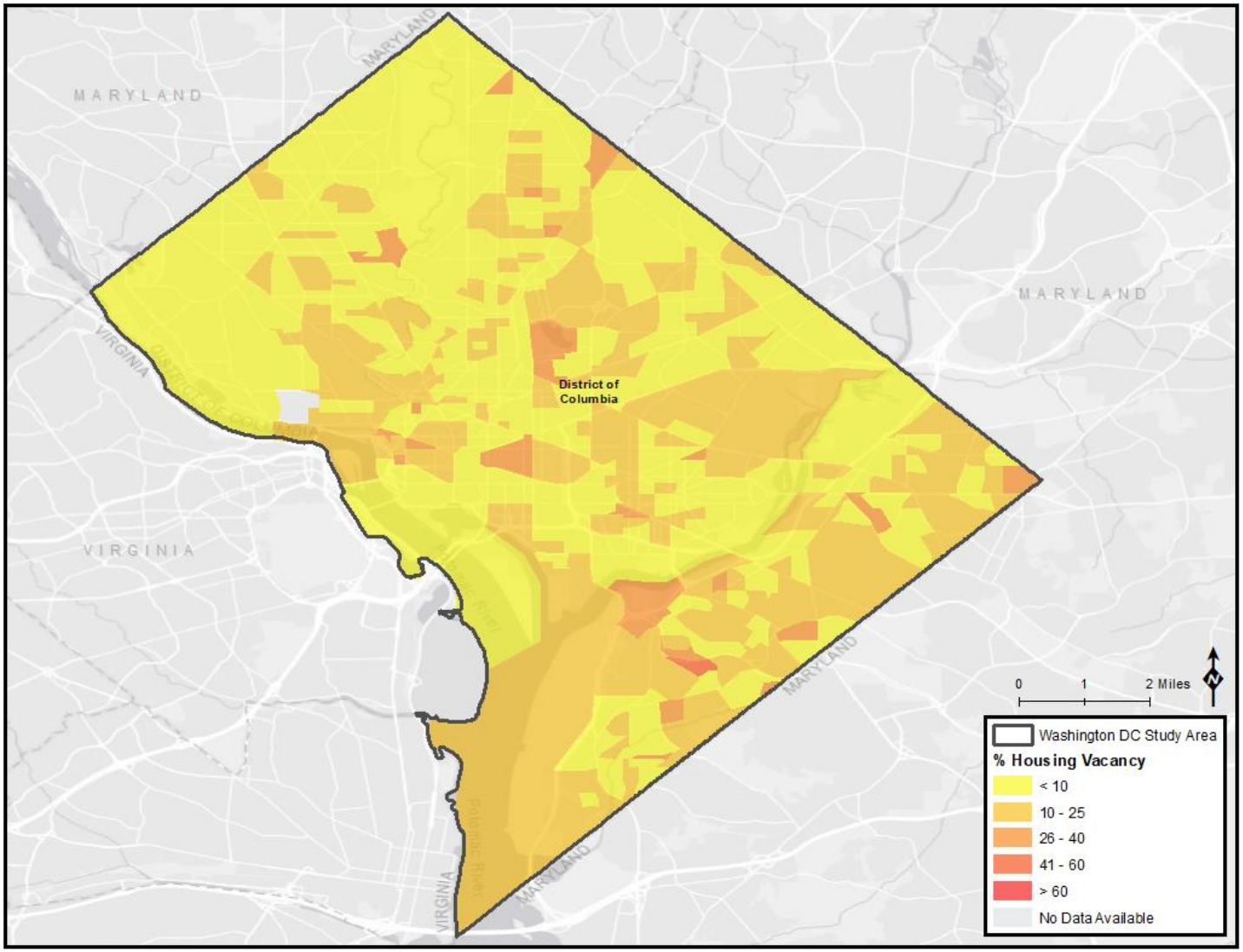
As shown in Table 12-8, home vacancy rates in the Study Area (9.8%) in 2017 were lower than the Nation (12.2%). Figure 12-28 shows vacancy rates in the Study Area by census block group (USCB 2017g). Low vacancy rates may drive home prices higher and encourage development in surrounding areas.

The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019). The District of Columbia is among the last jurisdictions in the Washington Region to pass a law regulating short-term rentals, and it is one of the most restrictive. Under the new law, homeowners in the District of Columbia can post bedrooms, basements, or carriage houses on home-sharing platforms and rent them out as long and as often as they wish as long as the owner also resides on the property. The law prohibits residents who own second or third homes from using those for short-term rentals (Austermuhle 2019).



Source: USCB 2017r

Figure 12-27. Median Gross Rent in the District of Columbia Study Area by Census Block Group



Source: USCB 2017r)

Figure 12-28. Housing Vacancy Rates in the District of Columbia Study Area by Census Block Group

12.4.4 Employment

12.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 12-9. In 2017, the Study Area had a total employment of 565,727 jobs, representing approximately 0.4% of the total jobs in the U.S. (USCB 2017p). The District of Columbia's 2018 annual gross domestic product was 140.6 billion, which represented 0.7% of the Nation's gross domestic product (BEA 2019).

Table 12-9. Census Bureau Labor and Industry Statistics for the U.S. and the District of Columbia Study Area (number of jobs)

Industry	United States	Percent (%)	District of Columbia/ Study Area	Percent (%)
TOTAL	150,599,165		357,701	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	327	0.1
Construction	9,564,541	6.4	9,453	2.6
Manufacturing	15,477,389	10.3	4,579	1.3
Wholesale trade	4,042,867	2.7	1,965	0.5
Retail trade	17,167,000	11.4	17,255	4.8
Transportation and warehousing, and utilities	7,681,579	5.1	10,635	3.0
Information	3,173,300	2.1	13,050	3.6
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	22,612	6.3
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	83,734	23.4
Educational services, and health care and social assistance	34,781,348	23.1	67,485	18.9
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	35,020	9.8
Other services, except public administration	7,371,226	4.9	32,630	9.1
Public administration	7,025,870	4.7	58,956	16.5

Source: USCB 2017p

Table 12-9 and Figure 12-29 show the number of jobs in each major industry sector for the U.S. and the Study Area. The dominant industry sectors in the Study Area per the Census Bureau are professional, scientific, and management, and administrative and waste management (23.4%); educational services, and health care and social assistance (18.9%); public administration (16.5%); retail trade (12.2%); and arts, entertainment, and recreation, and accommodation and food services (9.8%). As compared to the Nation, the Study Area has a greater percentage of public administration and Professional, scientific, and management, and administrative and waste management services jobs. The Study Area has much less

manufacturing (1.3%) and retail (4.8%) jobs as compared to the Nation (10.3% and 11.4%, respectively) (USCB 2017p).

The top industries that hold the highest percentage of the overall workforce in the Federal district per the Bureau of Labor Statistics are (1) professional and business services;(2) government; (3) education and health services; (4) trade, transportation, and utilities; and (5) leisure and hospitality (BLS 2019b). Due to the District of Columbia being the seat of the Federal government of the U.S., government industries are included in the top industries list and employ 21% of the working population in the District of Columbia, directly behind the 23% employed by the professional and business services industry (BLS 2019b), many of which may be in roles that are also focused on government services. In addition, Forbes lists tourism as a major industry within the District of Columbia due to the high density of national monuments and the seat of national government (Forbes 2019).

Figure 12-30 shows the location of jobs within the Study Area. The greater portion of jobs are located in the city's core.

According to DC's Office of Planning, the District of Columbia will continue to attract prime working-age migrating populations and highly skilled foreign labor due to new employment growth in the private sector. Professional and business services, retail and accommodations and education and health service sectors will continue to dominate job growth in the District. Employment opportunities will disperse and grow throughout District neighborhoods as the trend toward retail and commercial ground and second floor uses within multi-family development continues (DCOP 2016a).

12.4.4.2 Income

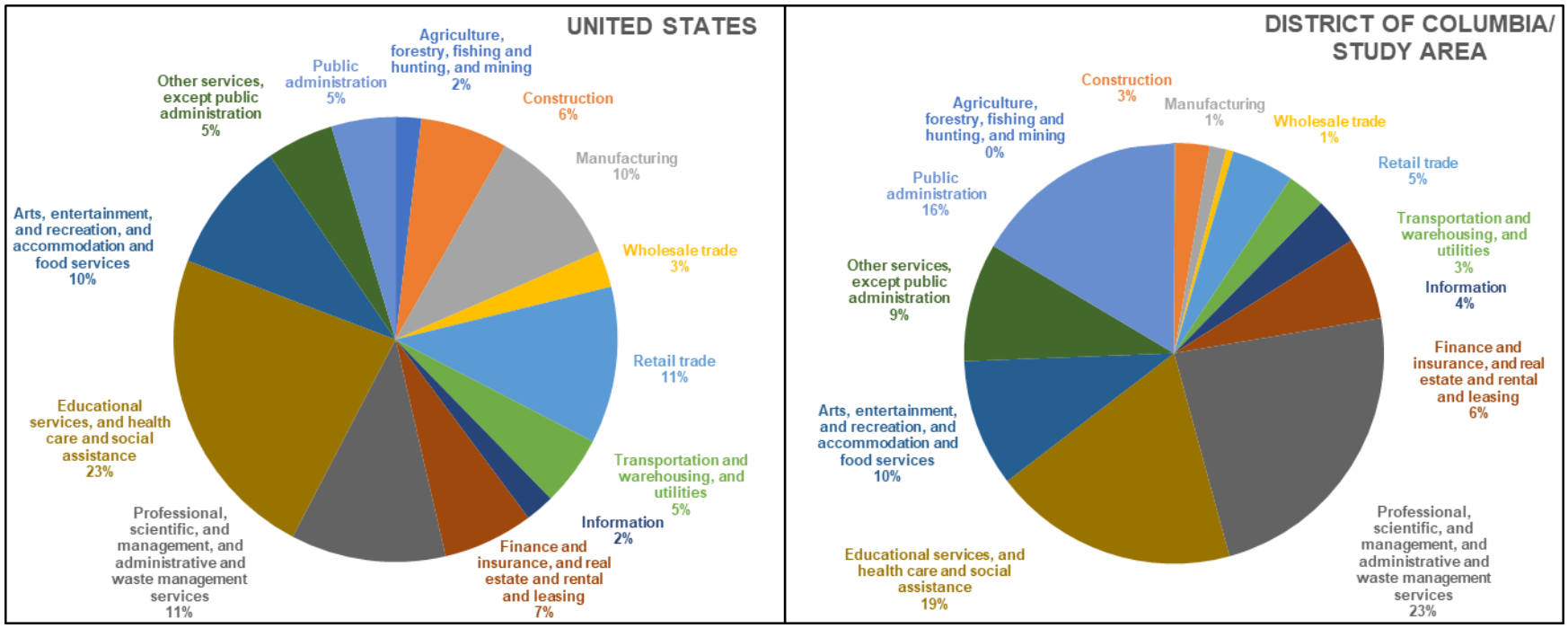
As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 12-10, in 2017 the Study Area had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, the Study Area had a median income of $77,649 (34.7% higher than the Nation's median income) and a per capita income of $50,832 (63.0% higher than the Nation's per capita income) (USCB 2017k, USCB 2017n).

According to the DC Planning Office, income gains are unevenly distributed among the Wards (DCOP 2016b).

Figure 12-31 and Figure 12-32 illustrate that median household and per capita income in the Study Area is higher in the northwestern part of the District of Columbia.

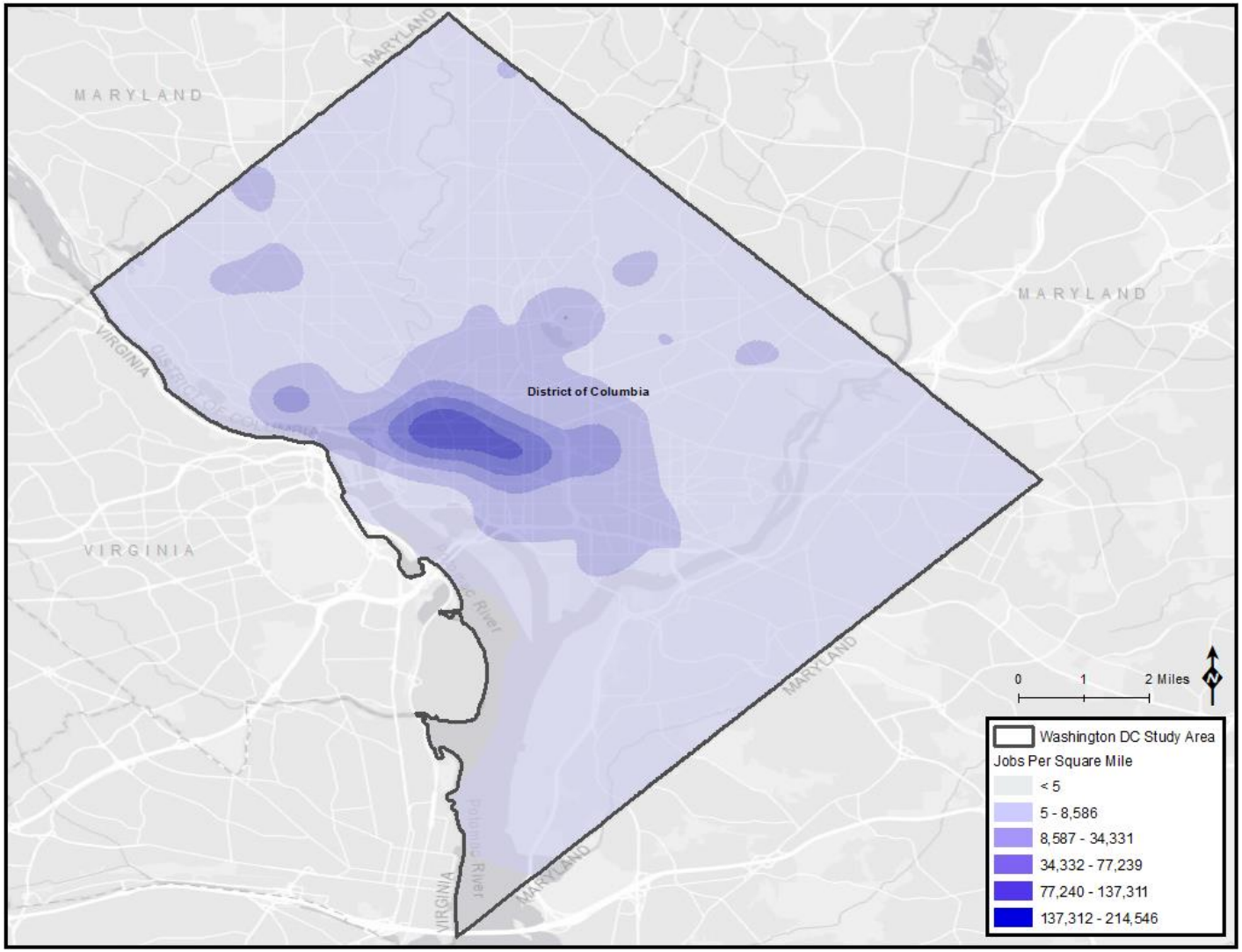
12.4.4.3 Unemployment Rates

Figure 12-33 shows the 2017 unemployment rates in the Study Area by census block group. Table 12-10 presents unemployment rates for the Study Area and the Nation. The unemployment rate in the Study Area was 8.0%, which was higher than the Nation (6.6%) (USCB 2017h). Figure 12-33 illustrates that unemployment is higher in the southeastern part of the District of Columbia.



Source: USCB 2017p

Figure 12-29. Number of Jobs by Industry Sector for the U.S. and the District of Columbia Study Area



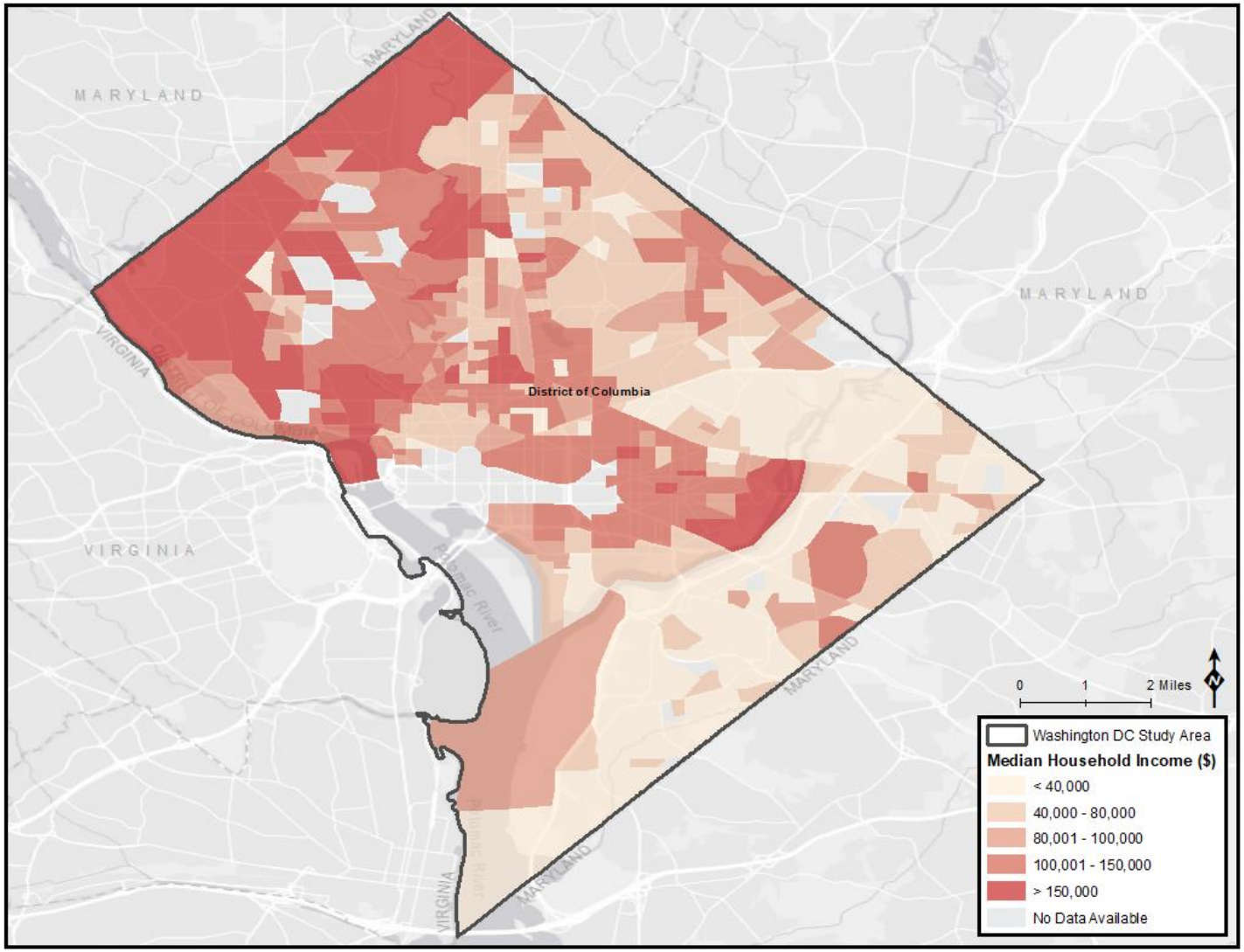
Source: USCB 2017r

Figure 12-30. Jobs Per Square Mile in the District of Columbia Study Area by Census Block Group

Table 12-10. Employment Data in the District of Columbia Study Area (from the Longitudinal Employer-Household Dynamics dataset)

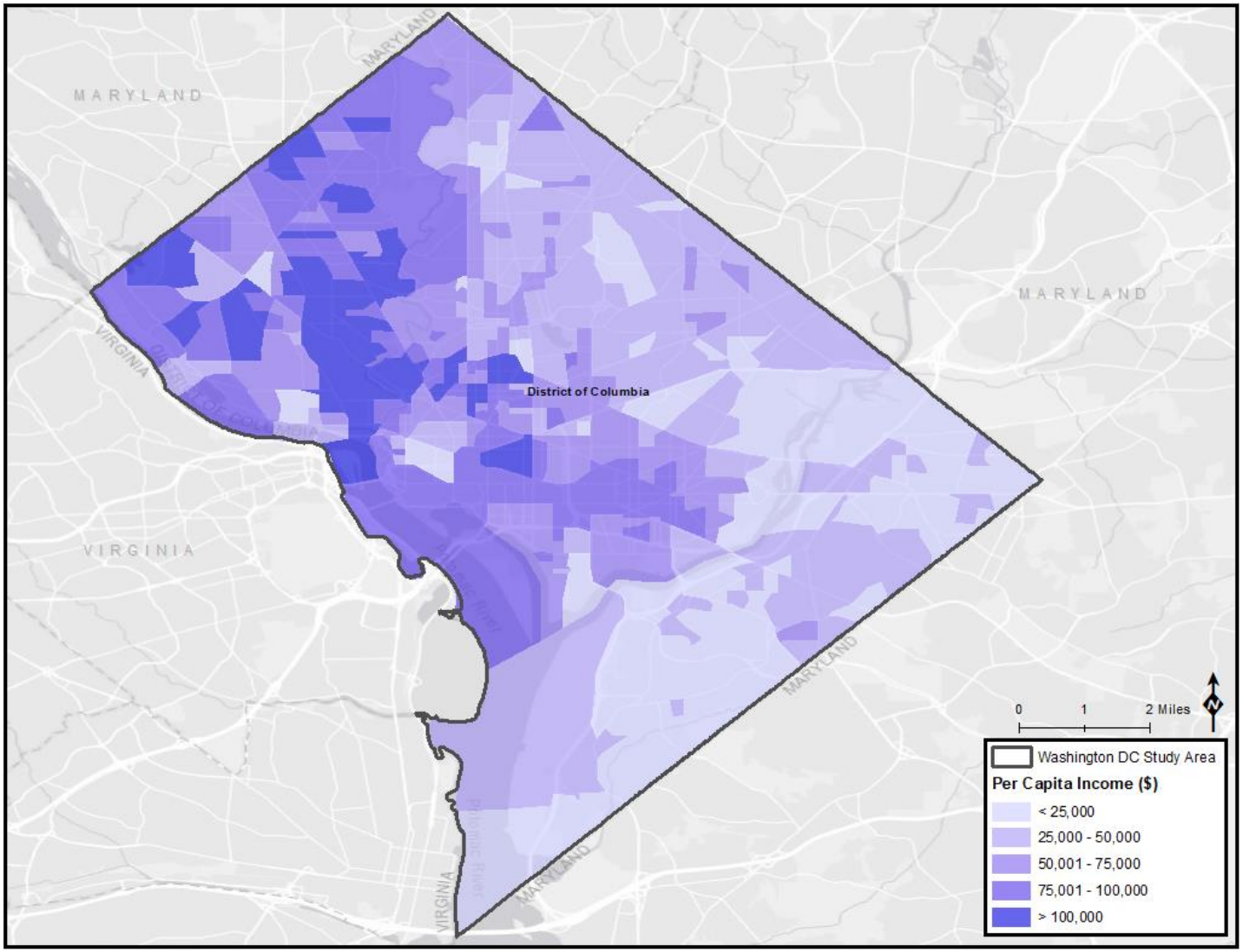
Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017) [1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
District of Columbia	392,421	388,980	357,701	31,279	8.0	565,727	0	0.0	$77,649	$50,832
United States	162,184,325	161,159,470	150,599,165	10,560,305	6.6	140,240,825	3,389,551	2.4	$57,652	$31,177

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



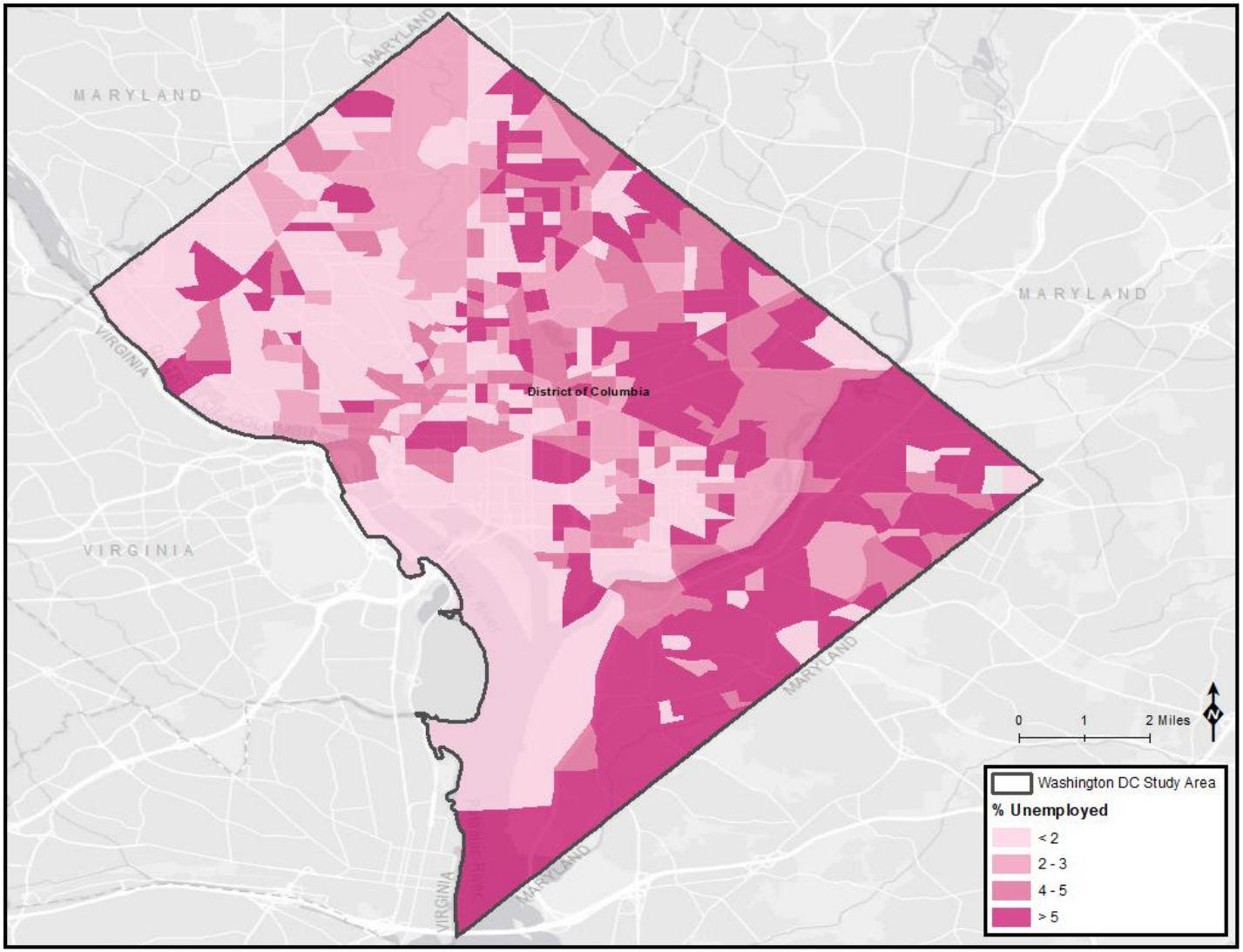
Source: USCB 2017r

Figure 12-31. Median Household Income in the District of Columbia Study Area by Census Block Group



Source: USCB 2017r

Figure 12-32. Per Capita Income in the District of Columbia Study Area by Census Block Group



Source: USCB 2017r

Figure 12-33. Unemployment Rates in the District of Columbia Study Area by Census Block Group

12.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the district, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 12-11 shows the number and percentage of the working-age population classified into seven groups of educational attainment, which are less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the Study Area and the Nation (USCB 2017t).

Figure 12-34 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation and the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma and 36.9% earned a college or advanced degree.
- In the Study Area, 18.6% of the working-age population earned only a high school diploma and 54.4% earned a college or advanced degree (USCB 2017q).

The Study Area has significantly lower high school graduation rates as compared to the Nation; and conversely, significantly higher college and advanced degree graduation rates. The higher college and postgraduate rates are most likely attributed to the number of domestic and international workers attracted to the job opportunities in the Study Area.

Figure 12-35 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q). Percentages of the working-age population achieving less than a high school diploma are relatively consistent between the District of Columbia and the Nation. The District of Columbia falls below the Nation in percentages of workers earning only a high school diploma, achieving some college, and earning an associate's degree. Percentages of workers with a bachelor's degree (23.5%) or a graduate or professional degree (28.2%) in the District of Columbia are significantly higher than the Nation 18.6% and 10.8%, respectively). The proportion of workers with bachelor's degrees or higher reflects the heavy emphasis on government sector jobs throughout the District which likely carry specific education requirements.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

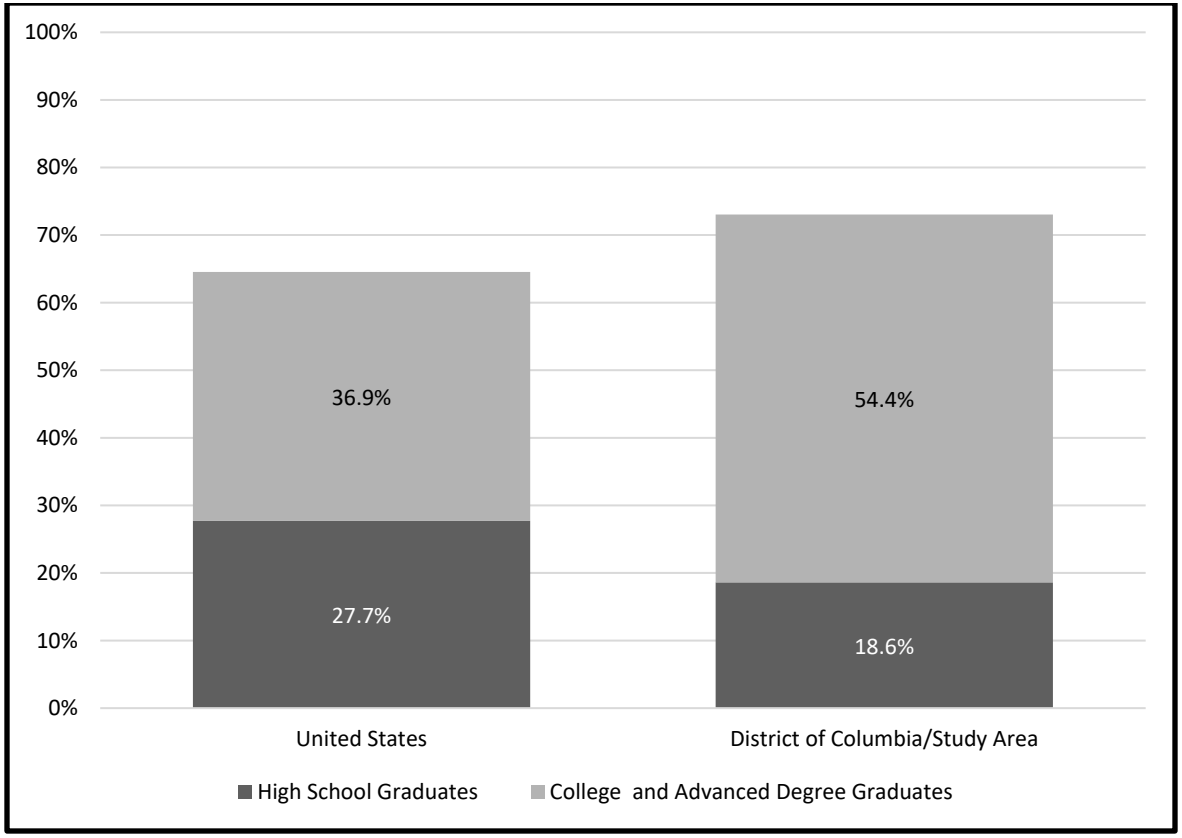
12.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Table 12-11. Educational Attainment in the District of Columbia Study Area

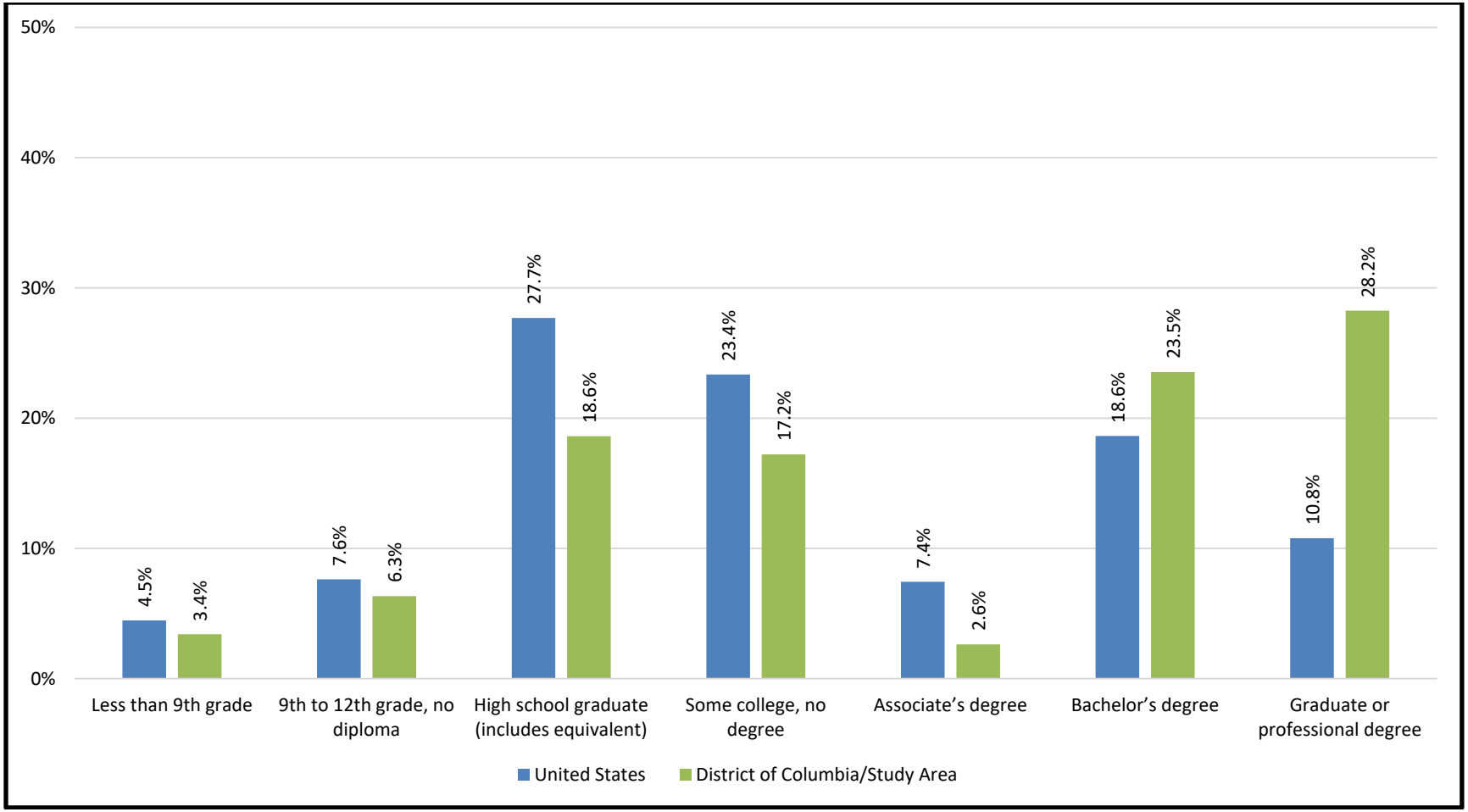
Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Study Area/ District of Columbia	18,889	35,146	103,151	95,460	14,601	130,493	156,593	554,333	3.4	6.3	18.6	17.2	2.6	23.5	28.2
United States	11,267,058	19,234,290	69,803,749	58,865,296	18,760,759	46,958,456	27,180,887	252,070,495	4.5	7.6	27.7	23.4	7.4	18.6	10.8

Source: USCB 2017q



Source: USCB 2017q

Figure 12-34. High School, College, and Advanced Degree Graduate Rates in the District of Columbia Study Area



Source: USCB 2017q

Figure 12-35. Educational Attainment in the District of Columbia Study Area

Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

12.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 12-36 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

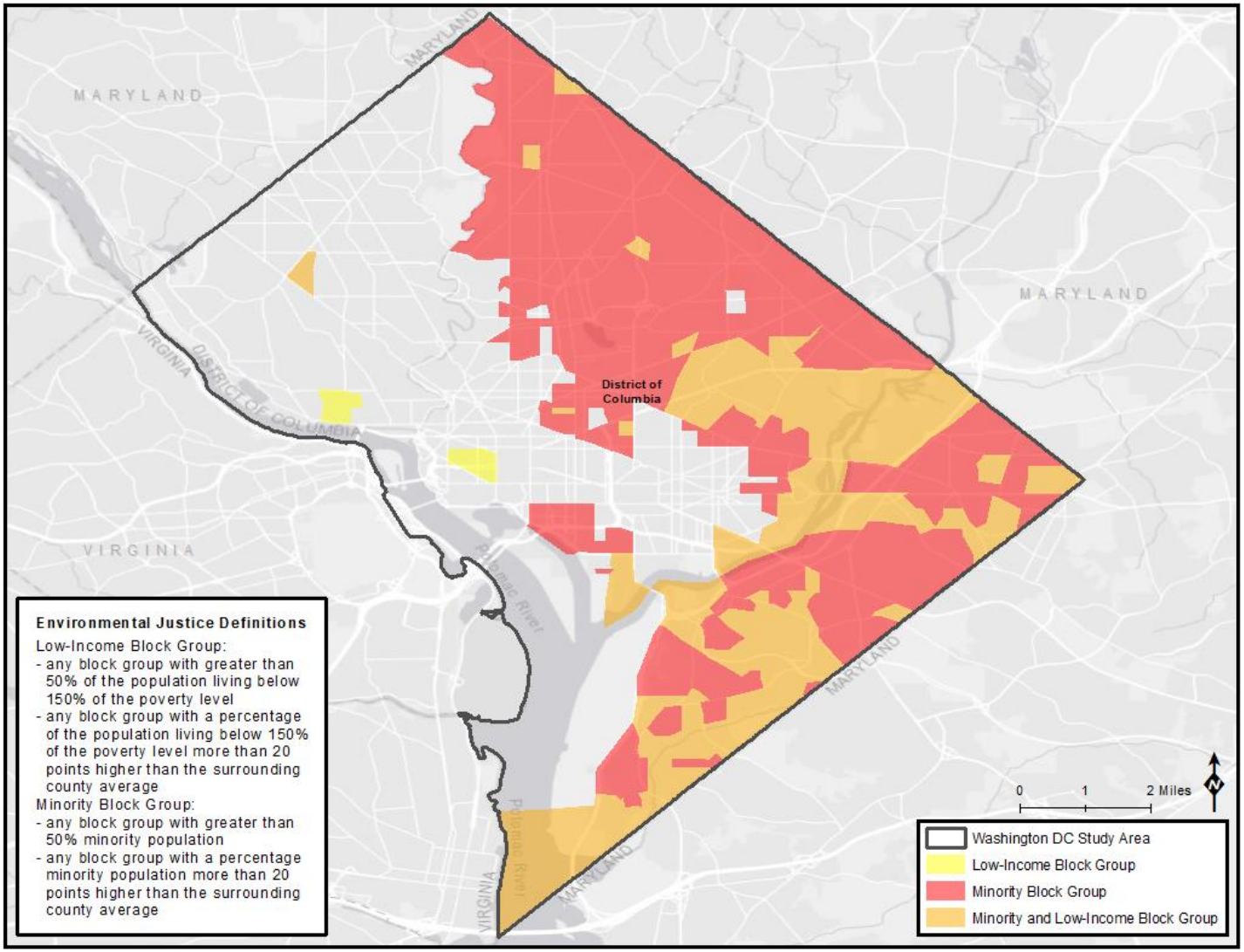
12.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 12-12 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 672,391 people living in the Study Area, approximately 430,490 (64.0%) are minority. This is significantly higher than the National minority percentage of 38.5%. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 450 block groups in the Study Area, approximately 61.6% (277 block groups) are considered minority populations (USCB 2017f).

As illustrated in Figure 12-36, the Study Area contains census block groups with high percentages of minority populations. Within the overall Study Area the largest minority group is Black or African-American (46.9%) followed by Hispanic or Latino (4.7%) (USCB 2017f).

12.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 12-12 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 638,362 people for whom poverty status is determined living in the Study Area, approximately 156,706 (24.5%) individuals have incomes less than 150% of the poverty level. This is commensurate with the National percentage of 23.7%. These sensitive populations are subject to environmental justice consideration. Of the 450 census block groups in the Study Area, approximately 14.9% (67 block groups) are considered low-income populations (USCB 2017o). Figure 12-36 illustrates the location of block groups with high percentages of low-income populations.



Source: USCB 2017r

Figure 12-36. Minority and Low-Income Population in the District of Columbia Study Area by Census Block Group

Table 12-12. Low-Income and Minority Populations in the District of Columbia Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
District of Columbia/ Study Area	672,391	241,901	430,490	64.0	450	67	14.9	277	61.6	638,362	156,706	24.5
United States	321,004,407	197,277,789	123,726,618	38.5						313,048,563	74,202,606	23.7

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

12.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this report, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

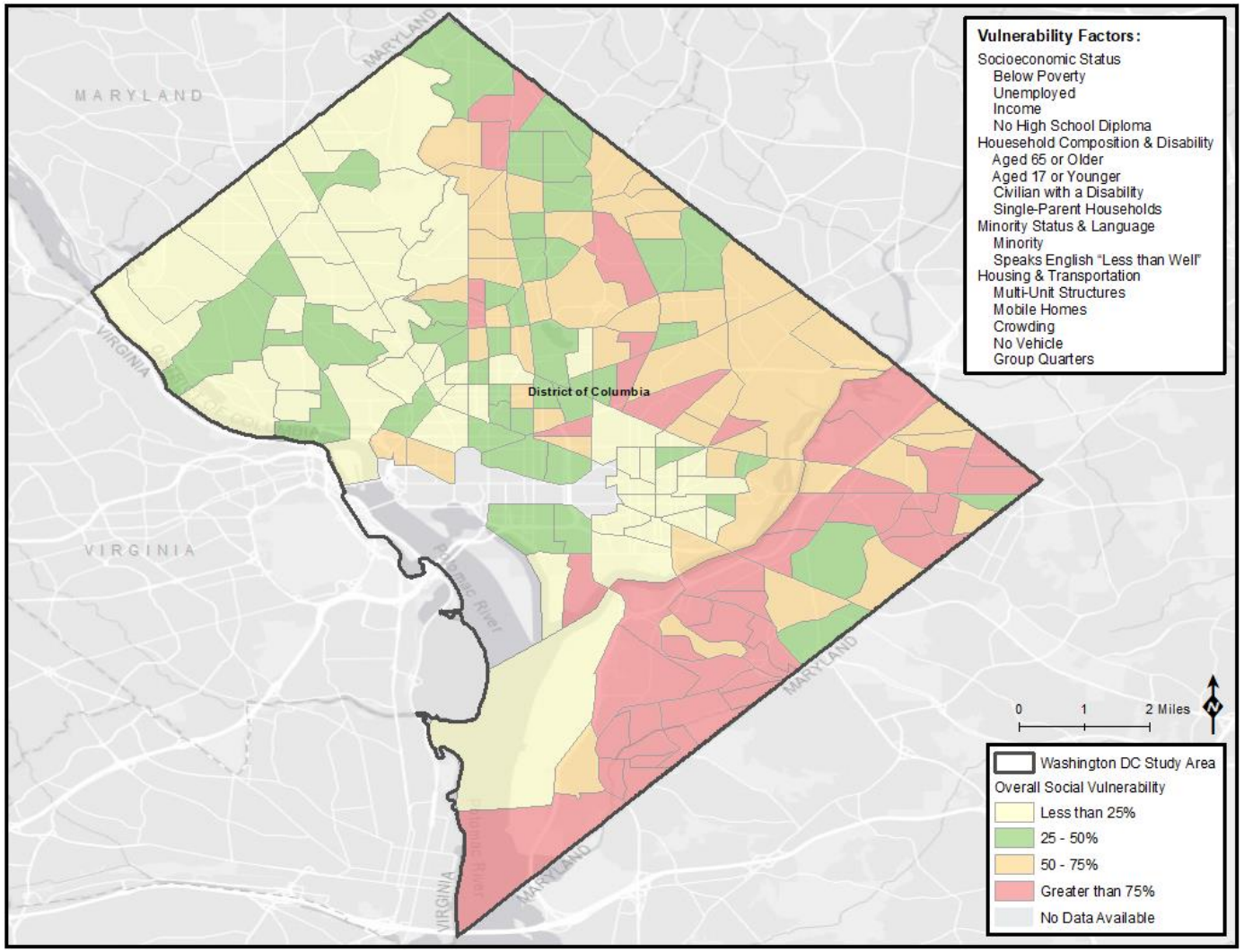
Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize a tool developed by the CDC (SoVI) to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is not used in this section due to the absence of fishing communities in the Study Area.

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 12-37 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 12-37, the southeastern portion of the District of Columbia has the highest vulnerability rankings (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 12-38 combines the CDC SoVI index (as shown in Figure 12-37) with minority and low-income populations (as shown in Figure 12-36) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC SoVI vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in the southeastern portion of the District of Columbia.

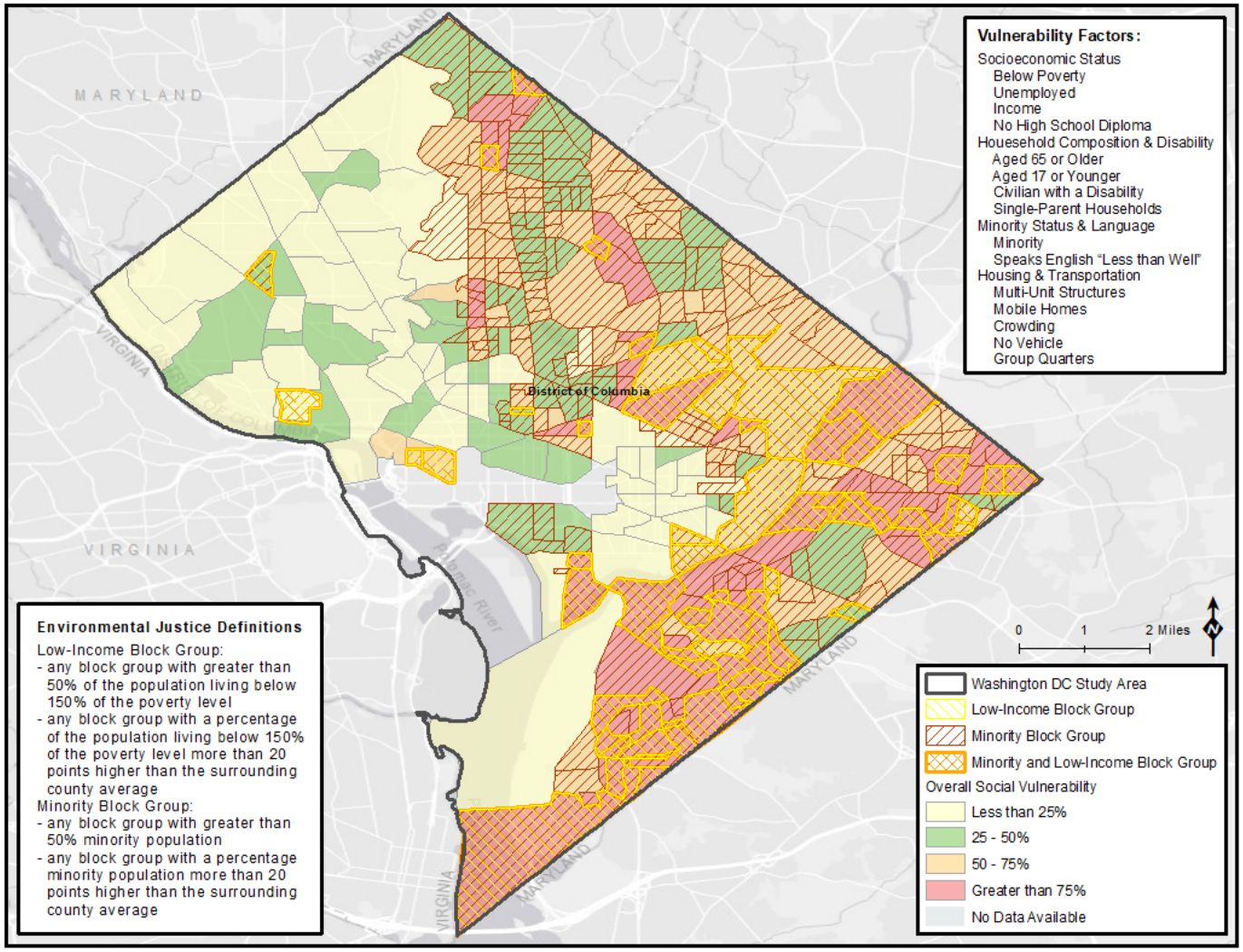
Figure 12-39 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 12-39 shows that several vulnerable communities along the Potomac and Anacostia Rivers are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 12.2.2.3 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

As discussed in Chapter 12.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.



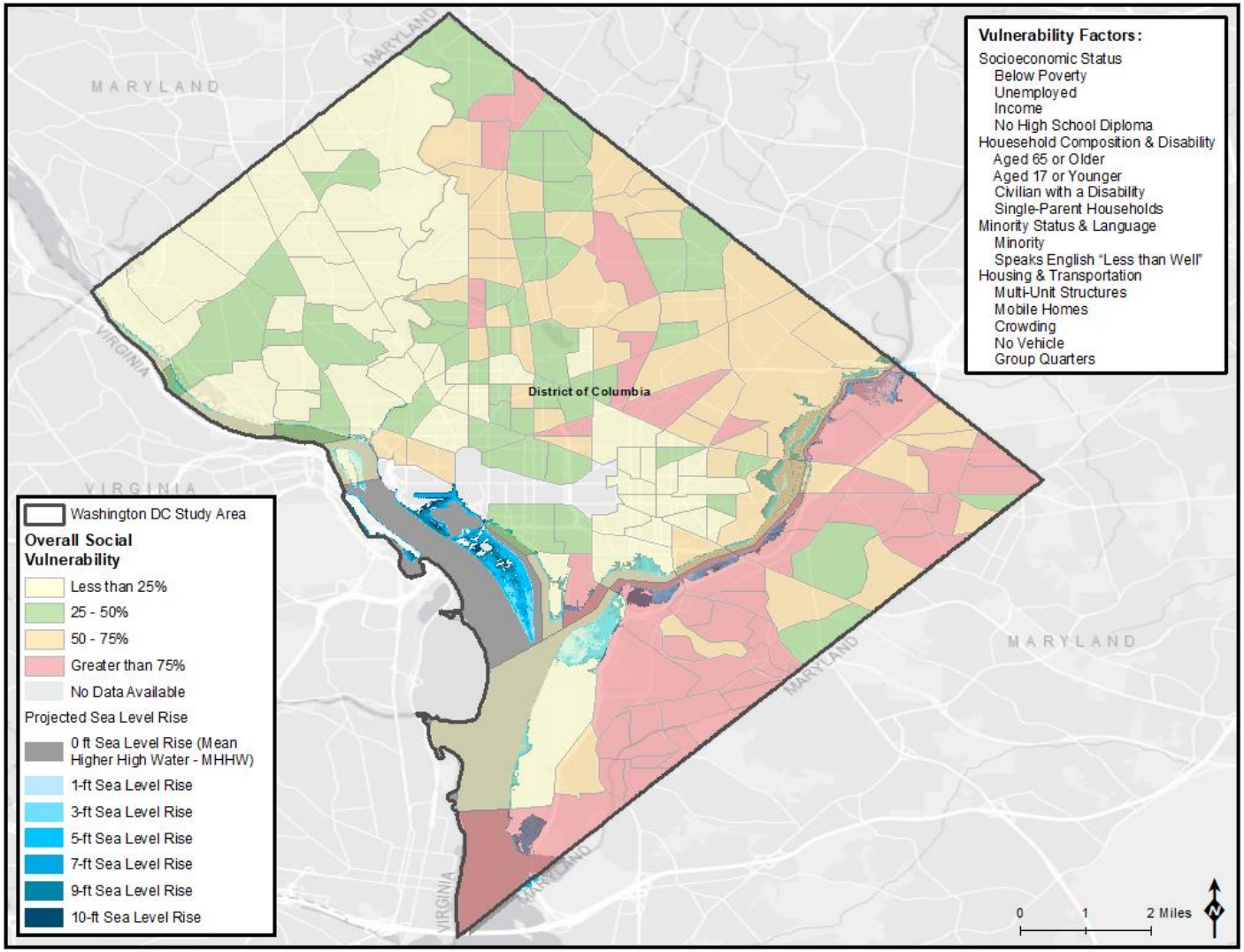
Source: CDC 2016

Figure 12-37. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the District of Columbia Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 12-38. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the District of Columbia Study Area



Sources: CDC 2016, NOAA 2018a

Figure 12-39. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the District of Columbia Study Area by Census Tract

The output of the CDC SoVI indicates that the presence of populations in the Study Area are deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the Anacostia River in the southeastern portion of the Study Area and southwest Washington, and southwest waterfront areas adjacent to the Potomac River (CDC 2016).

12.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, resource-dependent populations may include subsistence populations. There are no fishing communities or religious (Amish or Mennonite settlements) populations in the Study Area.

12.4.5.3.1 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe, or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general. However, there are no identified fishing communities in the Study Area.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources, may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

12.4.5.4 Tribes

The District of Columbia has only one federally recognized tribe (Pamunkey Indian Tribe) that has historical ties to the District and no State-recognized tribes; however, there are no tribes living in the District (NCSL 2019, HUD 2019b). The Pamunkey Indian Tribe lives primarily in Virginia, where they have been recognized by the Commonwealth of Virginia since at least 1646 and Virginia reconfirmed and

acknowledged the tribe in 1983 (Encyclopedia Virginia 2015). They gained Federal recognition on January 28, 2016 (Pamunkey Indian Tribe n.d.). Given the location of the District of Columbia along the major waterway of the Potomac River, other tribes may also have historic ties to the area.

The District of Columbia area was likely surrounded by dozens of tribes along the Anacostia and Potomac River watershed, in the Chesapeake Bay region, and in Maryland, Virginia, and Delaware. The river systems are where several cultures (including the Piscataway, Paminkey, Nentego (Nanichoke), Mattaponi, Chickahominy, Monacan, and Powhatan) lived prior to the arrival of European settlers. Today, there are approximately 4,163 American Indians living in the District, some of whom may be representatives of these tribes (ALA 2020). The District also sits on the ancestral grounds of the Nacotchtank, or Anacostians, who were Algonquian -speaking people that lived between the Bolling Airforce Base and Anacostia Park. Nacotchtank was the largest of the thee American Indian villages in the area at the time; however, today, there are no living individuals of Nacotchtank lineage left (ALA 2020).

Tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

12.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 12-13**Error! Reference source not found.** provides an analysis of people who speak a language other than English at home in the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 17.5% of the population do not speak English at home. Spanish is the language spoken by the majority (56,512 people or 9.0% of the total population) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 27,900 people (4.4%) of the Study Area population (USCB 2017e).

Table 12-13. People who Speak a Language Other than English at Home in the District of Columbia Study Area by Census Block Group

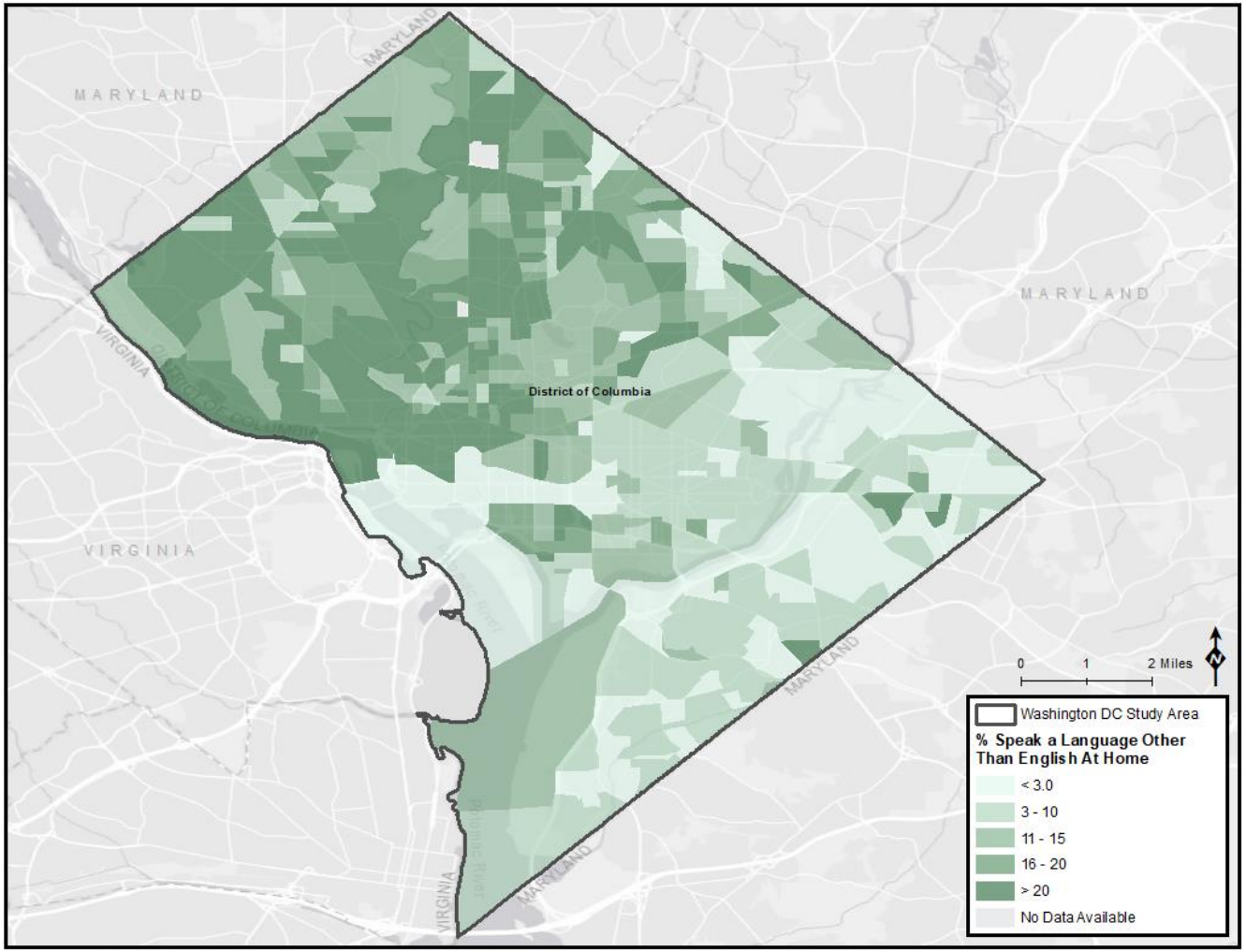
Geographic Unit	Total Population Over Age 5	Total Population Who Speak a Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
District of Columbia	628,784	110,078	17.5	56,512	27,900	12,271	13,395
United States	301,150,892	64,221,193	21.3	39,769,281	10,907,675	10,409,087	3,135,150

Source: USCB 2017e

Figure 12-40 illustrates the percent of people who speak a language other than English at home in the Study Area. As shown in the Figure, the northern portion of the Study Area contains a higher percentage of people who speak a language other than English at home. This area encompasses Embassy Row, which is home to many foreign embassies. The presence of embassies with staff who speak foreign languages likely account for the high concentration of non-English speakers at home. According to Figures 12-37 and 12-39, the southern portion of the Study Area is ranked as over 75% vulnerable and impacted by rising sea level. The northern portion is less vulnerable and will experience lesser sea level rise impacts.

Chinese residents of a building located in the Chinatown section of the District of Columbia can provide an example of the impact of the language barriers faced by households with people who speak English less than well or reside in limited-English households. When the building's landlord stopped accepting Section 8 housing vouchers from low-income Chinese and African American residents, they were informed that the building would be demolished to make way for a luxury building in its stead. In response, several building residents formed a tenant's organization by using a clause of the Rental Housing Conversion and Sale Act requiring that tenants be given the right to buy the building at market rate before anyone else. In spite of receiving temporary protection during several ensuing lawsuits, many non-English speaking and elderly tenants left the building in response to explicit encouragement from the landlord. Though the law maintained the residents' rights, these residents felt particularly vulnerable when confronted directly by the landlord knocking at their door telling them they have to leave, and therefore many vacated the building anyway (Hackman 2017). Language and cultural barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect a person's ability to accurately assess a situation, causing them to act in ways not in their best interest.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.



Sources: USCB 2017r, USCB 2017e

Figure 12-40. Percent of People Who Speak a Language Other than English at Home in the District of Columbia Study Area by Census Block Group

12.4.6 Summary – Demographics and Socioeconomics

The Nation's capital is growing again. Once-neglected neighborhoods, scarred by riots in earlier decades, are now recovering and even thriving. Major demographic changes are underway, as gentrification pressures mount in the city. The building boom is driving out long-time, low-income and/or minority residents, some of whom are elderly and have limited-English language abilities. They are often replaced by younger, middle-class, often non-minority residents. An on-going challenge for the city is to meet the needs of its new generation of residents – young, highly educated and mostly white millennials – while also creating and preserving affordable housing at all income levels. According to the DC Office of Planning, millennials comprised approximately 35% of the District of Columbia's population as compared to the U.S. (23%) in 2015 (DCOP 2016a). The District of Columbia is one of the few cities where growth is being driven by an influx of whites, rather than by Latinos, Asians, or immigrants. More whites are moving into the District of Columbia, while African-American populations move out.

The District of Columbia's population grew 11.7% (70,688 people) between 2010 and 2017 to 672,391, faster than the national rate (4.0%) during the same period. Population continues to grow due to natural increase as well as international migration. Projections indicate a population growth of 39.9% by 2040, significantly greater than the national rate (16.4%) during the same period (USCB 2017a, USCB 2017d, mwcog.org 2018).

Population density of the Study Area was 10,998 persons per square mile in 2017 and is forecasted to grow to 15,386 persons per square mile by 2040 as the area continues to attract people seeking job opportunities and cultural urban environment available within the District of Columbia's metropolitan area (mwcog.org 2018, USCB 2017c, USCB 2017d). As compared to all Study Areas within the 15 coastal states comprising the Project Area, the District of Columbia is the most densely populated.

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017. The age distribution of the Study Area indicates a greater proportion of young children but a lesser proportion of elderly as compared to the Nation. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population and 6.5% in the Study Area, the elderly represented 14.9% of the U.S. population, and 11.9% in the Study Area. This signifies that, as of 2017, the Study Area has not aged, contrary to nationwide trends described in Chapter 1.6.3. This may be attributed to the high number of millennials who prefer to work as well as live in the District of Columbia, instead of nearby suburbs (Urban.org 2020). However, by 2040, population in the Study Area is expected to age, consistent with the national trend. Projections indicate that the number of young children will rise in the Nation and the Study Area, but the proportion of this group in comparison to the overall population is projected to decline in the Nation (5.7%) and the Study Area (6.0%). The number of elderly people is also projected to rise in the Nation, representing 21.6% of the population; however, contrary to national trends, the group's percentage is projected to decline in the Study Area, representing 11.5% of the population by 2040 (USCB 2017b, USCB 2018b, mwcog.org 2018).

Homeownership in the District of Columbia was 41.7%, significantly lower than the Nation (63.8%). Renters comprised approximately 58.3% of the Study Area population in 2017, significantly higher than the Nation (36.2%) (USCB 2017m). High housing costs (median home value and median gross rent was $537,400 and $1,424, respectively, in 2017) have helped make the District of Columbia one of the most expensive places in the country to live (USCB 2017l). Even at higher-income levels, many renters are paying more than 30% of their income on housing and some find homeownership out of reach. Meanwhile, lower-income residents, including those with limited English ability, are getting priced out of the market (Urban.org 2020).

Demographic changes set off a surge of new development as well as redevelopment of worn-out and under-utilized buildings. Additionally, revisions to zoning codes have allowed for maximization of site

capacity. Formerly vacant or underutilized parcels of land have been redeveloped, providing for high density development (DCOP 2016a). The District of Columbia is working on providing affordable housing through its Housing Production Trust Fund and the DC Local Rent Supplement Programs. Since 2001, over 9,000 affordable housing units have been produced (DHCD 2020).

Home vacancy rates in the District of Columbia (9.8%) in 2017 were lower than the Nation (12.2%). Figure 12-28 shows vacancy rates in the Study Area by census block group (USCB 2017g). Low vacancy rates may drive home prices higher and encourage development in surrounding areas.

The Study Area has a total employment of 565,727 million jobs, none of which are maritime related. The dominant employment categories in the Study Area are professional, scientific, and management, and administrative and waste management (23.4%); educational services, and health care and social assistance (18.9%); and public administration (16.5%). The District of Columbia had less manufacturing (1.3%) and retail (4.8%) jobs as compared to the Nation (10.3% and 11.4%, respectively) (USCB 2017p).

According to DC's Office of Planning, the District of Columbia will continue to attract prime working-age migrating populations and highly skilled foreign labor due to new employment growth in the private sector. Professional and business services, retail and accommodations and education and health service sectors will continue to dominate job growth in the District of Columbia. Employment opportunities will disperse and grow throughout District neighborhoods as the trend toward retail and commercial ground and second floor uses within multi-family development continues (DCOP 2016a).

The Study Area had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, the Study Area had a median income of $77,649 (34.7% higher than the Nation's median income) and a per capita income of $50,832 (63.0% higher than the Nation's per capita income) (USCB 2017k, USCB 2017n). However, income gains were unevenly distributed among the Wards, with higher income in the northwestern portion of the District of Columbia (DCOP 2016b). The unemployment rate in the Study Area in 2017 was 8.0%, which was higher than the Nation (6.6%) (USCB 2017h). Unemployment is higher in the southeastern part of the District of Columbia, where many low-income and minorities live.

In the Study Area, 54.4% of working-age population earned a bachelor's degree as compared to the Nation (36.9%), this is likely related to the high proportion of government jobs throughout the District which likely require these levels of educational achievement (USCB 2017r).

Minority and low-income status are two of several factors that the CDC uses to calculate potentially vulnerable populations. The Study Area contains low-income and minority populations. Of the 450 census block groups in the Study Area, approximately 14.9% (67 block groups) are considered low-income populations; approximately 61.6% (277 block groups) are considered minority populations (USCB 2017f, USCB 2017o). Low-income and minority populations are subject to consideration under NEPA, as they have the potential to be "environmental justice communities of concern." These communities may have other attributes of vulnerability such as limited-English ability and lack of access to a personal vehicle.

The output of the CDC SoVI indicates areas with populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the Anacostia River in the southeastern portion of the Study Area and southwest Washington, and southwest waterfront areas adjacent to the Potomac River (CDC 2016).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. These communities are particularly susceptible to

projected sea level rise and storm surge changes. In the Study Area, these groups include tribes and linguistically challenged populations. There are no fishing communities that are formally recognized by NOAA or other identified subsistence populations. Neither are there any known religious settlements of Amish or Mennonites. There is one federally recognized tribe (Pamunkey Indian Tribe) and other tribal groups with historical ties to the District of Columbia.

Limited-English populations are present throughout the Study Area. These are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public. Within the Study Area, 17.5% of the population do not speak English at home, with Spanish being the language spoken by the majority (56,512 people or 9.0%) of the non-English speaking at home population. Indo European languages were spoken by 27,900 people (4.4%) of the non-English speaking at home population (USCB 2017e).

Proximity to potentially vulnerable communities is a factor that future project developers should consider during their site-selection process.

12.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

12.5.1 Regional Observations

Effects of accelerated sea level rise in the Study Area are already apparent, especially nuisance tidal flooding, which will increasingly impact property and infrastructure. The region is also susceptible to nor'easters, tropical storms, and hurricanes. Hurricanes can drive storm surge which, when combined with rising sea level, can contribute to increased regional flooding impacts. Within the Study Area, 1,350 acres of land, 21 miles of road, two military facilities, one hospital, one museum, and 12 USEPA-listed sites such as hazardous waste dumps and sewage plants are on property at an elevation of 6 feet above the high tide line. This same area holds 1,400 people in 400 homes accounting for $4.6 billion in property value. As sea level progresses and storm surge moves further inland, these areas could be heavily impacted.

It is likely that future industrial development activities will be limited in the Study Area due to the large proportions of medium and high intensity development as compared to other land use types. Further, most, if not all areas of developed open space or forest land cover in the Study Area are areas protected by local and Federal historic preservation laws.

The District of Columbia is over 85% developed land types and development appears to be continuing within the District as well as the surrounding region.

In the District of Columbia, there are un-zoned districts and various types of zoning districts, including residential, mixed-use and neighborhood mixed-use, downtown, special purpose, and industrial zones. The Zoning Commission for the District of Columbia has published a Zoning Handbook that contains the 2016 Zoning Regulation. The District of Columbia's Office of Zoning provides both interactive and static maps showing zoning information for every property in the District of Columbia. Also provided on the Official DC Zoning Map is a link that direct users to static Future Land Use Map Plans for the District of Columbia. These maps do not show the lands as they are being used today but how District Officials intend the land to be used in the future.

The District of Columbia's population is growing and it is one of the few cities in the U.S. where growth is being driven by an influx of whites, rather than by Latinos, Asians, or immigrants. More whites are moving into the District of Columbia, while African-American populations move out (Urban.org 2020). According to the Metropolitan Washington Council of Governments, the District's population is projected to grow 39.9% (940,687 residents) by 2040 as compared to a projected national grown of 16.4% in the same time period. Additionally, the age of the population is generally decreasing due to an in-migration of millennials largely for new job opportunities. This trend may shift by 2040 as the millennials begin to age.

Homeownership in the District of Columbia is significantly lower than the Nation whereas rentals are significantly higher than the national average. This may be in part an effect of political cycles, the in-migration of millennials, and the high cost of homeownership in the District. High housing costs have helped make the District of Columbia one of the most expensive places in the country to live. Even at higher-income levels, many renters are paying more than 30% of their income on housing and some find homeownership out of reach. Meanwhile lower-income residents, including those with limited English ability, are getting priced out of the market (Urban.org 2020).

The demographic changes in the District set off a surge of new development as well as redevelopment of worn-out and under-utilized buildings. Maximization of site capacity under new zoning and PUD zoning for new neighborhoods on currently vacant or underutilized parcels of land allows for more production of multi-family rental units and greater density (DCOP 2016a). As a result, the area's assisted housing stock has been at risk of being demolished and replaced with high-cost, market-rate homes and apartments.

The Housing Production Trust Fund and the DC Local Rent Supplement Program, which use local tax dollars to subsidize developers and providers of affordable housing, are critical to maintaining affordable housing in the District. The District of Columbia's Inclusionary Zoning policy requires that new residential buildings set aside a percentage of its units for low- and moderate-income households (Urban.org 2020). Over 9,000 affordable housing units have been produced using the Housing Production Trust Fund since 2001 (DHCD 2020).

The Study Area has significantly lower percentages of workers who have earned only a high school diploma as compared to the Nation and, conversely, significantly higher percentages of workers with college and advanced degrees. The higher college and postgraduate rates are most likely attributed to the types of job opportunities in the Study Area (i.e., the high percentages of government related jobs which likely require these levels of educational attainment).

12.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- The impact of potential future projects on the Anacostia Watershed Restoration Agreement and restoration projects throughout the watershed will need to be considered during analysis.
- Analysis for future projects should include consideration of the District of Columbia's Office of Zoning existing and future land use map plans to determine suitability of siting projects in certain areas and potential impacts of the projects.
- The District of Columbia has prepared a Comprehensive Plan meant to guide future growth and development. The District of Columbia's Office of Planning is currently working to amend the Comprehensive Plan a second time to ensure that it meets the changing conditions and needs of the community. The Comprehensive Plan and the Mayor's Draft Comprehensive Plan Proposal

with the second proposed amendment can be found on the District of Columbia's Office of Planning website and should be reviewed as part of the analysis for any potential future projects.

- Analysis of potential future projects will need to take the District of Columbia's unique cultural, historical, and recreation sites, landmarks, destinations, recreational opportunities, and events into account during project planning. Most cultural sites throughout the District have significance on a national level; therefore, potential impacts to such sites could have national implications.
- The District of Columbia is over 85% developed areas; the remainder is largely protected in various ways as parks, cultural sites, etc. Most of the city constitutes a recreation area as the city as a whole is a popular tourist destination. The rivers are also protected areas. Most of the city's businesses are focused on the national government. There are not many areas that would be suited for development of a large projects; however, smaller projects or project components may be able to be accommodated.
- The District of Columbia's significant roadway congestion should be taken into account in any future project analysis.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 13

VIRGINIA

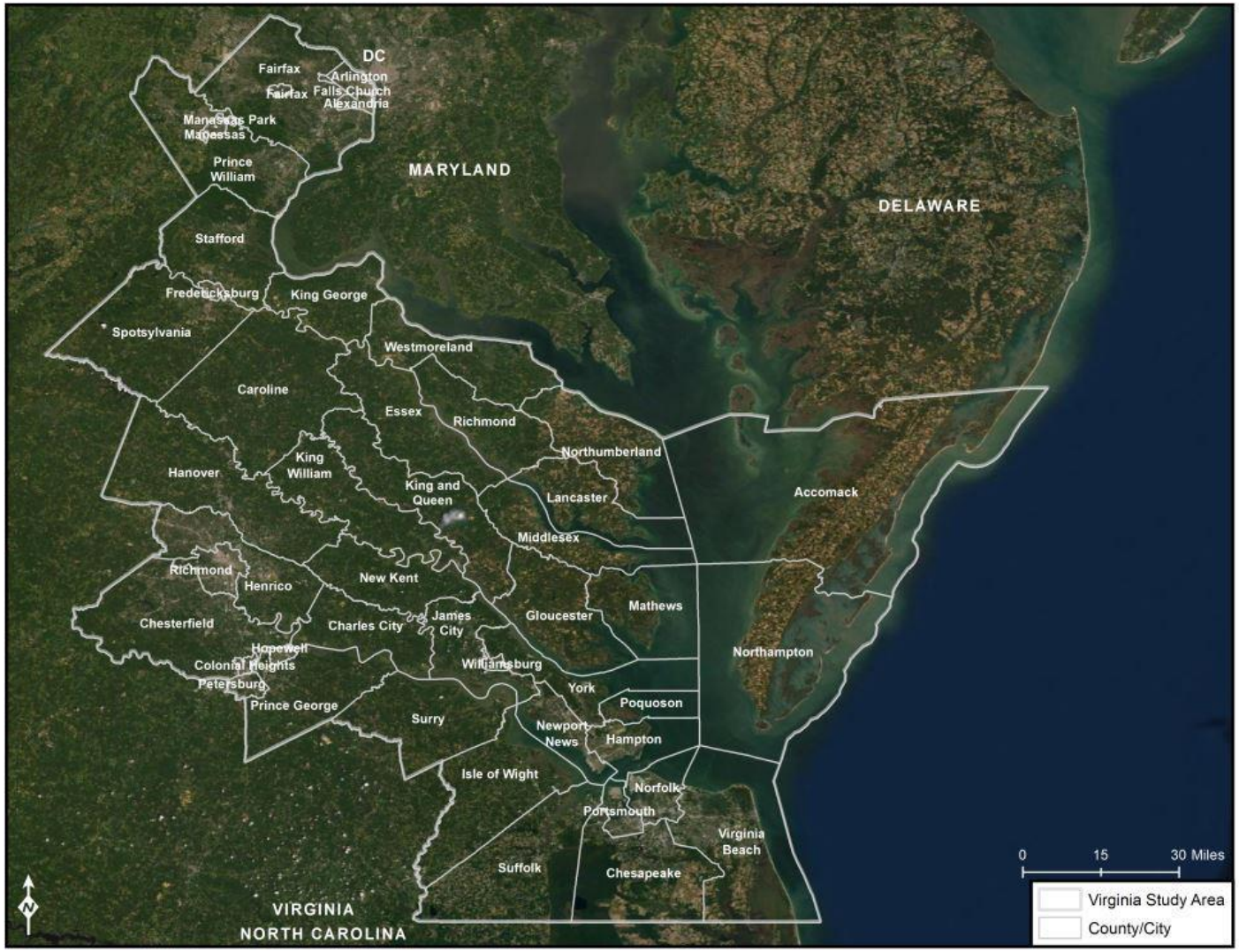
13 Virginia

13.1 Introduction

This chapter presents the coastal land use baseline analysis for the Commonwealth of Virginia to support development of future BOEM environmental impact assessments related to prospective development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

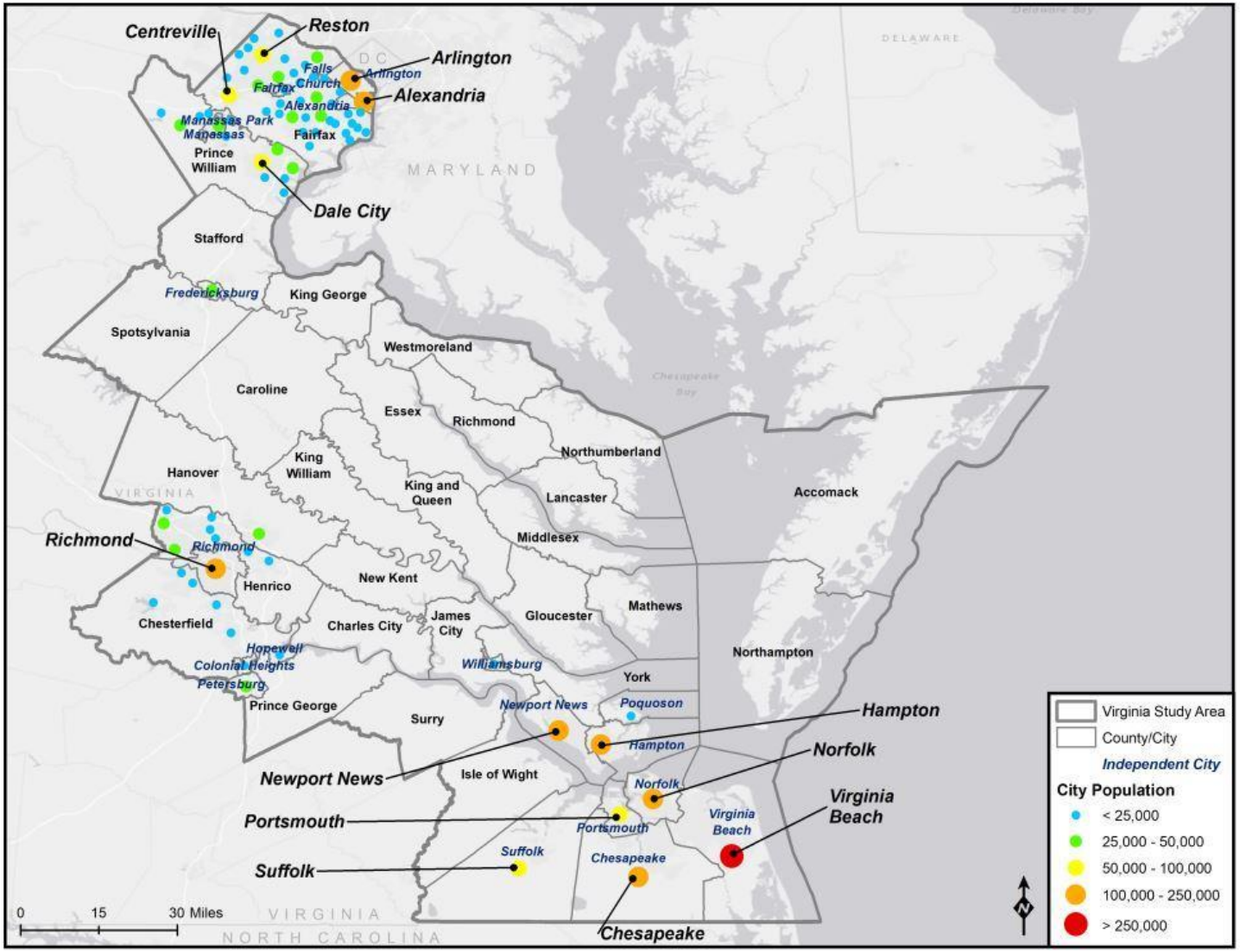
Virginia is located near the Mid-Atlantic Planning Area (Figure 1-1 in Chapter 1.1). A total of 48 counties and independent cities are located within the Project Area along the Virginia coastline. The independent cities range in population size from around 12,000 in Poquoson to over 450,000 in Virginia Beach. The counties range in population size from around 6,600 in Surry County to over 1.1 million in Fairfax County (ESRI 2019a). These cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. The proximity of Virginia to Washington D.C. increases the diversity of demographics and visitors to the area. Additionally, Virginia's location in the mid-Atlantic has geographical commonalities with many of the other Atlantic States with open coastlines in the southern and eastern shore portions of the State, and more sheltered coastlines along the Chesapeake Bay. The Virginia coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast. Virginia's mid-Atlantic location places it within range of numerous issued, pending, and withdrawn OCS permit applications.

The Virginia Study Area (Study Area) includes the overall Project Area counties and independent cities that are located within the Commonwealth of Virginia. As described in Chapter 1.1, the counties selected for this study are CZM counties and NOAA's designated coastal shoreline counties located along the Atlantic coastal area. The counties with coastline (i.e., polygons that extend into the water and provide complete land coverage from the USCB) were used to define the Study Area. Additionally, uniquely in the Commonwealth of Virginia, there are several independent cities, which are politically and administratively independent from the counties with which they share borders. No other State in the U.S. has independent cities. The independent cities are geographically separate divisions from the counties; however, they are located within the boundaries of the overall Project Area. Therefore, independent cities must be included within the baseline analysis for the Study Area to ensure all land and populations within the Atlantic coastal region of interest are fully represented. The Study Area is shown in Figure 13-1 and Figure 13-2. Figure 13-2 identifies cities which are cities with a population over 25,000 individuals. The Virginia Study Area includes the following counties and independent cities:



Source: ESRI 2019a

Figure 13-1. Commonwealth of Virginia Study Area



Source: ESRI 2019a

Figure 13-2. Cities in the Virginia Study Area

- Accomack County
- Alexandria (city)
- Arlington County
- Caroline County
- Charles City County
- Chesapeake (city)
- Chesterfield County
- Colonial Heights (city)
- Essex County
- Fairfax County
- Fairfax (city)
- Falls Church (city)
- Fredericksburg (city)
- Gloucester County
- Hampton (city)
- Hanover County
- Henrico County
- Hopewell (city)
- Isle of Wight County
- James City County
- King and Queen County
- King George County
- King William County
- Lancaster County
- Manassas (city)
- Manassas Park (city)
- Mathews County
- Middlesex County
- New Kent County
- Newport News (city)
- Norfolk (city)
- Northampton County
- Northumberland County
- Petersburg (city)
- Poquoson (city)
- Portsmouth (city)
- Prince George County
- Prince William County
- Richmond (city)
- Richmond County
- Spotsylvania County
- Stafford County
- Suffolk (city)
- Surry County
- Virginia Beach (city)
- Westmoreland County
- Williamsburg (city)
- York County

13.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the Commonwealth of Virginia are described below.

After canvasing nationally available data sources, additional data sources including State, county, and local datasets and information were examined for the Study Area. The State data sources that were canvased included:

- Virginia Geographic Information System Clearinghouse
- Virginia Department of Conservation and Recreation
- Virginia Department of Forestry
- Virginia Economic Development Partnership
- Virginia Department of Game and Inland Fisheries

The metadata database for Virginia data sources is included in Appendix A.

13.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

13.2.1 Water Resources

Virginia's water resources include the Chesapeake Bay, rivers, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

13.2.1.1 Chesapeake Bay

The Chesapeake Bay, shown in Figure 13-3, is an estuary, a body of water where fresh and salt water mix. The Bay is the largest estuary in the U.S.; it stretches 200 miles from Havre de Grace, Maryland down to Virginia Beach, Virginia. The Bay includes major ports in Baltimore and Hampton Roads. The Potomac, the Rappahannock, the York, and the James Rivers flow into Chesapeake Bay, bringing 51 billion gallons of fresh water into the Bay each day. Sediment load into the Bay, primarily from eroding land, stream banks, shores, and coasts, averages 5.2 million tons a year (Chesapeake Bay Foundation 2019).

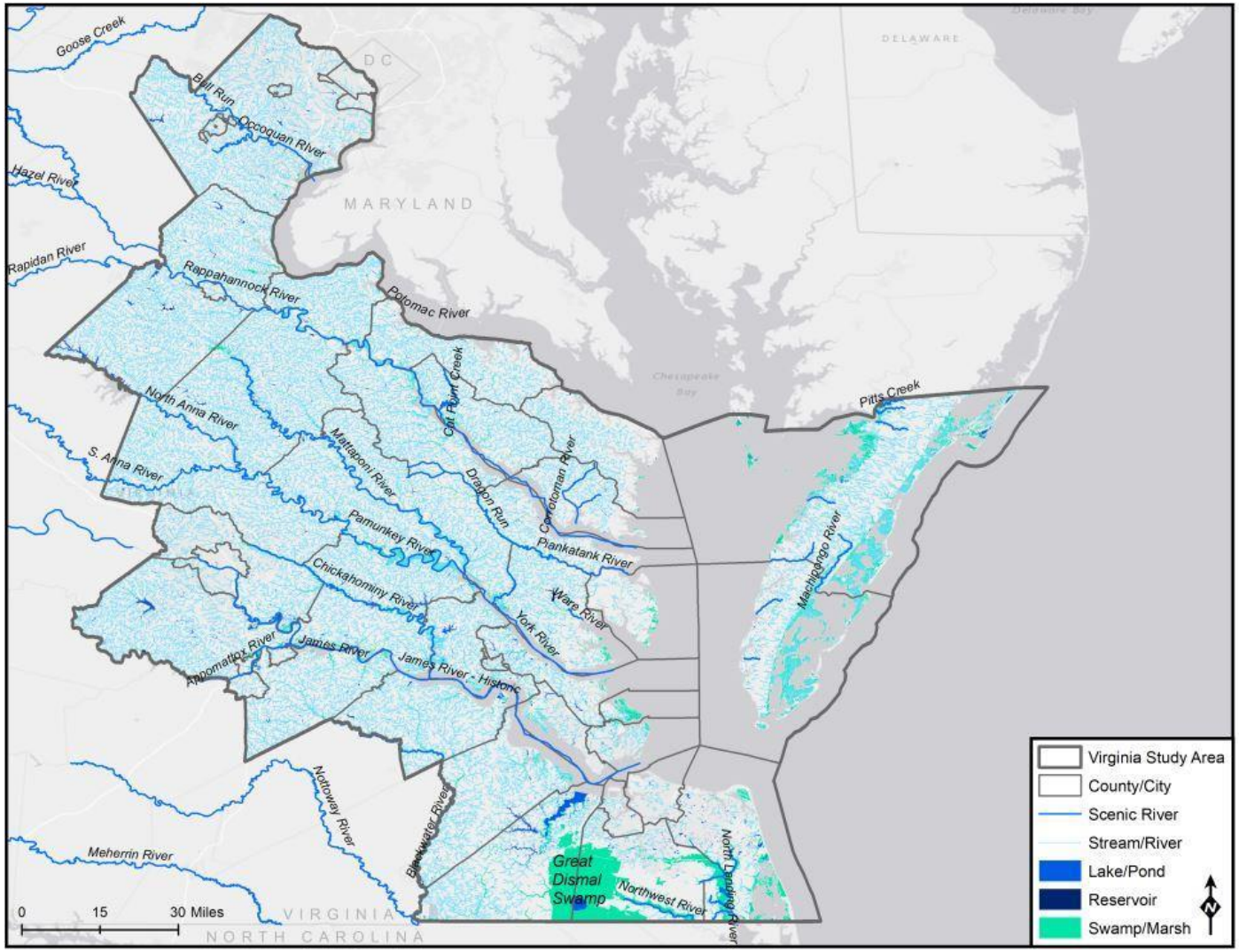
Nutrient pollution can lead to the growth of harmful algae blooms and dead zones, which are areas of hypoxic (low-oxygen) waters. The dead zone in Chesapeake Bay averages 1.7 cubic miles. Dead zones may result from a confluence of tides and currents along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. The Chesapeake dead zone is most pronounced in the deep waters of the Bay's main stem during warm summer months. Measures have been employed to help manage nutrient pollution, including wastewater treatment plant upgrades, reduced power plant emissions, and farmland runoff reduction practices (Chesapeake Bay Foundation 2019, VIMS 2019).

As shown in Figure 13-4, the coastal areas of Virginia in the Study Area include designated critical habitat for the Atlantic sturgeon. The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Virginia, the designated critical habitats for the Atlantic sturgeon are in the Rappahannock River; York/Mattaponi/Pamunkey Rivers; James River, and Potomac River. (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

13.2.1.2 Rivers

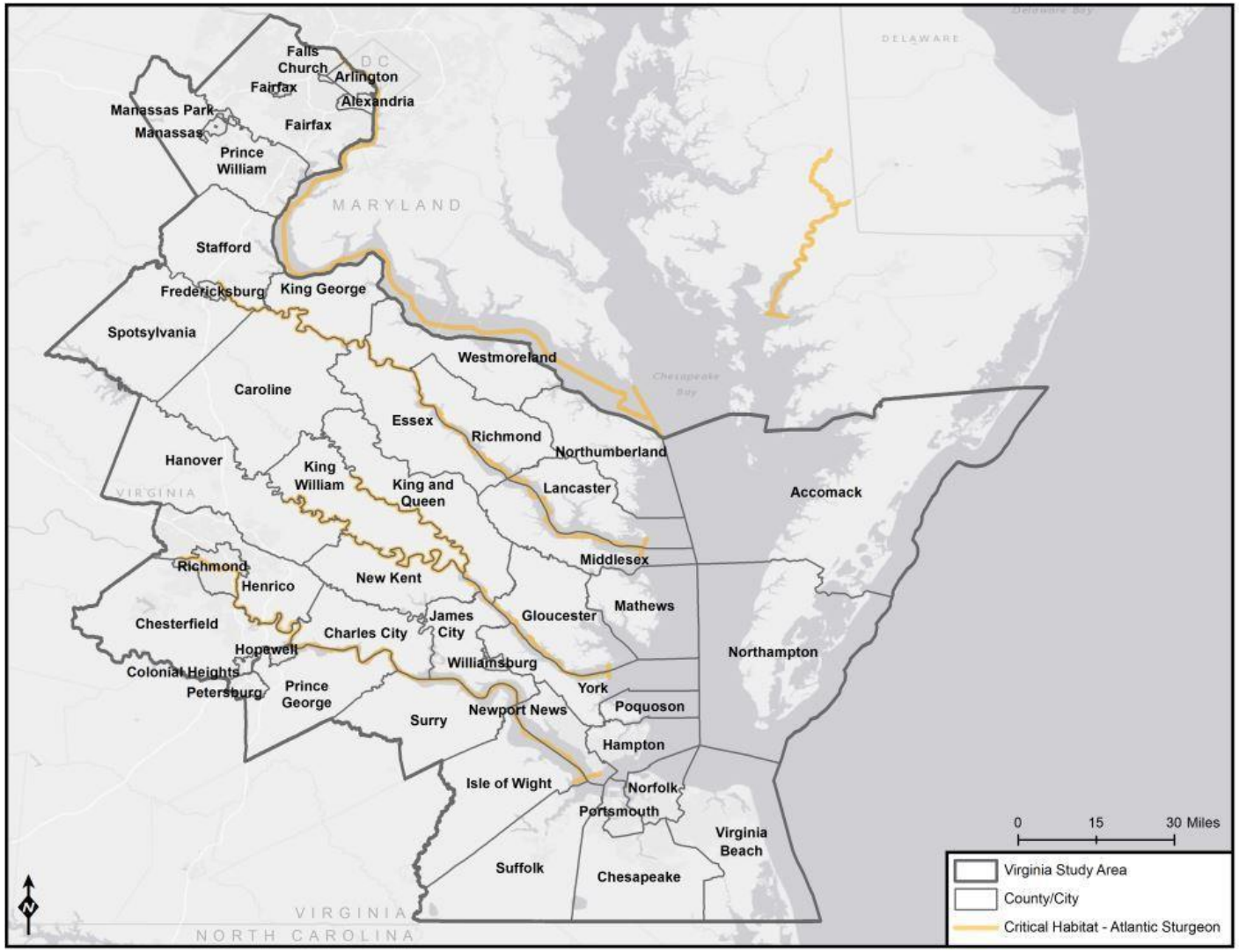
Within the Study Area, the major drainage basins include the Potomac, the Rappahannock, the York, and the James Rivers; these basins all flow into the Chesapeake Bay and ultimately into the Atlantic Ocean. Figure 13-3 shows the major surface water bodies within the Study Area. These rivers also provide critical habitat for the Atlantic sturgeon, as shown in Figure 13-4, the only designated critical habitat within the Study Area.

The headwaters of the Potomac River are in the Allegheny Mountains of West Virginia. The river marks the border between Virginia and Maryland and is fed by tributaries from both States, including the Anacostia, Shenandoah, and Monocacy Rivers. The Potomac River covers 383 miles from West Virginia to the tidewater at Point Lookout, Maryland where it enters the Chesapeake Bay. Historically, pollution and degradation of the river were a problem. The Potomac River was designated as an American Heritage River in 1998, which enabled communities along the river to utilize Federal funds for revitalization efforts (American Rivers 2019, Potomac Conservancy 2020). The Potomac Conservancy nonprofit land trust was established in 1993 with a purpose of stewarding conservation easements along the river (Potomac Conservancy 2019). The Conservancy has noted pollutants such as nitrogen, phosphorous, and suspended sediments are declining in the river over time. As a result, various fish species that have been previously impacted are showing signs of recovery. Urban runoff remains an issue (American Rivers 2019). As shown in Figure 13-4, the Potomac River, is critical habitat for the Atlantic sturgeon (NOAA 2017c, NOAA 2019l, USFWS 2019i, USFWS 2019j, NOAA 2019l).



Source: USGS 2019e

Figure 13-3. Hydrography in the Virginia Study Area



Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j

Figure 13-4. Critical Habitat within the Virginia Study Area

In Virginia, the Potomac River's major tributary is the Shenandoah River, with a confluence at Harper's Ferry just upstream of the Potomac's journey through a water gap in the Blue Ridge Region. The Potomac forms spectacular waterfalls where it crosses through the Piedmont metamorphic rocks at Great Falls along the Fall Line before continuing onward through the Coastal Plain Region to Chesapeake Bay and the Atlantic Ocean.

South of the Potomac River, the Rappahannock River and its major tributary, the Rapidan River, begin on the east slope of the Blue Ridge and flow eastward across the Piedmont. The Rappahannock crosses the Fall Line at Fredericksburg and continues through the Coastal Plain to Chesapeake Bay and the Atlantic Ocean.

South of the Rappahannock, the York River forms at the confluence of its main tributaries, the Mattaponi River from the northwest and the Pamunkey River from the southwest. The confluence happens at West Point, which is at the tri-county border of King and Queen, King William, and New Kent Counties in the Coastal Plain. Headwaters of the Mattaponi River are in the Piedmont, where its main tributaries, the Mat, Ta, Po, and Ni Rivers, join and form the Mattaponi River near the Fall Line. The Pamunkey River is formed by the confluence of the North Anna River and the South Anna River in the Piedmont near the Fall Line.

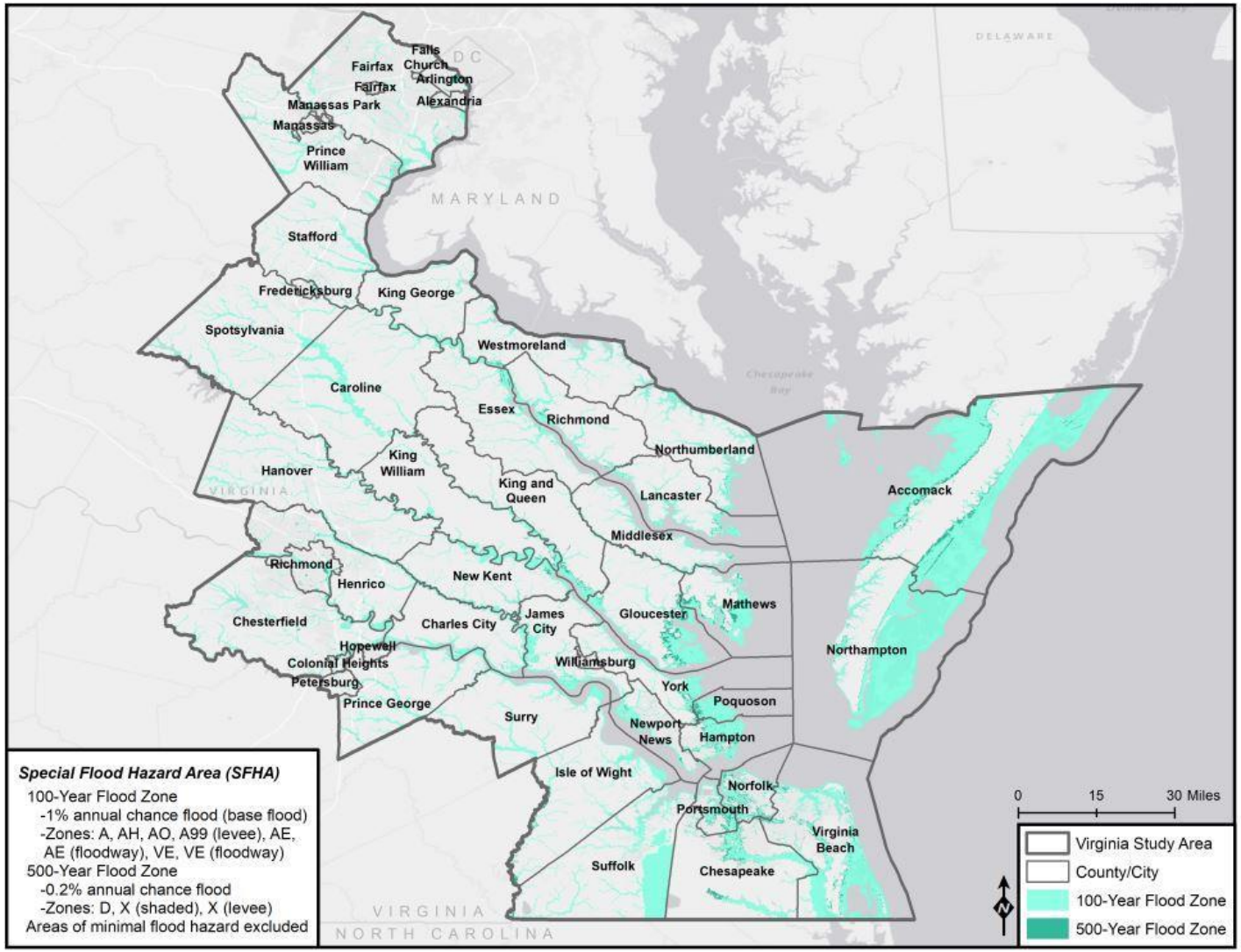
South of the York River, the James River is the largest drainage basin in Virginia, spanning the width of the State. Major tributaries include the Appomattox, the Rivanna, and the Maury Rivers. The James River crosses the Fall Line at Richmond. With headwaters in the Valley and Ridge near the West Virginia border, the James River passes through the Blue Ridge, the Piedmont, and the Coastal Plain on its way to Chesapeake Bay and the Atlantic Ocean.

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Virginia has approximately 49,350 miles of river, it has no designated wild and scenic rivers (USFWS 2019a).

13.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 Floodplain Management and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 13-5, floodplains comprise a significant portion of land area in several counties in the Study Area. Table 13-1 details the flood zone acreage within the geographic units of the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.



Source: FEMA 2019b

Figure 13-5. Floodplains of the Virginia Study Area

Table 13-1. Floodplains in the Virginia Study Area (acres)

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Accomack	214,434	74.6	14,177	4.9
Alexandria (city)	805	8.4	391	4.1
Arlington	597	3.6	1,717	10.3
Caroline	40,368	12.0	0	0.0
Charles City	19,566	16.7	529	0.5
Chesapeake (city)	27,764	12.8	5,609	2.6
Chesterfield	27,991	10.3	1,121	0.4
Colonial Heights (city)	1,160	24.1	110	2.3
Essex	21,898	13.3	1,082	0.7
Fairfax (city)	323	8.1	48	1.2
Fairfax	25,498	10.2	272	0.1
Falls Church (city)	55	4.2	12	0.9
Fredericksburg (city)	643	9.6	383	5.7
Gloucester	35,871	25.7	6,800	4.9
Hampton (city)	19,089	58.0	3,437	10.4
Hanover	31,016	10.4	1,250	0.4
Henrico	20,797	13.9	914	0.6
Hopewell (city)	762	11.5	48	0.7
Isle of Wight	25,317	12.5	2,075	1.0
James City	21,740	23.9	729	0.8
King and Queen	17,851	8.9	1,984	1.0
King George	11,598	10.1	159	0.1
King William	25,711	14.7	957	0.5
Lancaster	17,028	20.0	841	1.0
Manassas (city)	511	8.1	142	2.3
Manassas Park (city)	51	3.2	3	0.2
Mathews	24,452	44.5	5,199	9.5
Middlesex	14,379	17.2	302	0.4
New Kent	25,009	18.6	660	0.5
Newport News (city)	12,226	27.6	1,096	2.5
Norfolk (city)	12,415	36.4	5,274	15.5
Northampton	142,264	105.0	2,269	1.7
Northumberland	25,044	20.4	478	0.4
Petersburg (city)	1,118	7.7	157	1.1
Poquoson (city)	12,226	124.2	1,031	10.5
Portsmouth (city)	8,324	39.1	2,866	13.4
Prince George	20,238	11.9	602	0.4
Prince William	21,400	10.0	1,139	0.5

Table 13-1. Floodplains in the Virginia Study Area (acres)

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Richmond (city)	4,220	11.0	1,305	3.4
Richmond	13,620	11.1	1,236	1.0
Spotsylvania	21,715	8.5	0	0.0
Stafford	19,453	11.3	646	0.4
Suffolk (city)	66,772	26.1	684	0.3
Surry	21,602	12.1	74	0.0
Virginia Beach (city)	74,252	47.4	6,930	4.4
Westmoreland	17,490	11.9	624	0.4
Williamsburg (city)	193	3.4	13	0.2
York	16,370	24.5	1,709	2.6
Study Area Total	**1,183,228**	21.0	**79,081**	1.4

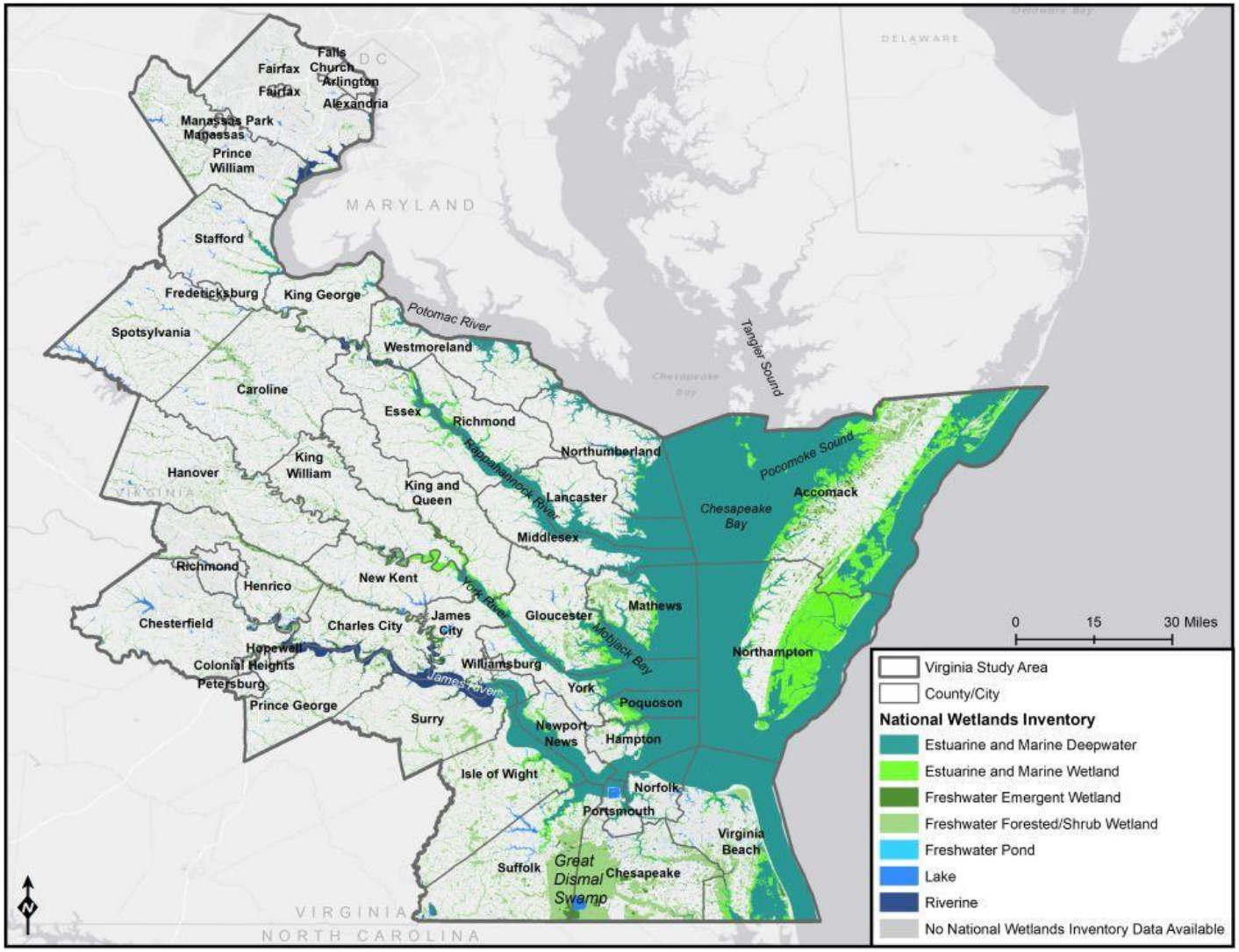
Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

13.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. §1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 13-6, wetlands are a large part of the land area in many of the Study Area counties and/or independent cities.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 13-2 details the wetland acreage in the Study Area along with other water resources. (FGDC 2013, USFWS 2019c).

The Great Dismal Swamp NWR occupies approximately 112,000 acres straddling the State line between Virginia and North Carolina (USFWS 2019b). It occupies a significant portion of Chesapeake County and part of Suffolk County. The Great Dismal Swamp is the largest remaining intact remnant of a formerly vast habitat that once covered over 1 million acres. Protection of this resource began in 1973 prior to the formation of the Great Dismal Swamp NWR in 1974 (USFWS 2019b). The Dismal Swamp Act of 1974 directs the USFWS to "Manage the area for the primary purpose of protecting and preserving a unique and outstanding ecosystem, as well as protecting and perpetuating the diversity of animal and plant life therein. Management of the refuge will be directed to stabilize conditions in as wild a character as possible, consistent with achieving the refuge's State objectives." A secondary purpose is to "Promote a public use program when not in conflict with the primary objectives of the refuge." The Great Dismal Swamp NWR also holds both Virginia and Globally Important bird area designations, and the NPS National Natural Landmark and Underground Railroad Network to Freedom site designations (USFWS 2019b). As such, this is an important natural and cultural resource within the Study Area. Chapter 13.3.2.5, Protected Areas, provides additional discussion about the Great Dismal Swamp.



Source: USFWS 2018a

Figure 13-6. Wetlands in the Virginia Study Area

Table 13-2. Wetlands in Virginia Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine	Other
Accomack	680,586	96,413	7,665	44,904	529,418	98	1,301	759	27
Alexandria (city)	350	0	49	54	0	0	18	230	0
Arlington	187	0	13	20	0	58	7	90	0
Caroline	38,523	0	4,993	23,753	0	1,277	3,559	4,919	22
Charles City	33,643	0	4,586	13,922	0	908	728	13,497	2
Chesapeake (city)	104,686	2,211	4,974	86,804	2,602	3,386	1,369	3,332	8
Chesterfield	26,668	0	1,977	14,726	0	2,997	1,833	5,134	0
Colonial Heights (city)	740	0	126	354	0	38	73	149	0
Essex	37,979	4,043	1,756	12,229	14,330	326	1,270	3,949	77
Fairfax (city)	47	0	0	7	0	0	7	33	0
Fairfax	17,374	258	973	6,136	94	1,322	985	7,605	0
Falls Church (city)	6	0	0	3	0	0	0	3	0
Fredericksburg (city)	265	0	3	145	0	0	47	70	0
Gloucester	69,948	9,986	1,050	16,114	41,230	663	449	455	0
Hampton (city)	59,692	2,585	135	2,323	54,035	191	216	206	0
Hanover	32,865	0	4,229	22,609	0	433	3,114	2,458	22
Henrico	24,598	0	2,898	15,211	0	384	1,418	4,686	0
Hopewell (city)	884	0	85	394	0	0	31	374	0
Isle of Wight	64,243	6,183	1,514	26,223	27,564	999	1,021	716	22
James City	36,146	999	5,121	4,845	10,297	1,253	658	12,973	0
King and Queen	26,361	2,948	2,175	12,628	4,797	400	1,000	2,404	8
King George	15,453	1,048	970	6,322	2,691	430	681	3,268	43
King William	31,598	3,753	4,262	14,196	2,726	530	1,486	4,629	16
Lancaster	69,419	1,906	175	4,324	62,421	167	251	162	13
Manassas (city)	170	0	33	55	0	0	21	61	0
Manassas Park (city)	20	0	0	2	0	0	2	16	0

Table 13-2. Wetlands in Virginia Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine	Other
Mathews	126,878	6,409	880	15,318	104,082	0	120	69	0
Middlesex	57,946	1,265	370	4,342	51,159	259	285	256	10
New Kent	27,850	3,810	2,573	10,637	4,324	2,306	880	3,320	0
Newport News (city)	37,645	3,298	172	1,311	31,716	584	352	212	0
Norfolk (city)	28,955	1,056	142	300	26,759	547	95	57	0
Northampton	419,969	105,194	1,218	8,613	303,732	187	803	217	6
Northumberland	68,454	2,377	360	5,403	59,253	78	288	695	0
Petersburg (city)	985	0	131	515	0	16	128	196	0
Poquoson (city)	46,107	5,250	27	702	40,092	0	12	24	0
Portsmouth (city)	11,643	779	70	292	7,988	2,326	107	81	1
Prince George	31,162	0	2,249	16,184	0	580	1,297	10,850	2
Prince William	24,111	396	2,068	11,519	1,298	1,807	1,010	5,840	174
Richmond (city)	2,560	1	98	690	0	60	155	1,556	0
Richmond	29,968	4,246	527	8,332	15,692	135	417	523	96
Spotsylvania	23,789	0	1,100	14,537	0	4,849	1,358	1,945	0
Stafford	19,347	834	778	8,527	3,892	1,430	830	3,058	0
Suffolk (city)	94,020	5,612	4,913	63,135	13,032	4,655	1,424	1,174	76
Surry	46,120	666	2,474	21,853	6,149	664	762	13,550	1
Virginia Beach (city)	202,210	13,439	1,694	30,785	150,362	1,942	1,839	2,116	34
Westmoreland	28,703	1,467	1,517	9,104	12,846	329	733	2,653	54
Williamsburg (city)	400	20	44	193	3	37	38	65	0
York	78,350	3,321	217	4,137	68,756	1,091	497	329	3
Study Area Total	**2,779,619**	**291,774**	**73,380**	**564,732**	**1,653,336**	**39,739**	**34,977**	**120,964**	**718**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

13.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

13.2.2.1 Sea Level Rise

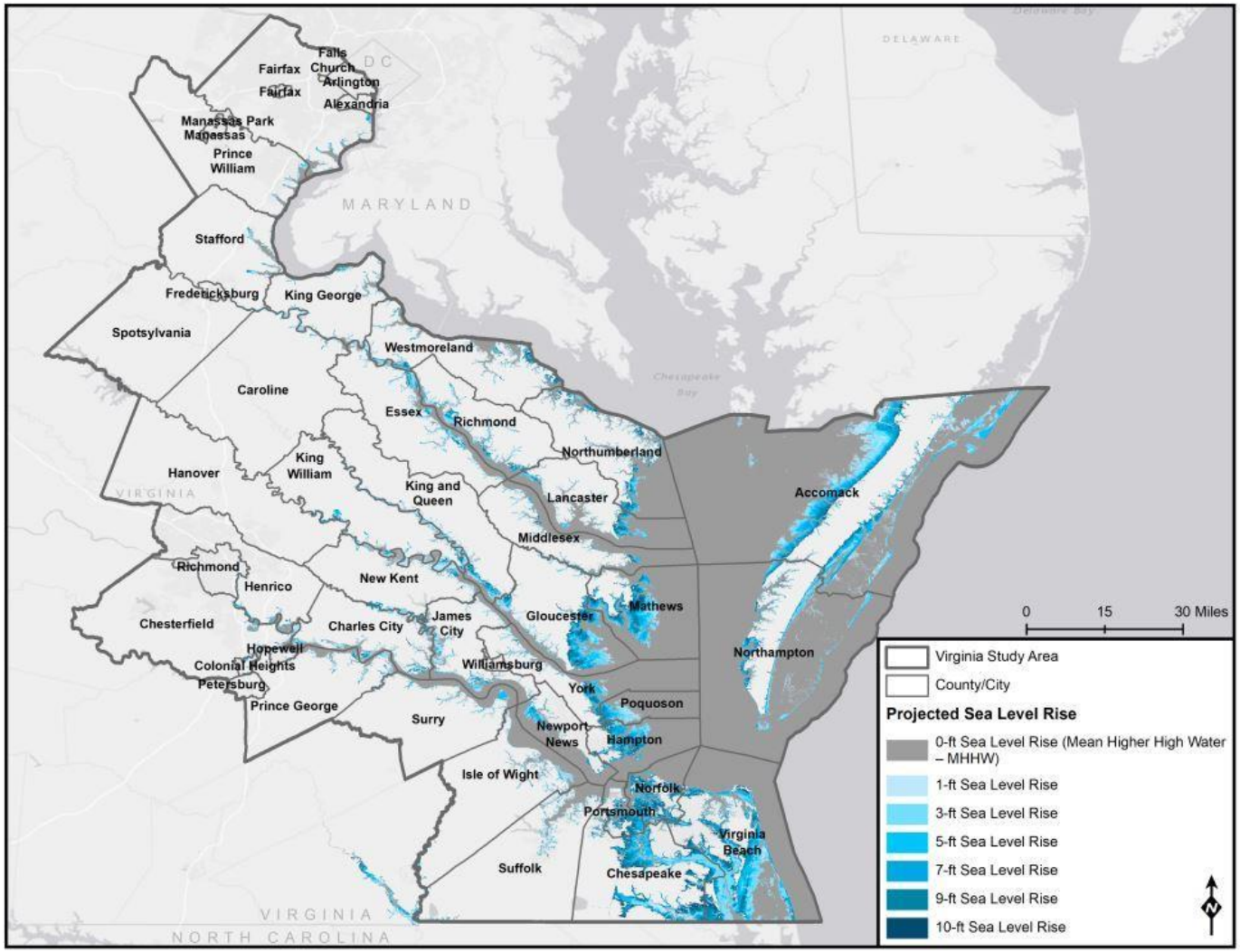
Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019).

Figure 13-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.

Since 1950, sea level has risen 14 inches near Sewells Point, Virginia, as measured by data from floating buoys and tidal gauges. The rate of sea level rise all along the Virginia coast is increasing over time (SeaLevelRise.org 2019). According to NOAA, the highest rates of sea level rise on the Atlantic Coast are in the Hampton Roads Region of Virginia. An estimated 59,059 to 176,124 people in the Hampton Roads area are potentially impacted by sea level rise. This is the second largest population in the U.S. at risk (New Orleans, Louisiana much of which is below sea level is first). Estimates project that rising sea level in Hampton Roads could inundate 162 to 877 miles of roads either permanently or on a recurring basis. Hampton Roads city planners, managers, and government are actively engaged in planning and preparing for the impacts associated with sea level rise (NOAA 2020f). Relative sea level rise, determined from more than 30 years of monthly measurements, ranged from 0.145 inches to 0.233 inches per year with an average increase of 0.18 inches per year for the Study Area. The peak increase of 0.233 inches per year was determined at the Chesapeake Bay Bridge Tunnel measured mid-Bay (NOAA 2019b). Sea level rise in the Study Area results from the combination of rising global levels with local land subsidence as a result of isostatic adjustment and aquifer compaction from groundwater withdrawals. According to NOAA measurements of relative sea level trends using tide gauges throughout the US, the average Linear Relative Mean Sea Level rate for the Study Area is 0.19 inches/year (NOAA 2019b).

A small factor in land subsidence in the southern Chesapeake Bay Region is glacial isostatic adjustment, the flexing of the Earth's crust in response to ice loading or melting. The earth's crust flexes downward from the weight of the overlying ice causing the surrounding area (the glacial forebulge) to flex upward. The southern Chesapeake Bay Region was in the forebulge area and since the ice sheet started melting 18,000 years ago, the Bay Region continues adjusting slowly downward. Contributions to land subsidence from continuing glacial isostatic adjustment are probably not uniform and estimated at about 0.04 inches per year (Eggleston and Pope 2013).

Studying land subsidence and relative sea level rise in the Southern Chesapeake Bay Region, a 2013 USGS report theorized that aquifer compaction accounted for much of the land subsidence. The southern Chesapeake Bay Region includes the Chesapeake Bay, the adjoining Virginia Coastal Plain, and the Eastern Shore. Hampton Roads, the sole urban center in the region, includes the communities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Suffolk, and Virginia Beach.



Source: NOAA 2018a

Figure 13-7. Projected Sea Level Rise throughout the Virginia Study Area

Using NOAA stations at Gloucester, Kiptopeke, Portsmouth, and Sewells Point, the relative sea level rise in the region ranged from 0.138 to 0.173 inches with an average of 0.154 inches relative sea level rise per year. Choosing locations near the largest groundwater withdrawal in the region, land subsidence and aquifer-system compaction measurements in Franklin and Suffolk displayed land subsidence between 0.043 and 0.189 inches per year. Because corresponding measurements of aquifer-system compaction ranged from 0.059 to 0.146, or more than half the measured land subsidence, aquifer compaction from groundwater withdrawal was theorized to account for the majority of the relative sea level rise in the region (Eggleston and Pope 2013).

Compaction of the aquifer system occurs as pressures and water levels decrease with groundwater withdrawal. Rates of compaction and land subsidence vary geographically based on characteristics of the aquifer and on the amount of water withdrawn. Water withdrawal from the sand layers of the Virginia Coastal Plain aquifer system can cause pressure decreases across the stacked sand and clay layers allowing them to compress; thus triggering the land to subside. Compaction of the clay layers can continue for years as the decreased pressures propagate across the extent and depth of the aquifer (Eggleston and Pope 2013, NASA 2017).

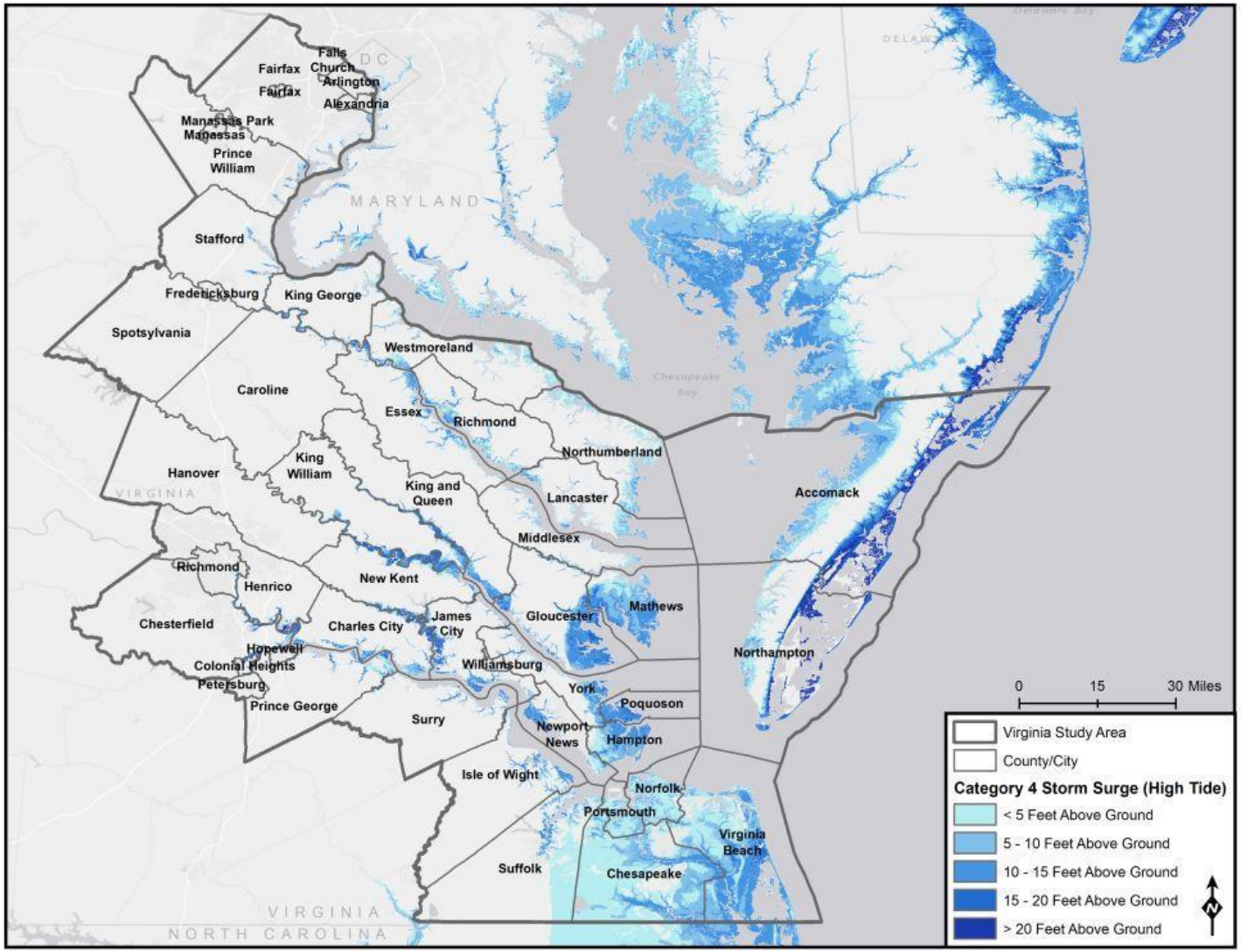
The Hampton Roads Sanitation District is experimenting with injecting purified wastewater into the Potomac aquifer to mitigate land subsidence. The Potomac aquifer, the deepest and thickest aquifer in the southern Chesapeake Bay Region, supplies the vast majority of groundwater in the region. The Sustainable Water Initiative for Tomorrow uses a multistep process to treat and purify wastewater to drinking water standards; then matching it with aquifer parameters for pH and geochemistry, prior to injection into the aquifer. With an ultimate goal to recharge the aquifer by injecting more water than is withdrawn along with an added benefit of reducing nutrients disposed into Chesapeake Bay, Hampton Roads Sanitation District continues to study and refine the Sustainable Water Initiative for Tomorrow process (Alliance for the Chesapeake Bay 2017, Ruggeri 2017, HRSD 2019).

Subsidence maps showing the types of land changes described above were not identified for the present study and no sinkholes were located within the Study Area at this time. Future OCS-related projects should examine sources such as the Virginia Division of Geology and Mineral Resources (https://www.arcgis.com/home/item.html?id=2d34b6e577d9435ca2d27abc67a048b9) and USGS (https://water.usgs.gov/GIS/metadata/usgswrd/XML/pp1766_subsidence_locations.xml#stdorder) to look for recent information on subsidence and sinkholes.

13.2.2.2 Storm Surge

Figure 13-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This Figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Virginia coastline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario.

Virginia can experience both nor'easters, occurring with highest severity between September and April, and tropical storms and hurricanes, occurring May-December; these storm systems are described in greater detail in Chapter 1.4.2.2. Within the Chesapeake Bay, nor’easters tend to push water down the bay from north to south (Applegate 2014). Hurricane Isabel in 2003 holds the record storm surge level for the Chesapeake Bay at 7.3 feet (Boesch et al. 2018, NOAA 2020c). Based on predictions for Hurricane Dorian in September 2019, significant flooding from storm surge would likely impact the Hampton Roads area (Belt 2019). Storm surge flooding maps for some communities in Virginia are available at https://www.floodingresiliency.org/resources-partners/useful-tools/ (CCRFR 2019).



Source: NOAA 2020a

Figure 13-8. Projected Storm Surge throughout the Virginia Study Area for a Category 4 Hurricane

13.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area have helped shaped the land use, development of cities and towns, and the locations of various cultural, historic, and natural areas. In particular the location of major rivers and the shape of the shoreline, the presence of mountainous areas in the west and the Chesapeake Bay in the east, the locations of floodplains and wetlands, the resistant rocks along the eastern side of these mountains creating rapids and waterfalls, have all influenced where settlers first established settlements, how far inland they first traveled, and where transportation routes were established. Rivers in Virginia provide a vital food source and transportation route; making them prime focal areas for cities. Historically, many cities developed at the Fall Line, the transition from the flat Coastal Region to the rolling Piedmont Region, where steep rises and waterfalls hindered further river travel upstream and thus contributing to the establishment of certain cities in certain areas (Virginia Places 2019). The locations of other cities and towns may have been selected based on certain topographic or geologic features such as beachside communities, mountain communities, etc. Those same features may have helped the towns prosper and grow both by providing natural resources for exploitation and by providing natural attractions that may draw in additional businesses and tourists thus influencing the economics and growth of the community.

The Chesapeake Bay separates Virginia's Eastern Shore from the mainland areas. The only way to access the Eastern Shore by land is through Maryland, or via a bridge on the southern end of the Virginia Eastern Shore peninsula. The topography of the Chesapeake Bay, therefore, has historically and continues to influence transportation and as a result also influences land use and population characteristics. Because of the pollution-related issues, management of the Chesapeake Bay waters is a priority in both Maryland and Virginia. Future projects located within and around the Chesapeake Bay will need to take into account current regulatory requirements associated with construction (in-water work, runoff, etc.) and any operational discharge. The presence of the Bay and the myriad beaches along the Virginia coastline also influences the maritime industry and maritime jobs in the region.

In addition to the Chesapeake Bay, other natural resources in the Study Area which are protected by certain regulations and laws include as the water resources, wetlands including the Great Dismal Swamp, floodplains, prime farmland and farmland of statewide importance, and critical habitat for the Atlantic sturgeon. These natural resources are prevalent across the Study Area and are factors which should be considered during evaluation of potential future projects in the Atlantic OCS planning area.

The physical characteristics of the Study Area clearly have historically and will continue to help shape existing and future land use, can be a factor in zoning decisions, can contribute to identification of protected areas, and may be a component of cultural and historic and recreational resource use and preservation. Additionally, the physical characteristics of the area can influence transportation routes and facilities, population distribution and density, and, therefore, housing and business distribution. Transportation routes, population distribution and density, and housing and business distribution all also influence employment trends which may in turn influence vulnerable populations.

The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Sea level rise will affect many counties and independent cities in the Study Area. Areas on the coastline will experience the most significant effects of sea level rise; Chesapeake, Hampton, Norfolk, Portsmouth, Poquoson, and Virginia Beach Counties in the southernmost portion of the Study Area would likely experience the most severe impacts. There are major urban centers located within these counties that would also be impacted by a rise in sea level. In some of these counties, sea level rise affects the majority of the county. Combined with the effects of sea level rise, storm surge would push further inland in the future. Developers of potential future OCS-related activities within these areas will need to be cognizant of the projected changes in sea level and storm surge. Potential future projects could exacerbate impacts if built in areas projected to experience sea level rise and increased

storm surge if these expected changes are not taken into account during the planning and design process. Early consideration of projected future changes is beneficial to the project as well to avoid potential future expenditures for costly repairs or relocations should sea level rise and/or storm surge affect project facilities and/or equipment.

In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

13.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

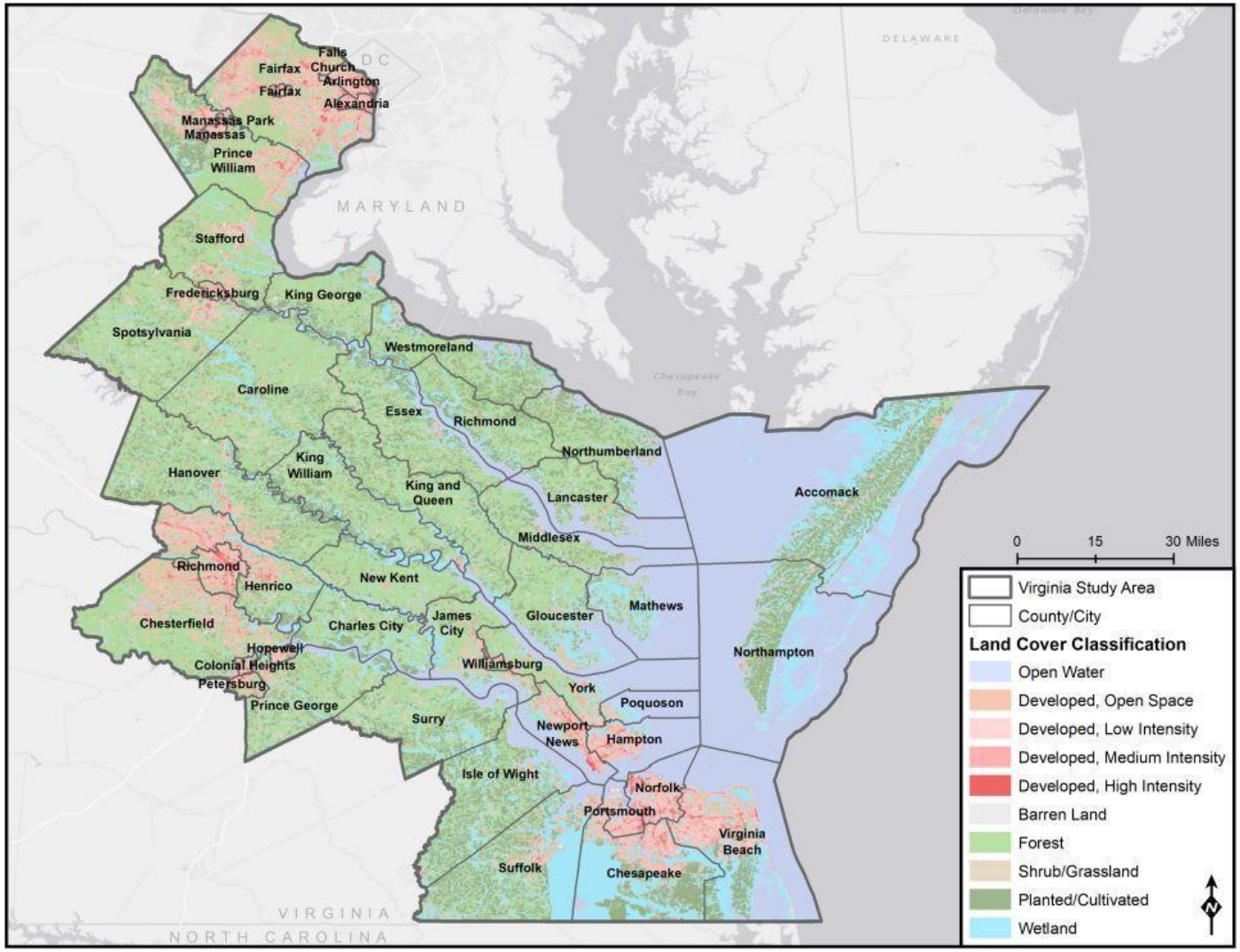
13.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

Figure 13-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 13-3 presents the NLCD data for each county and independent city within the State by acreage. Table 13-4 presents the NLCD data for each county and independent city within the State by percentage and presents a summary of the overall land cover classification for each geographic unit. Open water land use was excluded in Table 13-4 because this type of land cover would not be considered in future industrial development. Each county and independent city was then categorized based on its predominant land cover as shown in Table 13-4 and Figure 13-10. The following section discusses the key findings of this analysis.

The general land cover within the 48 counties and independent cities within the Study Area varies greatly. Some counties/independent cities are largely urban, whereas others are more undeveloped or agricultural. It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serves as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of Virginia may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of “Forest” could be very broad.

Table 13-4 presents an assessment of the general land cover for each of the 48 counties and independent cities in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 13-4, Figure 13-10 shows the majority land cover type within each county and/or independent city in the Study Area.



Source: NLCD 2016a

Figure 13-9. National Land Cover in the Virginia Study Area

Table 13-3. Acres of Land Cover by NLCD Classifications in Virginia Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Accomack	838,426	13,904	4,672	1,721	441	20,739	4,379	26,923	1,249	80,296	149,586	550,861
Alexandria (city)	9,822	1,523	2,845	3,258	1,248	8,874	41	561	17	52	72	144
Arlington	16,706	4,168	5,829	3,451	1,395	14,842	57	1,474	32	70	28	65
Caroline	343,830	13,450	3,287	1,048	233	18,018	504	203,712	32,089	47,554	37,353	4,600
Charles City	130,716	3,317	296	70	18	3,700	570	58,418	8,318	20,341	25,219	14,150
Chesapeake (city)	224,606	20,249	18,820	8,505	2,566	50,140	313	9,586	1,147	48,289	104,117	7,418
Chesterfield	279,671	48,193	21,871	10,672	2,978	83,715	906	139,829	10,011	13,817	19,896	7,106
Colonial Heights (city)	5,002	953	1,510	703	297	3,462	3	582	26	25	745	159
Essex	183,026	7,049	1,327	397	121	8,894	102	79,183	12,275	40,719	23,808	18,045
Fairfax (city)	4,015	1,207	1,098	770	270	3,344	1	656	7	2	3	2
Fairfax	260,155	65,005	48,818	24,023	6,080	143,927	810	89,409	2,222	4,698	10,051	7,110
Falls Church (city)	1,310	451	320	231	96	1,097	1	205	1	3	3	0
Fredericksburg (city)	6,732	1,138	1,611	1,369	446	4,564	13	1,570	114	195	228	47
Gloucester	184,309	11,600	2,041	661	145	14,447	279	64,905	4,040	17,603	37,003	46,032
Hampton (city)	87,203	8,977	10,153	4,877	1,801	25,809	296	976	175	275	5,581	54,093
Hanover	302,573	22,994	7,569	4,001	1,398	35,962	1,023	152,006	17,317	59,325	33,479	1,875
Henrico	156,693	28,843	22,993	11,559	4,030	67,425	689	44,936	2,862	15,342	19,956	5,088
Hopewell (city)	6,931	1,425	2,041	973	583	5,022	2	804	48	47	683	324
Isle of Wight	232,209	10,559	3,053	1,206	334	15,153	200	67,543	8,822	63,403	45,980	29,811
James City	114,650	10,866	5,710	2,327	537	19,440	108	44,936	2,022	7,188	16,355	24,601
King and Queen	208,837	7,393	863	175	15	8,446	306	117,225	16,919	35,434	23,459	7,050
King George	120,173	7,206	1,777	724	217	9,924	347	65,483	2,965	20,615	14,394	6,257
King William	183,009	7,200	1,009	327	162	8,698	250	86,994	12,244	37,870	29,684	7,270
Lancaster	148,104	7,372	958	302	90	8,722	135	43,538	4,080	17,517	10,030	64,081
Manassas (city)	6,340	1,827	2,146	1,341	504	5,818	6	294	27	132	56	7
Manassas Park (city)	1,616	415	584	341	92	1,432	2	159	13	10	0	0
Mathews	161,258	4,619	546	138	24	5,327	304	13,384	1,034	7,211	26,642	107,355
Middlesex	134,885	5,660	1,167	350	69	7,246	137	44,295	3,111	19,173	8,874	52,051
New Kent	143,219	6,760	1,673	421	86	8,940	69	80,648	6,050	14,660	23,568	9,284
Newport News (city)	76,590	8,292	10,658	6,919	3,065	28,934	36	7,504	323	492	5,973	33,327
Norfolk (city)	61,697	7,269	12,782	7,708	4,888	32,648	179	673	36	40	1,080	27,042
Northampton	508,961	5,447	2,596	870	166	9,079	2,387	16,047	609	50,162	55,234	372,308
Northumberland	182,788	8,663	1,070	291	69	10,093	285	56,422	4,251	35,792	14,217	61,728
Petersburg (city)	14,684	2,945	2,541	1,726	629	7,841	37	4,151	237	893	791	144
Poquoson (city)	50,233	1,603	1,034	203	39	2,879	34	795	62	39	5,736	40,689
Portsmouth (city)	29,877	4,873	7,519	3,424	1,757	17,573	1,522	578	130	152	964	8,957
Prince George	180,381	8,365	3,470	1,809	481	14,125	459	88,427	13,507	27,077	23,193	11,187
Prince William	222,506	32,700	22,408	12,867	2,872	70,846	702	91,347	4,317	32,038	14,658	6,129

Table 13-3. Acres of Land Cover by NLCD Classifications in Virginia Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Richmond (city)	40,045	10,738	9,252	7,246	3,780	31,016	222	5,934	309	256	837	1,471
Richmond	138,474	4,696	766	267	56	5,785	92	61,635	6,076	31,323	17,114	16,449
Spotsylvania	265,145	19,876	8,715	3,132	1,084	32,807	394	153,545	20,180	32,474	17,119	5,899
Stafford	179,232	17,922	9,067	3,484	1,036	31,509	696	104,340	5,584	16,587	13,312	6,687
Suffolk (city)	274,501	14,695	7,175	3,673	890	26,434	447	64,844	9,480	62,065	88,041	18,797
Surry	198,597	6,753	596	160	80	7,590	89	82,612	16,782	37,809	30,510	20,161
Virginia Beach (city)	318,398	24,097	29,300	13,538	3,952	70,887	2,678	6,762	682	25,807	49,781	158,467
Westmoreland	161,869	8,827	1,615	435	92	10,969	220	67,754	4,184	41,689	20,935	16,061
Williamsburg (city)	5,825	1,331	908	566	119	2,924	1	2,343	71	55	335	96
York	137,507	10,524	5,525	2,779	622	19,450	53	32,763	1,233	2,390	10,930	70,687
Study Area Total	**7,543,334**	**523,940**	**313,580**	**157,038**	**51,953**	**1,046,511**	**22,388**	**2,288,708**	**237,290**	**969,005**	**1,037,612**	**1,901,171**

Source: NLCD 2016a

Note: Due to the vast quantity of data involved, land cover calculations are not provided at the State or national level.

Table 13-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Virginia Study Area

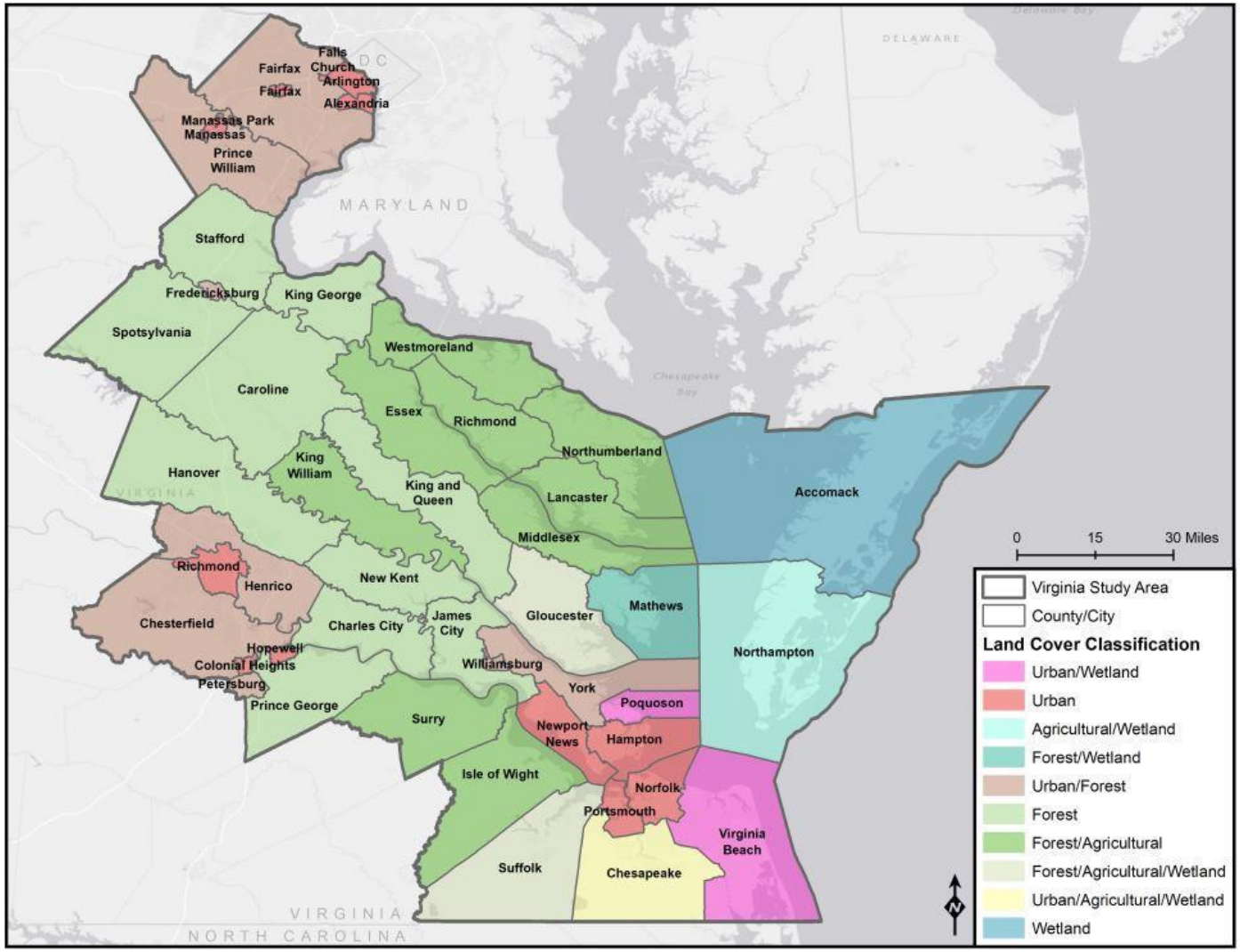
Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Accomack	4.8	1.6	0.6	0.2	7.2	1.5	9.4	0.4	27.9	52.0	Agricultural/Wetland
Alexandria (city)	15.7	29.4	33.7	12.9	91.7	0.4	5.8	0.2	0.5	0.7	Urban
Arlington	25.0	35.0	20.7	8.4	89.2	0.3	8.9	0.2	0.4	0.2	Urban
Caroline	4.0	1.0	0.3	0.1	5.3	0.1	60.1	9.5	14.0	11.0	Forest
Charles City	2.8	0.3	0.1	0.0	3.2	0.5	50.1	7.1	17.4	21.6	Forest/Wetland
Chesapeake (city)	9.3	8.7	3.9	1.2	23.1	0.1	4.4	0.5	22.2	47.9	Urban/Agricultural/Wetland
Chesterfield	17.7	8.0	3.9	1.1	30.7	0.3	51.3	3.7	5.1	7.3	Urban/Forest
Colonial Heights (city)	19.7	31.2	14.5	6.1	71.5	0.1	12.0	0.5	0.5	15.4	Urban
Essex	4.3	0.8	0.2	0.1	5.4	0.1	48.0	7.4	24.7	14.4	Forest/Agricultural
Fairfax (city)	30.1	27.4	19.2	6.7	83.3	0.0	16.4	0.2	0.0	0.1	Urban
Fairfax	25.7	19.3	9.5	2.4	56.9	0.3	35.3	0.9	1.9	4.0	Urban/Forest
Falls Church (city)	34.4	24.4	17.6	7.3	83.7	0.0	15.6	0.1	0.2	0.3	Urban
Fredericksburg (city)	17.0	24.1	20.5	6.7	68.3	0.2	23.5	1.7	2.9	3.4	Urban/Forest
Gloucester	8.4	1.5	0.5	0.1	10.4	0.2	46.9	2.9	12.7	26.8	Forest/Wetland
Hampton (city)	27.1	30.7	14.7	5.4	77.9	0.9	2.9	0.5	0.8	16.9	Urban
Hanover	7.6	2.5	1.3	0.5	12.0	0.3	50.6	5.8	19.7	11.1	Forest

Table 13-4. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Virginia Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Henrico	19.0	15.2	7.6	2.7	44.5	0.5	29.6	1.9	10.1	13.2	Urban/Forest
Hopewell (city)	21.6	30.9	14.7	8.8	76.0	0.0	12.2	0.7	0.7	10.3	Urban
Isle of Wight	5.2	1.5	0.6	0.2	7.5	0.1	33.4	4.4	31.3	22.7	Forest/Agricultural/Wetland
James City	12.1	6.3	2.6	0.6	21.6	0.1	49.9	2.2	8.0	18.2	Urban/Forest
King and Queen	3.7	0.4	0.1	0.0	4.2	0.2	58.1	8.4	17.6	11.6	Forest
King George	6.3	1.6	0.6	0.2	8.7	0.3	57.5	2.6	18.1	12.6	Forest
King William	4.1	0.6	0.2	0.1	4.9	0.1	49.5	7.0	21.5	16.9	Forest/Agricultural
Lancaster	8.8	1.1	0.4	0.1	10.4	0.2	51.8	4.9	20.8	11.9	Forest/Agricultural
Manassas (city)	28.8	33.9	21.2	8.0	91.9	0.1	4.6	0.4	2.1	0.9	Urban
Manassas Park (city)	25.7	36.1	21.1	5.7	88.6	0.1	9.8	0.8	0.6	0.0	Urban
Mathews	8.6	1.0	0.3	0.0	9.9	0.6	24.8	1.9	13.4	49.4	Forest/Wetland
Middlesex	6.8	1.4	0.4	0.1	8.7	0.2	53.5	3.8	23.1	10.7	Forest/Agricultural
New Kent	5.0	1.2	0.3	0.1	6.7	0.1	60.2	4.5	10.9	17.6	Forest
Newport News (city)	19.2	24.6	16.0	7.1	66.9	0.1	17.3	0.7	1.1	13.8	Urban
Norfolk (city)	21.0	36.9	22.2	14.1	94.2	0.5	1.9	0.1	0.1	3.1	Urban
Northampton	4.0	1.9	0.6	0.1	6.6	1.7	11.7	0.4	36.7	40.4	Agricultural/Wetland
Northumberland	7.2	0.9	0.2	0.1	8.3	0.2	46.6	3.5	29.6	11.7	Forest/Agricultural
Petersburg (city)	20.3	17.5	11.9	4.3	53.9	0.3	28.6	1.6	6.1	5.4	Urban/Forest
Poquoson (city)	16.8	10.8	2.1	0.4	30.2	0.4	8.3	0.7	0.4	60.1	Urban/Wetland
Portsmouth (city)	23.3	35.9	16.4	8.4	84.0	7.3	2.8	0.6	0.7	4.6	Urban
Prince George	4.9	2.1	1.1	0.3	8.3	0.3	52.3	8.0	16.0	13.7	Forest
Prince William	15.1	10.4	5.9	1.3	32.7	0.3	42.2	2.0	14.8	6.8	Urban/Forest
Richmond (city)	27.8	24.0	18.8	9.8	80.4	0.6	15.4	0.8	0.7	2.2	Urban
Richmond	3.8	0.6	0.2	0.0	4.7	0.1	50.5	5.0	25.7	14.0	Forest/Agricultural
Spotsylvania	7.7	3.4	1.2	0.4	12.7	0.2	59.2	7.8	12.5	6.6	Forest
Stafford	10.4	5.3	2.0	0.6	18.3	0.4	60.5	3.2	9.6	7.7	Forest
Suffolk (city)	5.7	2.8	1.4	0.3	10.3	0.2	25.4	3.7	24.3	34.4	Forest/Agricultural/Wetland
Surry	3.8	0.3	0.1	0.0	4.3	0.0	46.3	9.4	21.2	17.1	Forest/Agricultural
Virginia Beach (city)	15.1	18.3	8.5	2.5	44.3	1.7	4.2	0.4	16.1	31.1	Urban/Wetland
Westmoreland	6.1	1.1	0.3	0.1	7.5	0.2	46.5	2.9	28.6	14.4	Forest/Agricultural
Williamsburg (city)	23.2	15.9	9.9	2.1	51.0	0.0	40.9	1.2	1.0	5.8	Urban/Forest
York	15.7	8.3	4.2	0.9	29.1	0.1	49.0	1.8	3.6	16.4	Urban/Forest
Study Area Total	**9.3**	**4.2**	**2.1**	**0.7**	**13.9**	**0.3**	**30.3**	**3.1**	**12.8**	**18.4**	**Forest**

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: (NLCD 2016a)

Figure 13-10. Summary of Major Land Cover Classification for the Virginia Study Area

As shown in Table 13-5, 26 of the counties and independent cities within the Study Area are predominantly covered by forest, urban development, or both. As described previously, "Forest" land cover in the State of Virginia could range from natural forested areas to neighborhoods in suburban areas. Half of the geographic units in the Study Area are either predominantly urban (13 units), or a mix of urban and another land cover type (11 units). Geographic units with dense urban development mixed with forest tend to be those approaching Washington DC, such as at Arlington and Manassas Park. These are likely indicative of wooded suburban landscapes. Inland counties are predominantly either forest or a mix of forest and agriculture, except at the urban areas at Richmond and approaching Washington DC. Predominantly urban counties at the coast are Hampton, Newport News, Norfolk, and Portsmouth. Also, at the coast, there are several counties with a balance of urban development and either wetland, agriculture, or forest; they are Virginia Beach, Poquoson, Chesapeake, and York Counties. It appears there is room for development in or adjacent to these counties; however, the Great Dismal Swamp in Chesapeake would limit development in that county (NLCD 2016a).

Table 13-5. Major Land Cover within each County and Independent City in the Virginia Study Area

Predominant Land Cover Type(s)	Count	Geographic Units
Urban	13	Alexandria, Arlington, Colonial Heights (city), Fairfax (city), Falls Church (city), Hampton (city), Hopewell (city), Manassas (city), Manassas Park (city), Newport News (city), Norfolk (city), Portsmouth (city), Richmond (city)
Forest	8	Caroline, Hanover, King and Queen, King George, New Kent, Prince George, Spotsylvania, Stafford
Forest/Agricultural	8	Essex, King William, Lancaster, Middlesex, Northumberland, Richmond, Surry, Westmoreland
Urban/Forest	9	Chesterfield, Fairfax, Fredericksburg (city), Henrico, James City, Petersburg (city), Prince William, Williamsburg (city), York
Forest/Agricultural/Wetland	2	Isle of Wight, Suffolk (city)
Urban/Wetland	2	Poquoson (city), Virginia Beach (city)
Urban/Agricultural/Wetland	1	Chesapeake (city)
Agriculture/Wetland	2	Accomack, Northampton
Forest/Wetland	3	Charles City, Gloucester, Mathews

Source: NLCD 2016a

It is likely that future industrial development activities will be concentrated in the counties and independent cities that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.

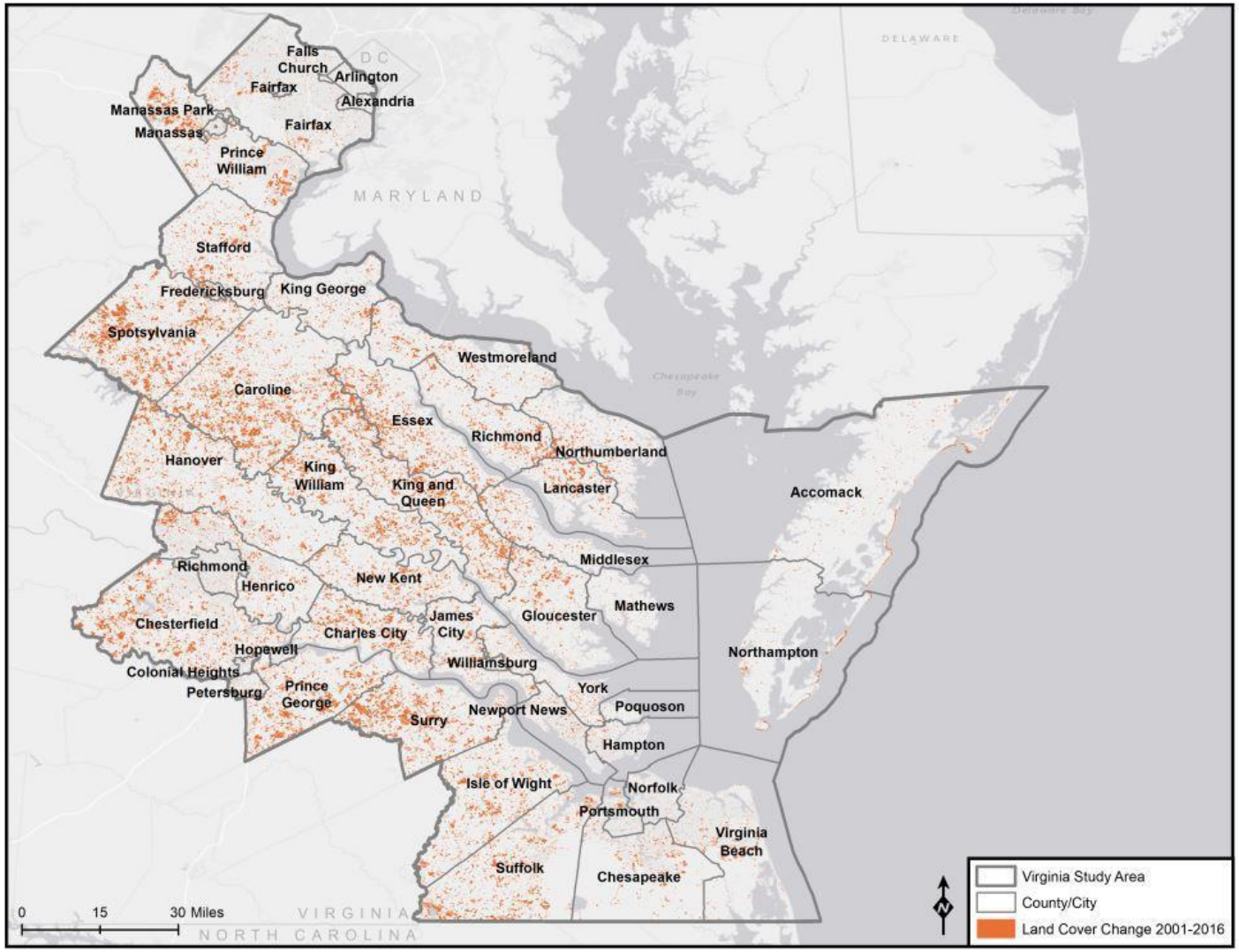
It is also likely that future industrial development would want to avoid counties such as Accomack, Matthews, and Northampton, which are much less developed and have a larger proportion of agricultural and undisturbed land covers (excluding the areas counted as open water). Similarly, future industrial development likely would not be proposed immediately adjacent to the Great Dismal Swamp NWR in Chesapeake County. Counties in the northern portion of Virginia's Chesapeake Bay area tend to have land use covers that are also predominantly non-urban and may not be conducive to industrial type projects.

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). A total of 7.7% of the land cover in the Study Area changed at least once. Figure 13-11 and Table 13-6 show the land cover change within the Study Area from 2001 to 2016. The independent city of Fredericksburg experienced the most significant land cover change at 19.1%, followed closely by King and Queen County at 18.1%. In Fredericksburg this change was largely from or to one of the developed land cover types. In King and Queen County this change was largely from or to one of the three forest classes. The independent city of Poquoson experienced the least land cover change at 0.5% followed closely by Northampton, Mathews, and Accomack Counties at 0.8% each. In Poquoson this change was largely from or to one of the developed land cover types. In all three of these counties the land cover changes were mixed, though in Northampton and Accomack Counties there were a couple of clusters specific to change from or to one of the developed classes (MRLC 2016).

Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including York, Poquoson, Newport News, Virginia Beach, Hampton, Portsmouth, and Norfolk would be the most suitable counties to accommodate future industrial coastal projects.

13.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.



Source: NLCD 2001-2016

Figure 13-11. Land Cover Change in the Virginia Study Area

Table 13-6. Land Cover Change in the Virginia Study Area

Geographic Unit	County - Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Accomack	838,426	7,013	0.8
Alexandria (city)	9,822	261	2.7
Arlington	16,706	340	2.0
Caroline	343,830	54,759	15.9
Charles City	130,716	17,667	13.5
Chesapeake (city)	224,606	7,965	3.5
Chesterfield	279,671	35,516	12.7
Colonial Heights (city)	5,002	385	7.7
Essex	183,026	24,793	13.5
Fairfax (city)	4,015	120	3.0
Fairfax	260,155	10,785	4.1
Falls Church (city)	1,310	29	2.2
Fredericksburg (city)	6,732	1,287	19.1
Gloucester	184,309	11,846	6.4
Hampton (city)	87,203	1,617	1.9
Hanover	302,573	31,419	10.4
Henrico	156,693	14,120	9.0
Hopewell (city)	6,931	439	6.3
Isle of Wight	232,209	21,622	9.3
James City	114,650	8,869	7.7
King and Queen	208,837	37,873	18.1
King George	120,173	6,596	5.5
King William	183,009	24,052	13.1
Lancaster	148,104	8,454	5.7
Manassas (city)	6,340	402	6.3
Manassas Park (city)	1,616	229	14.2
Mathews	161,258	1,219	0.8
Middlesex	134,885	7,792	5.8
New Kent	143,219	13,615	9.5
Newport News (city)	76,590	2,968	3.9
Norfolk (city)	61,697	1,010	1.6
Northampton	508,961	3,833	0.8
Northumberland	182,788	8,769	4.8
Petersburg (city)	14,684	1,343	9.1
Poquoson (city)	50,233	246	0.5
Portsmouth (city)	29,877	1,523	5.1
Prince George	180,381	27,887	15.5

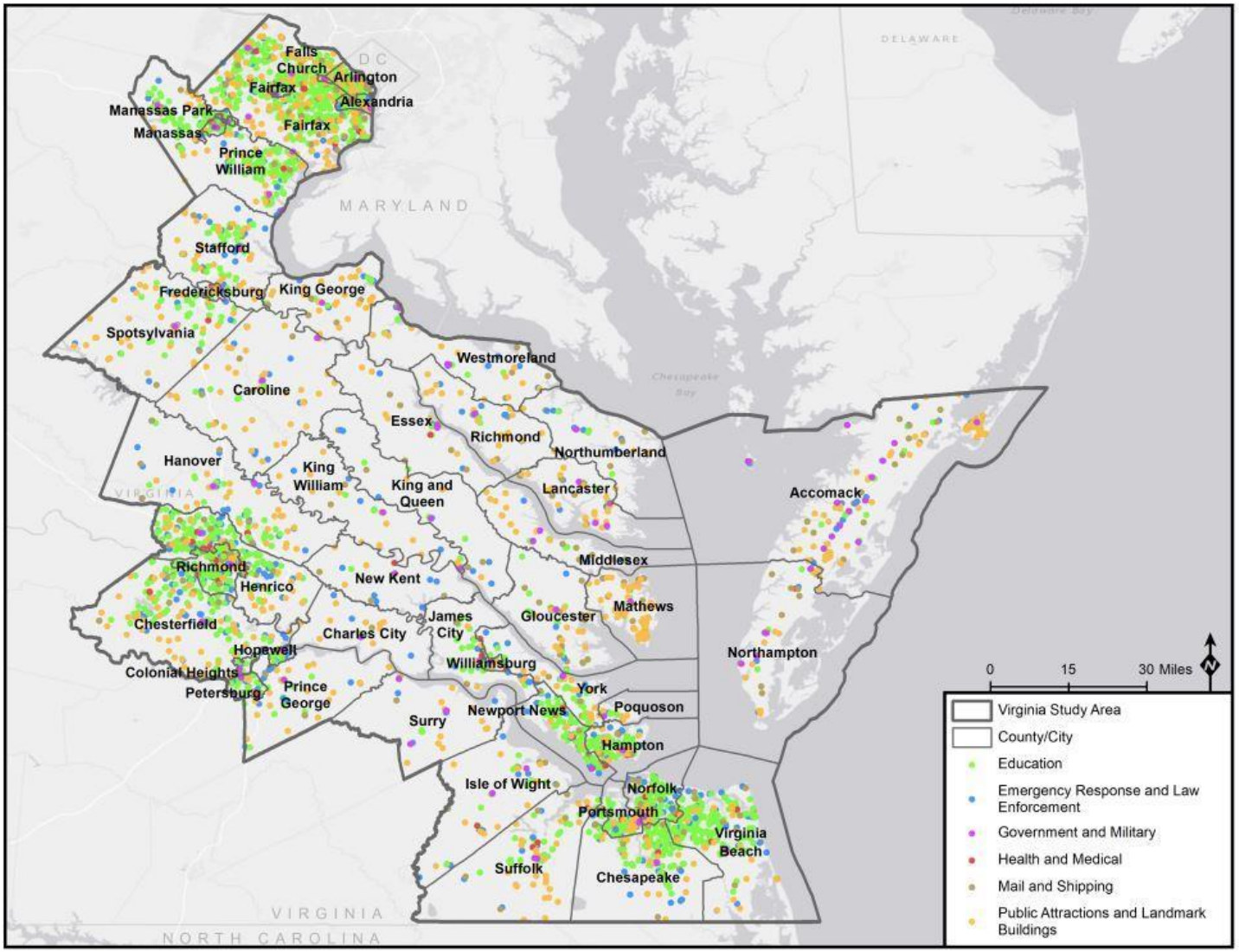
Table 13-6. Land Cover Change in the Virginia Study Area

Geographic Unit	County - Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Prince William	222,506	22,886	10.3
Richmond (city)	40,045	1,909	4.8
Richmond	138,474	13,317	9.6
Spotsylvania	265,145	44,735	16.9
Stafford	179,232	14,677	8.2
Suffolk (city)	274,501	26,880	9.8
Surry	198,597	32,198	16.2
Virginia Beach (city)	318,398	7,399	2.3
Westmoreland	161,869	10,006	6.2
Williamsburg (city)	5,825	414	7.1
York	137,507	5,000	3.6
Study Area Total	**7,543,334**	**578,086**	**7.7**

Source: NLCD 2001-2016

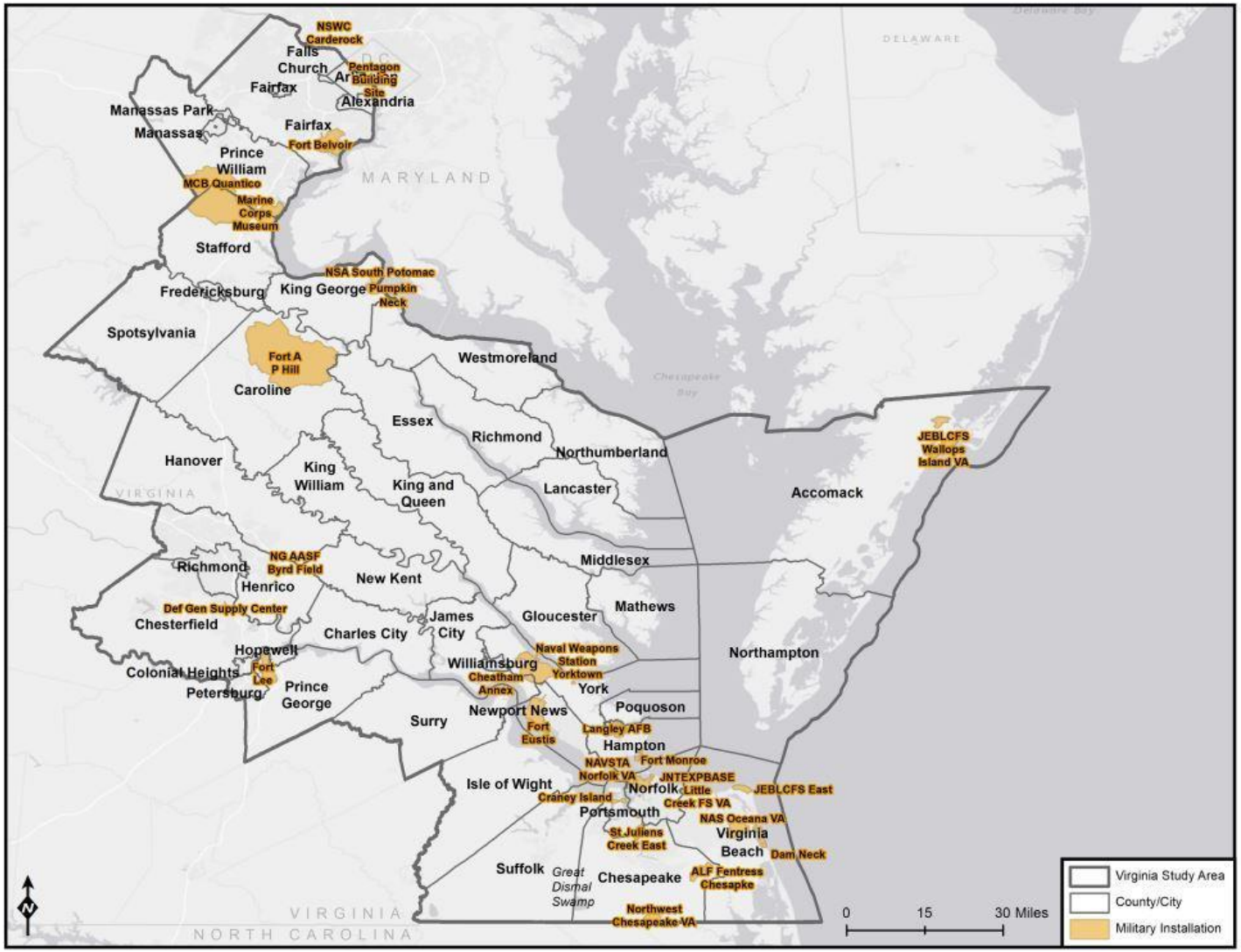
13.3.2.1 Existing and Future Land Use

The land cover data provides an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 13-12 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 13-13 shows the location of existing military installations across the Study Area. Figure 13-14 shows impervious areas across the Study Area. These Figures show the relationship between land cover analysis which identified developed areas in Chapter 13.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



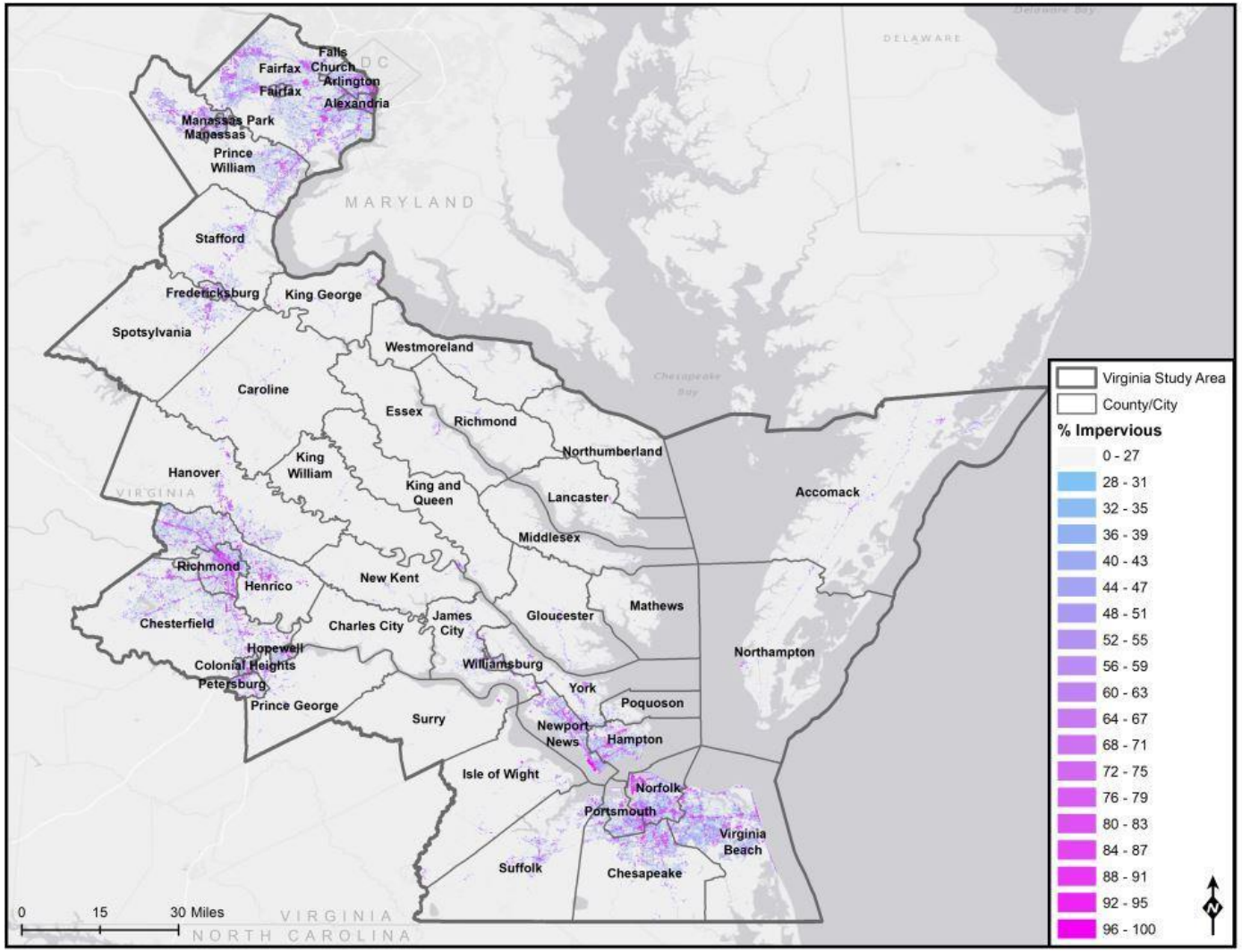
Source: USGS 2017

Figure 13-12. Select Existing Land Uses within the Virginia Study Area



Source: Data.gov 2017

Figure 13-13. Military Installations within the Virginia Study Area



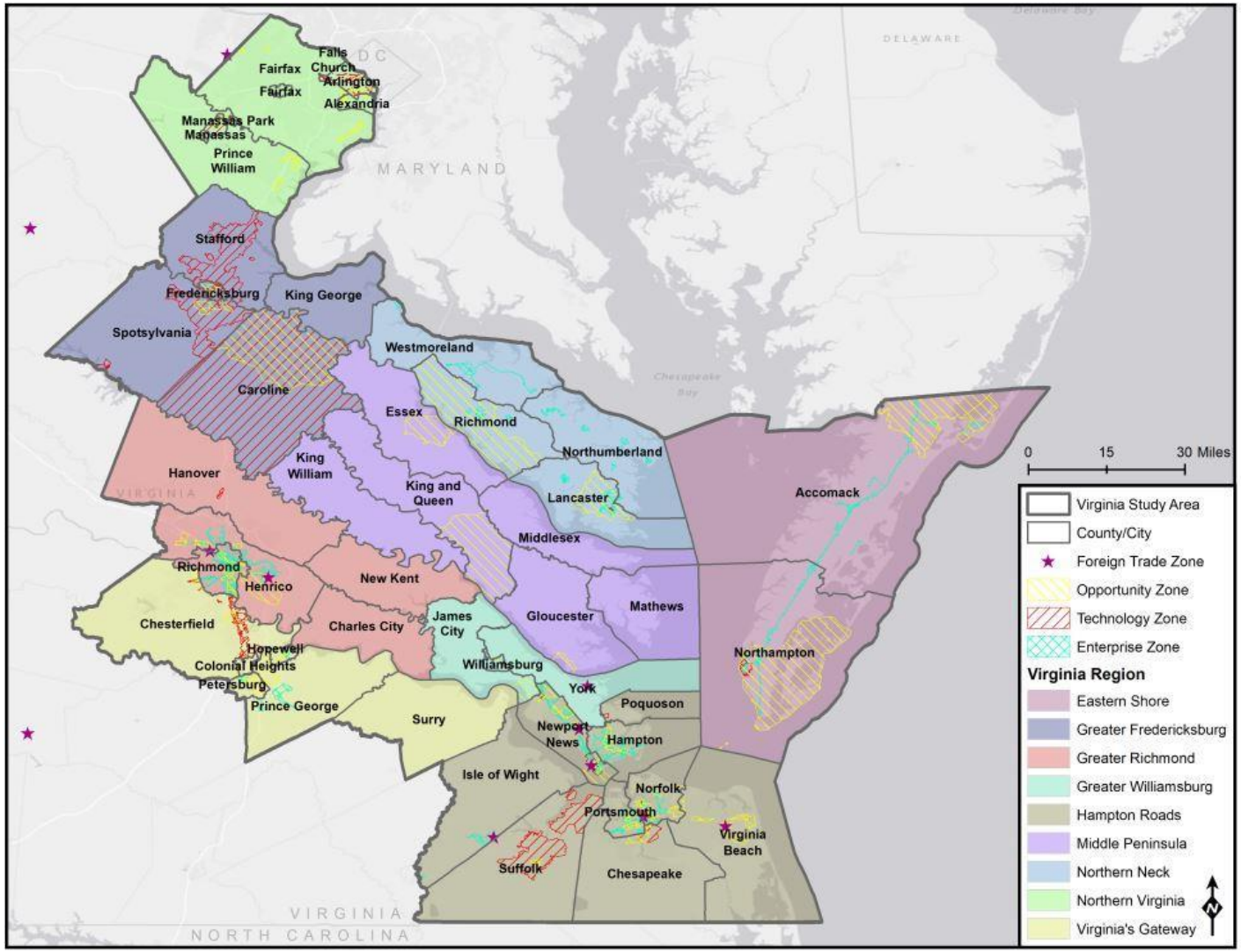
Source: NLCD 2016b

Figure 13-14. Impervious Surfaces within the Virginia Study Area

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Each county and independent city within the Study Area has developed a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as schools, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to show case future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 13.3.2.2.

In 1995, the Virginia General Assembly created the Virginia Economic Development Partnership (VEDP) to "encourage, stimulate, and support development and expansion of the Commonwealth's economy" (VEDP 2019a). To accomplish this goal, VEDP focuses on business recruitment, expansion, and international trade and operates offices in Virginia, Germany, Japan, and South Korea. VEDP creates economic opportunity through the use of marketing programs, business and product development activities, coordination of economic development organizations, economic development incentive programs, and participating in discussions associated with export of Virginia's products and services and formulation of Virginia's economic development strategies (VEDP 2019a). The VEDP has outlined regions within the Commonwealth of Virginia to help businesses interested in development within the State in their site selection process. Although these regions are defined to encourage future development, their individual characteristics help define the most common types of land use at present within these areas. Figure 13-15 shows the VEDP Regions and trade zones for the Study Area. Table 13-7 describes the identifying characteristics for each VEDP Region. The VEDP Regions and trade zones was one resource available at the scale of the Study Area that provided a description of the types of existing land uses within each region and the areas in which the regions are growing for future land use opportunities as described in Table 13-7. The VEDP is discussed in additional detail in Chapter 13.3.2.1. The trade zones shown in Figure 13-15 are targeted incentive programs that are designed to help foster future growth. These programs can be both statutory or discretionary. Additionally, certain areas of Virginia may offer financial incentives for these programs (VEDP 2019b).

Certain organizations including VEDP and the Port of Virginia have identified certain sites targeted for different uses/programs/incentives and/or designated for specific kinds of future developments. The VEDP certified sites are currently listed at https://www.vedp.org/certified-sites. The Port of Virginia sites are currently listed at http://www.portofvirginia.com/tools/interactive-site-selection/. It is assumed these websites would be maintained and updated as existing targeted sites are developed and new sites are designated. Future OCS-related projects can benefit from a review of existing targeted development sites when considering site selection. Often these targeted sites are situated in areas zoned for certain types of development, may have had some preliminary site work completed to prepare the site for development, and may have had some preliminary environmental or permitting reviews already completed to streamline future development. This can ease the site selection and project development process.



Sources: VEDP 2018a, VEDP 2018b, VEDP 2018c

Figure 13-15. Opportunity Zones and VEDP Regions and Zones in the Virginia Study Area

Table 13-7. VEDP Regions in the Virginia Study Area

VEDP Region	Description
Eastern Shore	"The Eastern Shore, historically known for agricultural and seafood production, is diversifying its economy by growing the manufacturing and service sectors, enhancing tourism infrastructure, and supporting the advancement of aerospace and small businesses."
Greater Fredericksburg	"Greater Fredericksburg is located on the Interstate 95 corridor, midway between Washington, D.C., and Richmond, offering strategic access to East Coast and international markets, a highly educated workforce, diverse economic clusters, and a lower cost of doing business."
Greater Richmond	"Richmond is Virginia's State capital, and this dynamic and culturally rich region offers residents and businesses the advantages of a growing, vibrant metropolitan area with developable acreage in suburban and rural areas." (Note: Chesterfield County is in both the Greater Richmond and Virginia's Gateway Regions.)
Greater Williamsburg	"Greater Williamsburg offers a large slice of America's early history and hosts a diverse cross-section of industries. At its core are two world-class institutions: the College of William and Mary and the Colonial Williamsburg Foundation."
Hampton Roads	"With its diverse economy and the fastest-growing port on the East Coast, Hampton Roads is a region engineered for the future of global business, offering an integrated transportation network, technical innovation, and a skilled workforce."
Middle Peninsula	"The Middle Peninsula Region honors its natural resource heritage while boasting a diverse economic base of business services, research, agriculture, aquaculture, and tourism that creates a platform for business growth."
Northern Neck	"Bordered by the Potomac and Rappahannock Rivers and Chesapeake Bay, the Northern Neck offers a rich heritage and unparalleled natural resources that have shaped the region's industry base, coupled with a reliable talent pool and a business-friendly climate."
Northern Virginia	"Northern Virginia is a major center for U.S. and foreign commerce that delivers a diverse, top-ranked workforce coupled with an integrated transportation network that facilitates continued business growth and access to global markets."
I-95 I-85 Intersection / Virginia's Gateway Region	"Just south of the State capital, Virginia's Gateway Region is a portal to commerce well-positioned for logistics/distribution and advanced manufacturing companies seeking a location easily accessible to major U.S. markets." (Note: Chesterfield County is in both the Greater Richmond and Virginia's Gateway Regions.)

Source: VEDP 2019c

Additionally, nationwide Opportunity Zones for future development have been identified as a result of the Tax Cut and Jobs act of 2017 (IRS 2019). These opportunity zones are located in economically-distressed communities. Development in these opportunity zones may be eligible for certain tax incentives, such as rolling capital gains into Opportunity Funds. The hope is that the new investment in these communities will help "seed new startups, accelerate business expansions, create jobs, increase and improve housing options, and revitalize the built environment in distressed communities across the country" (Economic Innovation Group 2019). Opportunity zones are nominated by the State in which they are located. The nomination is certified by the Secretary of the U.S. Treasury via his delegation of authority to the Internal Revenue Service (IRS 2019). Information on, and a map of, opportunity zones can be found at https://www.cdfifund.gov/Pages/Opportunity-Zones.aspx; additional information on Opportunity Zones can be found at https://eig.org/opportunityzones/facts-and-Figures. It is assumed these zones will change over time and this website would be updated accordingly. Assessment of future OCS-related projects would benefit from an understanding of these opportunity zones and the associated tax incentives.

In summary, existing land use data shows there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data

shows the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses.

The characteristics of the VEDP economic development regions are generally consistent with the land cover as described in Chapter 13.3.1. Those counties with greater urban development in the land cover tend to coincide with the more concentrated land uses, which is consistent with the economic development regions that host larger metropolitan areas, transportation networks, and industry. Those counties with a higher proportion of natural land cover and lower total land use types and diversity tend to coincide with the economic development regions that tend to support a greater proportion of natural, agricultural, and recreational resources.

Future OCS-related projects should investigate resources such as the Opportunity Zones, VEDP Certified Sites, and the Port of Virginia identified sites that have already targeted areas for potential development (see Chapter 13.3.2.3 for additional organizations). Additionally, future OCS-related project developers would benefit from consideration of local comprehensive plans (or equivalent) for the county or independent city within which they are interested in developing a new project. Counties and cities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the OCS-related project planners in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

13.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, future projects may prefer to adhere to existing zoning ordinances during project planning and development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

13.3.2.3 Industrial Incentives

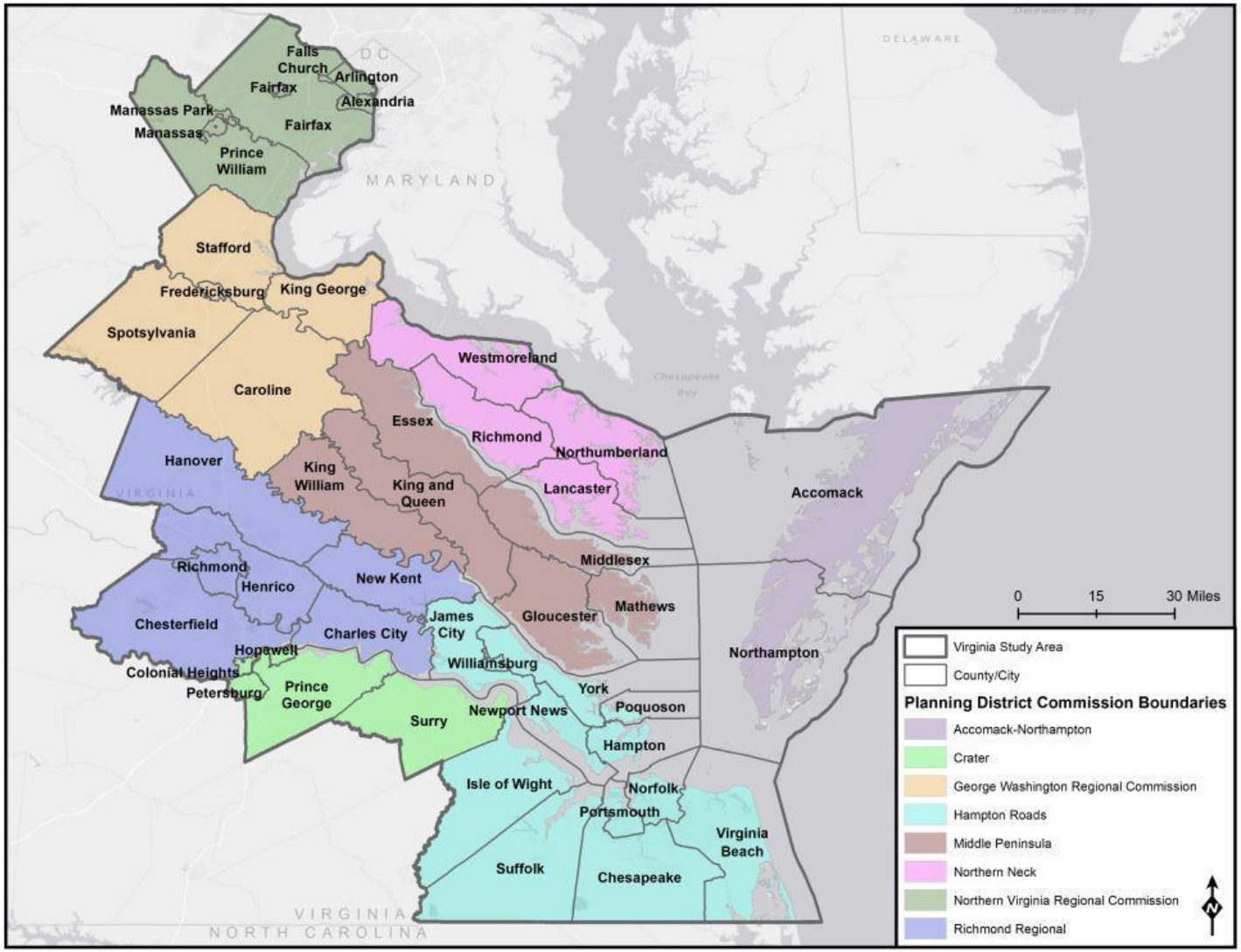
Virginia has a number of organizations dedicated to encouraging development in the Commonwealth. The VEDP creates economic opportunity through the use of marketing programs, business and product development activities, coordination of economic development organizations, economic development incentive programs, and participating in discussions associated with export of Virginia's products and

services and formulation of Virginia's economic development strategies (VEDP 2019a). VEDP's Regions are described in Chapter 13.3.2.1 and shown in Figure 13-16.

VEDP offers a variety of performance-based incentives for companies that decide to locate within Virginia. These incentive programs are designed to help reduce the costs of opening or expanding a facility. Incentive programs include discretionary incentives, financial assistance, infrastructure assistance, recruitment and training incentives, regional and local assistance, and various tax incentives (VEDP 2019b). VEDP administers the Commonwealth's Development Opportunity Fund, which awards funds to the Virginia locality (county, city, town, or applicable political subdivision) for the benefit of a company planning to build or expand in Virginia. The amount of funding is dependent on the level of "distress" within the geographic unit; thresholds for eligibility are relaxed in distressed counties. Within the Study Area, 15 geographic units are classified as Double Distressed, and nine geographic units are classified as Single Distressed (VEDP 2018e). Other specific grants and tax incentives that new facilities in the Study Area may be eligible for are available in VEDP's Guide to Incentives 2017-2018 (VEDP 2018e). Grants and incentives that may be helpful to OCS-related ventures include the following, among others:

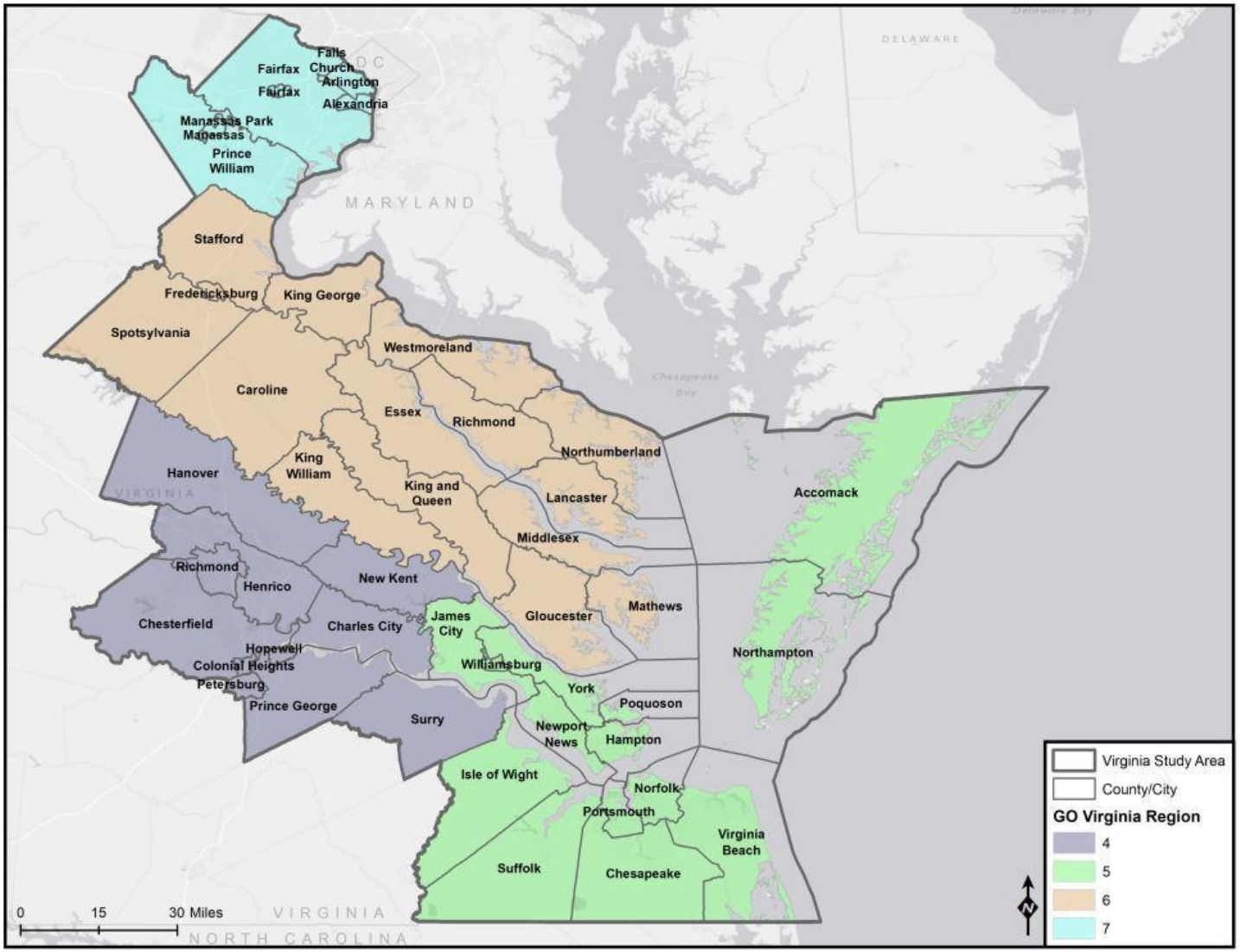
- Virginia Investment Partnership Grant
- Major Eligible Employer Grant
- Virginia Economic Development Incentive Grant
- Enterprise Zone Job Creation Grant
- Port of Virginia and Infrastructure Development Grant
- Enterprise Zone Real Property
- Investment Grant Corporate Income Tax
- Major Business Facility Job Tax Credit
- Port Volume Tax Credit
- International Trade Facility Tax Credit
- Property Tax Incentives

GO Virginia is a bipartisan, business-led economic development initiative. The purpose of GO Virginia is to "create more high-paying jobs through incentivized collaboration between business, education, and government to diversify and strengthen the economy" throughout the State. The initiative is focused on encouraging private-sector growth and job creation; encouraging collaboration between business, education, and government organizations; and for the State government to provide incentives to encourage such collaboration (Go Virginia 2019a). The GO Virginia Foundation provides and helps identify grant opportunities for projects that would help to grow Virginia's economy (Go Virginia 2019b). Figure 13-17 shows GO Virginia's economic regions.



Source: VADPC 2019

Figure 13-16. Virginia Study Area VEDP Coastal Planning Districts



Source: VEDP 2018d

Figure 13-17. GO Virginia Regions

The Virginia Maritime Association's mission is "to promote, protect, and encourage international and domestic commerce through the ports of Virginia." They advocate for growth of Virginia's maritime industry and waterborne commerce and have been in existence under various names since 1920 (VMA 2019). Figure 13-18 shows the Maritime Association's regional development organizations.

The Virginia Economic Developer's Association (VEDA) is a non-profit, non-partisan membership association for professionals interested in economic development across the Commonwealth of Virginia. The purpose of VEDA is to "increase the effectiveness of individuals involved in the practice of economic development across the Commonwealth of Virginia by encouraging cooperation, exchange of information, and professional development activities" (VEDA 2019). VEDA supports policies and growth that will lead to expanded job opportunities and improved quality of life in the State.

Both VEDP and GO Virginia are two examples of incentive opportunities designed to draw businesses to the Commonwealth of Virginia. The Virginia Maritime Association is specifically associated with bringing maritime business to the Commonwealth. The VEDA is a group of individuals interested in fostering economic development across the State. There is some overlap in the purposes of these organizations and in their regional organization. It is assumed that companies or developers that are interested in future industrial opportunities in Virginia would engage with VEDP, GO Virginia, and the Maritime Association in addition to the Opportunity Zones discussed in Chapter 13.3.2.1 and also seek out other incentive opportunities during their planning and development process for any potential project.

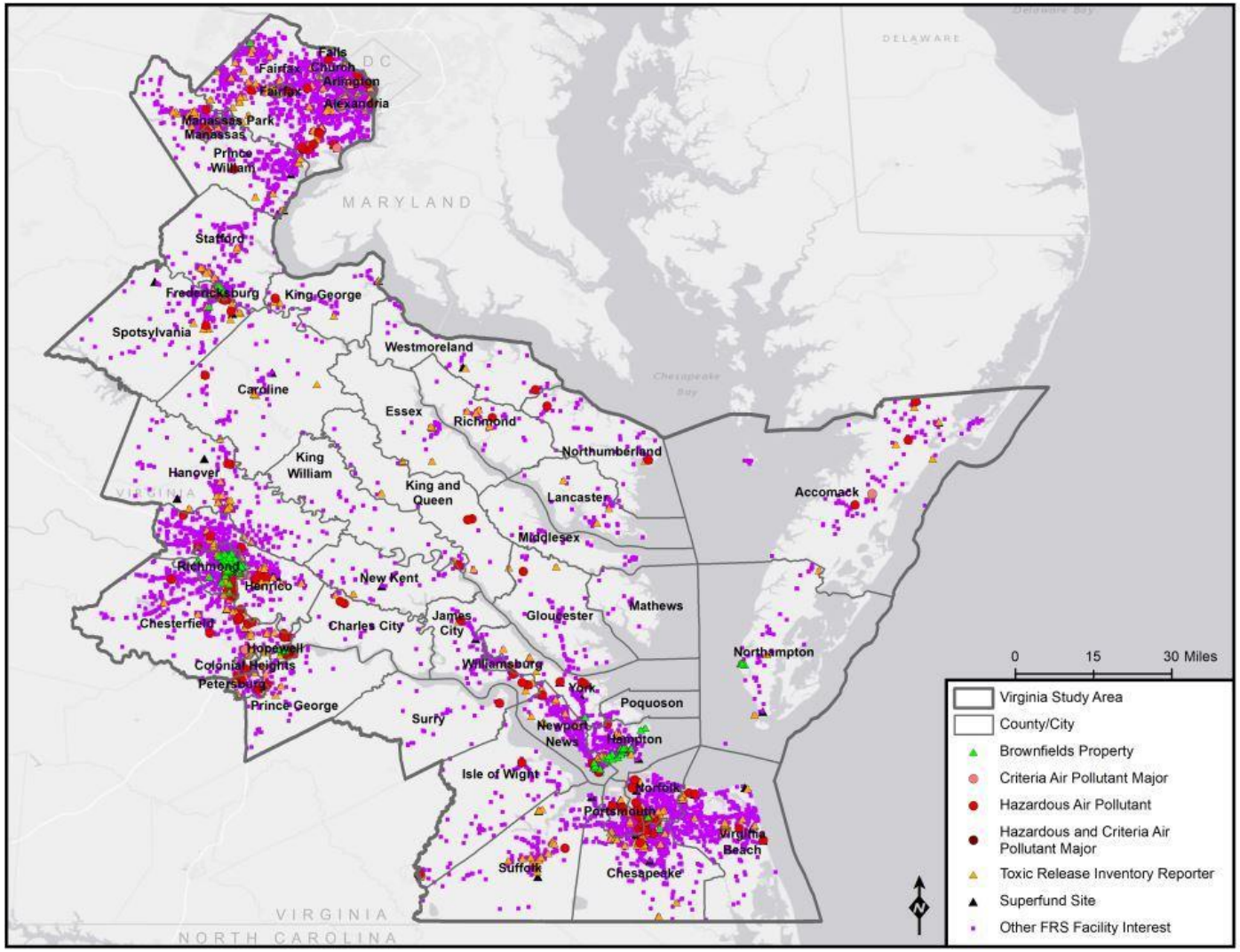
13.3.2.4 Industry

A variety of industry is present throughout the Study Area. The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 13-19 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this Figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this Figure include:

- *Brownfields Properties:* A hazardous substance, pollutant, or contaminant may be present which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major:* Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major:* Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major:* Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter:* Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site:* Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility:* Registry includes the facilities described in Chapter 1.5.2.4.

Source: VMA 2019

Figure 13-18. Virginia Maritime Association Regional Development Organizations



Source: USEPA 2018a

Figure 13-19. USEPA Facility Register Service Record for the Virginia Study Area

As described above, industrial sites are frequently concentrated in industrial zones or near other industrial properties. When purchasing property, particularly existing industrial property, developers will frequently conduct a Phase I Environmental Site Assessment to research the current and historical uses of a property and determine if the current or historic uses of the property may have impacted or pose a threat to the environment and/or human health. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties which may be similar in nature, or which may provide services relevant to the new site; therefore, a Phase I Environmental Site Assessment is often a useful evaluation to conduct during the site selection and planning process. Chapter 13.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

13.3.2.5 Protected Areas

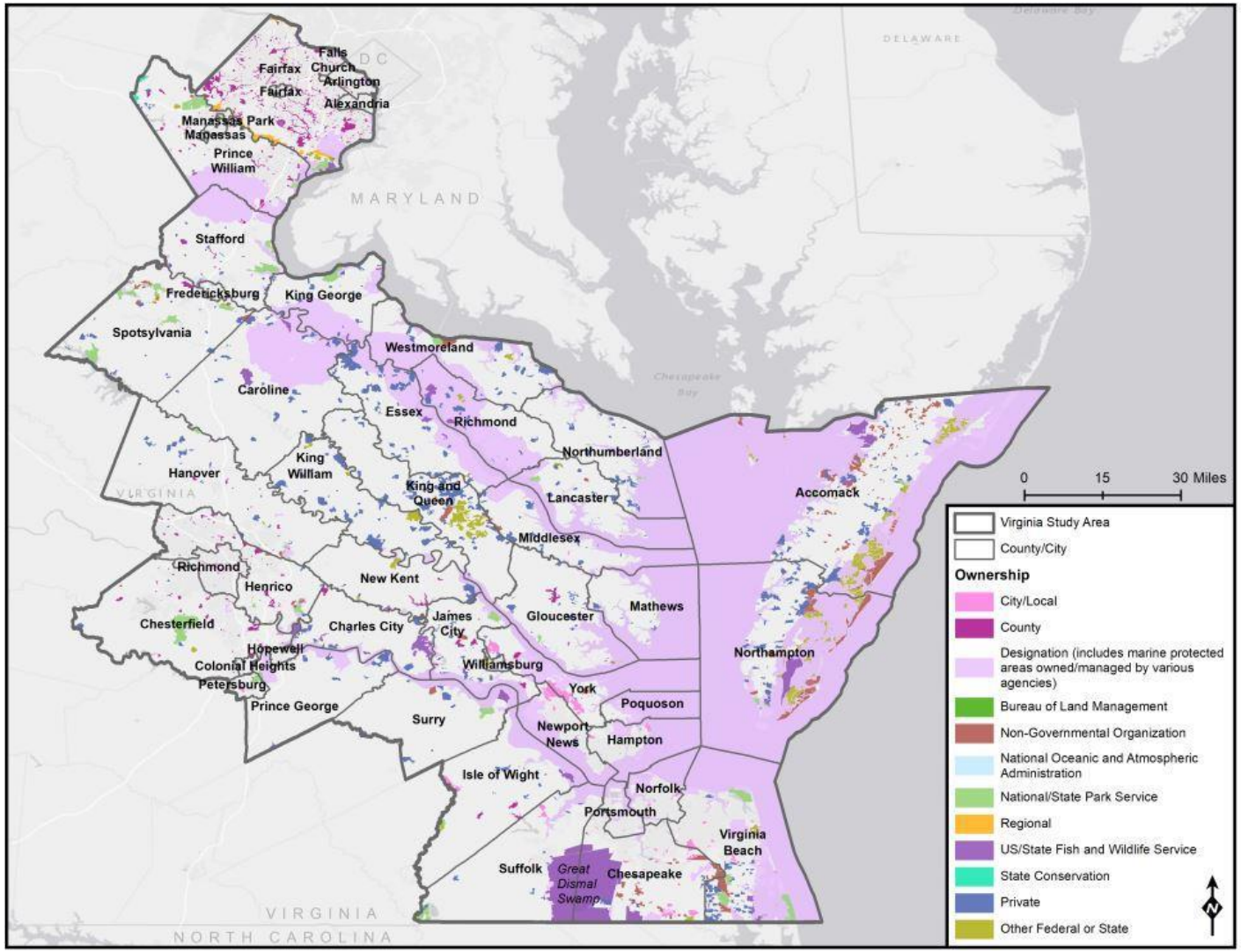
The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier, as well as to provide a more complete picture of recreational opportunities (USGS 2019f). This will also lead to a better understanding of land use change over time. Figure 13-20 presents the protected areas within the Study Area. The “designation” category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

As can be seen in Figure 13-20, much of the eastern shoreline of Accomack and Northampton counties consist of protected areas. The Chesapeake Bay is a protected area. The coastline in the southern portion of Virginia Beach is also protected. Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations.

13.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq.*, is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region now known as Virginia resided in the area long before the era of European exploration. They lived in the region as nomadic hunters and gatherers and as populations increased and regional climate improved, they settled in tribes of sedentary farmers throughout the area, primarily along riverbanks. They hunted, fished and farmed, maturing in their social systems and trade networks (Wolfe 2020). The rise of villages and the establishment of farming was also accompanied by the development of new tools and implements (Virginia Museum of History and Culture 2019). There were several different tribes in Virginia that made up the Powhatan Confederacy under Chief Powhatan, the father of Pocahontas (Nelson 2020c).



Source: USGS 2019f

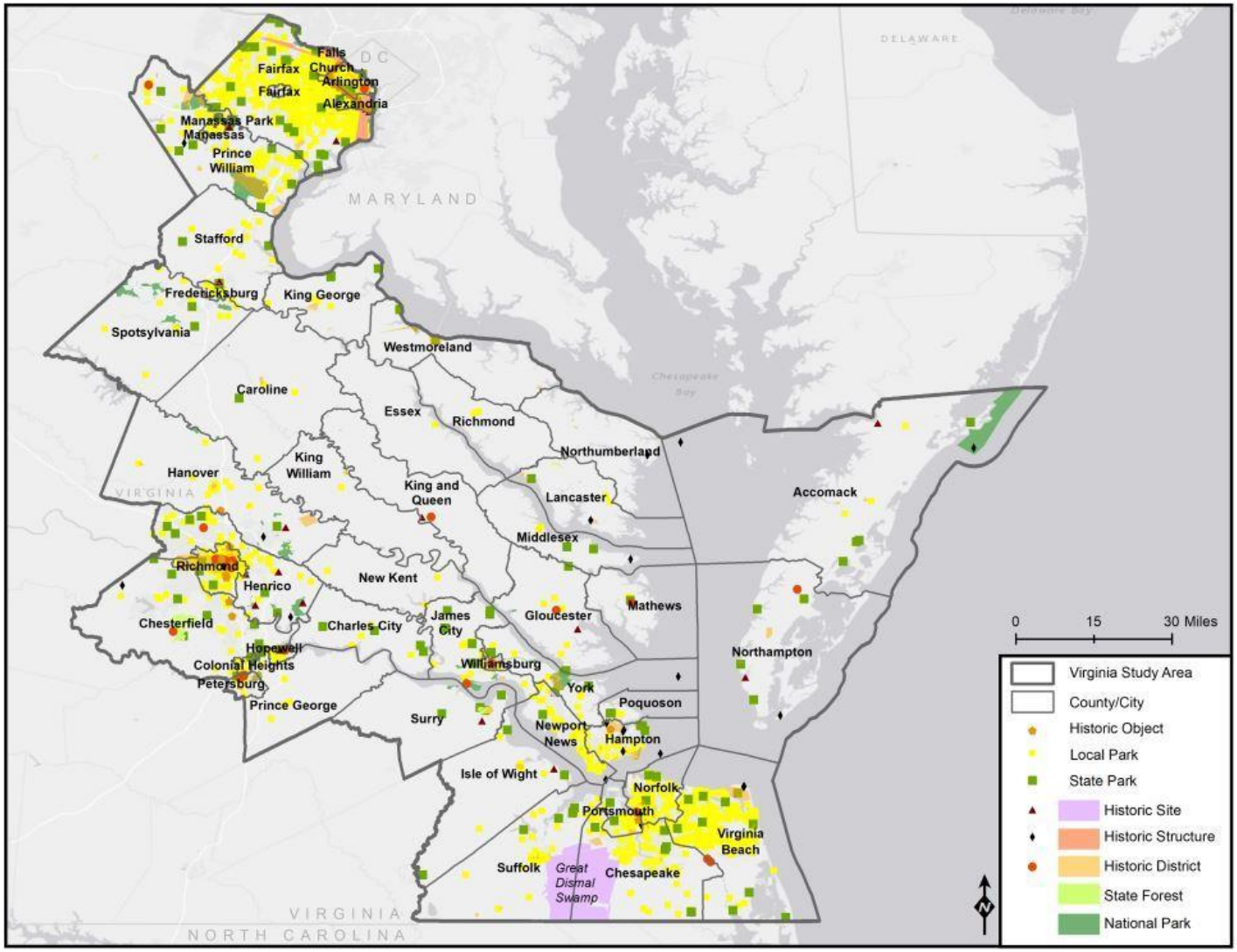
Figure 13-20. Protected Areas within the Virginia Study Area

American Indians were still living in this area when Europeans arrived. In May 1607, a group of settlers sailed to America on three ships (the *Susan Constant*, the *Godspeed*, and the *Discovery*) and founded Jamestown, the first permanent English settlement in North America, which later became the Commonwealth of Virginia (Nelson 2020c). The location was selected in part because it was not inhabited by American Indians and it was surrounded by water on three sides, making it easily defendable (NPS 2015c). Jamestown has a long history and is currently preserved as a historic site as part of the Colonial National Historic Park in Virginia (NPS 2015c). However, many settlers died from starvation and fought with the nearby Powhatan Indians. In 1608, the Powhatans captured an Englishman, John Smith, and was going to kill him. But Pocahontas stopped her father from killing John Smith, which ultimately improved the relationship between the settlers and the Powhatans (Nelson 2020d). However, the relationship between the Powhatans and settlers worsened, and Pocahontas was kidnapped in 1613. But while being held captive, Pocahontas fell in love with John Rolfe, a tobacco farmer, and married him in 1614 (Nelson 2020d). Eventually, tobacco became an important crop in Virginia, with large tobacco plantations being formed; thus, slaves were brought from Africa to work the land (Nelson 2020c).

During the Revolutionary War (1775-1783), several battles were fought in Virginia, including the Battle of Great Bridge (December 9, 1975; Norfolk County), Siege of Petersburg (April 25, 1781) and the Battle of Yorktown, which ended on October 19, 1781 (Thomas 2018). The Battle of Yorktown was important because the British army surrendered and considered a peace treaty. The peace treaty, known as the Treaty of Paris, was signed on September 3, 1783 (effective May 12, 1784), by the British and Americans in Paris. The treaty officially ended the Revolutionary War (Nelson. 2020c). Virginia became the 10th State to ratify the Constitution on June 25, 1788 (Nelson 2020c).

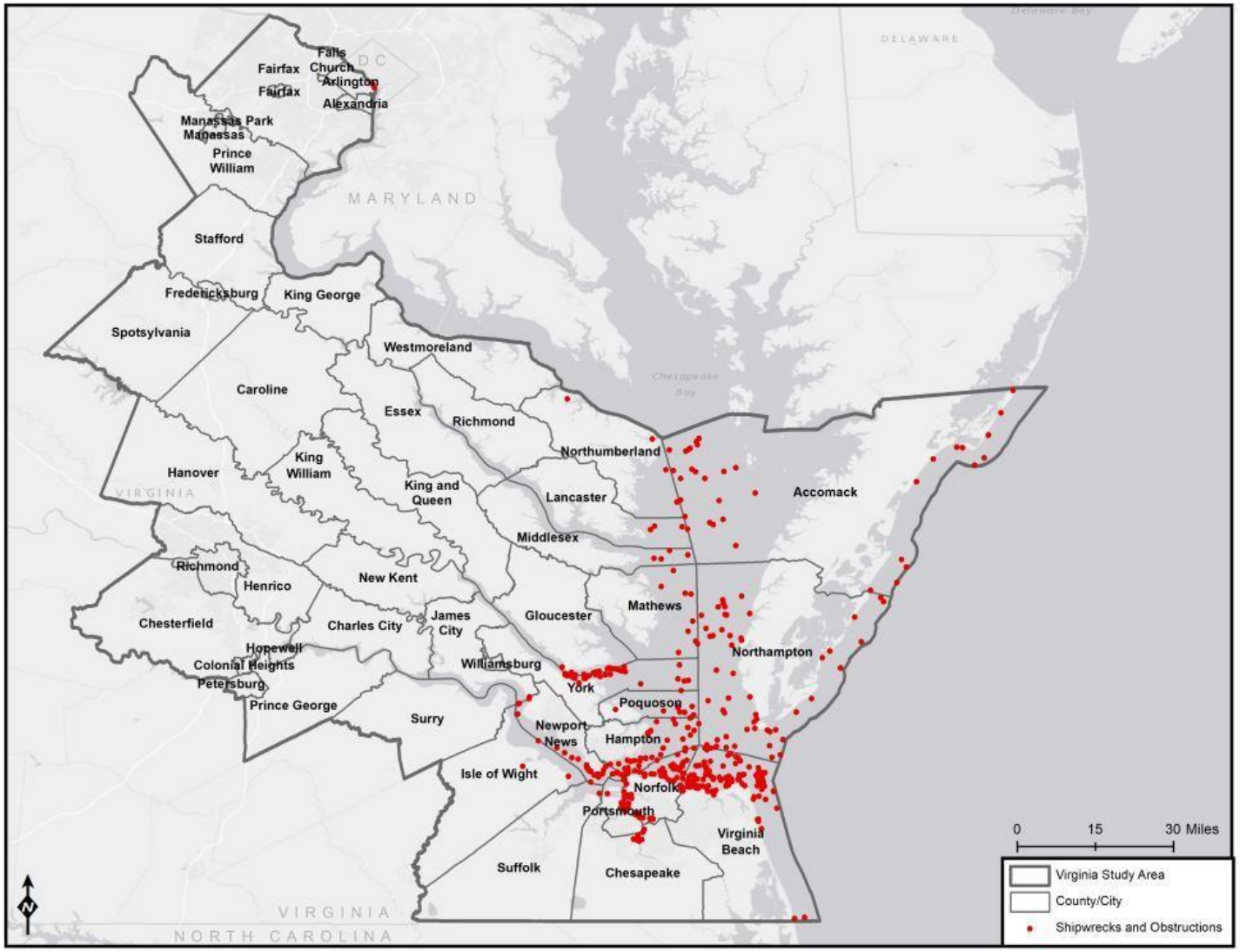
The Commonwealth of Virginia was important during the Civil War (1861-1865) because the capital of the Confederacy was in Richmond. Thus, there were more major battles fought in Virginia than any other State. Some battles include the Battles of Bull Run in Manassas (July 1861 and August 1862, Prince William County); Battle of Chancellorsville (May 1863, Spotsylvania County) which is known as General Lee's greatest victory and the most deadly battle in Virginia; and the Overland Campaign which was a series of battles fought in the Study Area between May and June 1864 (Nelson 2020c, Rhea 2014). One of the last battles of the Civil War was at the Battle of Appomattox Court House on April 9, 1865. Although the battlefield is west of the Study Area, it is an important battle in American history because it was the final battle before the Confederacy surrendered to the Union (Virginia Tourism Corporation 2020). After the Civil War, most of State needed to be rebuilt, including roads, railroads, cities, and industries (Nelson 2020c). Virginia's government restricted the rights of former slaves so it was placed under military rule until a new government could be adopted. In 1870, their new constitution, the Underwood Constitution, was adopted that included reforms of the tax system, created free public schools, and recognized the 14th and 15th amendments which allowed equal protection under the law and allowed black men the right to vote, respectively (Virginia Museum of History and Culture 2020).

Virginia's history is intimately tied to the history of the United States of America. Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with American Indians, the first English settlements, several of our first presidents of the United States, battlefields associated with the American Revolution, the War of 1812, and the American Civil War. Several sites are also associated with slavery and the abolitionist movement, the Underground Railroad; World War I and II; and the Civil Rights Movement. Dating back to the early settlements, Virginia has had a rich history associated with the tobacco and coal industries, as well as the railroad, shipping, and aerospace industries. Because of the duration of the human presence in Virginia and its proximity to the Nation's capital in Washington D.C., Virginia has an abundance of historic sites. Figure 13-21 and Figure 13-22 present a summary of many of these historic locations, including maritime sites and shipwrecks, located throughout the Chesapeake Bay or the Atlantic Ocean.



Sources: NPS 2014, USFS 2019a, VADCR 2019, VDOF 2019

Figure 13-21. Cultural and Historic Sites within the Virginia Study Area



Source: NOAA 2016a

Figure 13-22. Shipwrecks and Obstructions within the Virginia Study Area

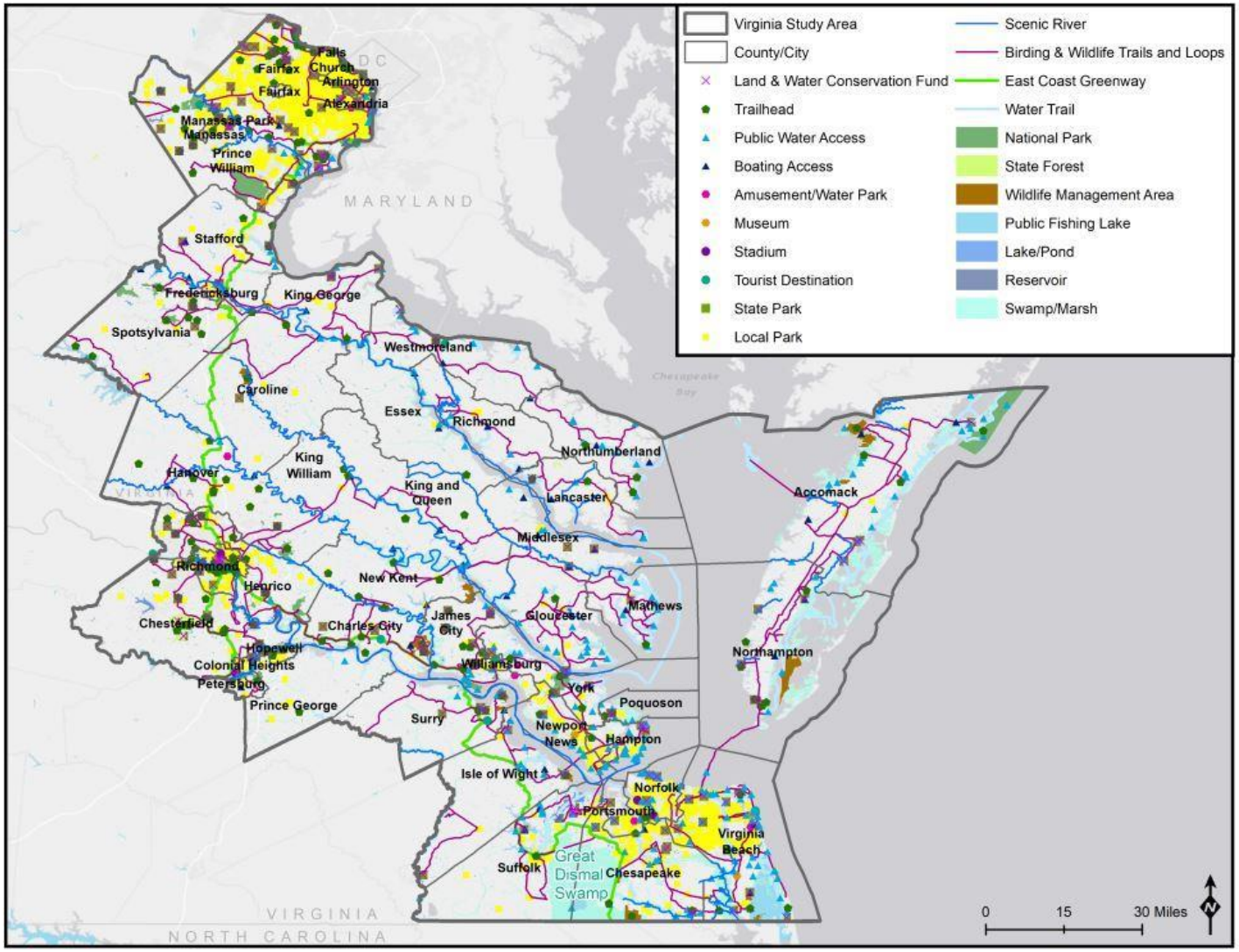
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Virginia) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for cultural and historic sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified on Figure 13-21 and Figure 13-22; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Virginia's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

13.3.2.7 Recreation

The Study Area has diverse recreational opportunities including National Parks, State Forests, Wildlife Management Areas, historical and cultural resources, national monuments, local parks, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 13-23. The cultural and historic resources shown in Figure 13-21 and Figure 13-22 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 13-20. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 13.3.2.6), transportation (Chapter 13.3.2.8), tourism employment (included in Chapter 13.4.4), and rental housing (included in Chapter 13.4.3).

Thirteen of the 15 largest cities in Virginia (Virginia Demographics 2019) are located in the Study Area. Many of these cities are destinations for tourists who enjoy beaches, National Parks, and historical monuments.



Sources: Google Maps 2019, East Coast Greenway 2019, NPS 2014, USFS 2019a, USFS 2019b, VADCR 2019

Figure 13-23. Select Recreational Resources within the Virginia Study Area

Cities of Arlington, Fairfax, and Alexandria

In the Northern Region of the Study Area are the cities of Arlington, Fairfax, and Alexandria. These cities are located within the Washington-Arlington-Alexandria, DC-VA-MD-WV Metropolitan Area and adjacent to Washington DC. These cities are very popular year-round tourist destinations; there is no peak tourist season. Arlington County was ranked Virginia's most visited locality in 2018 with tourists spending approximately $3.4 billion (Gambrell 2019). Fairfax County was the second highest contributor of expenditures to Virginia's tourism industry bringing in over $3.3 billion (Gambrell 2019). There are at least 70 annual festivals throughout the year in Virginia's Northern Region (Fun in Fairfax VA 2019). Attractions in this region of the Study Area include Arlington National Cemetery, The Pentagon, U.S. Marine Corps War Memorial, The Tomb of the Unknown Soldier, the Arlington House (memorial to Robert E. Lee), National 9/11 Pentagon Memorial, Pan Am Flight 103 Memorial, Gravely Point, Airforce Memorial, NRA National Firearms Museum, Wolf Trap National Park for the Performing Arts, and the Civil War Interpretive Center at Historic Blenheim. Parks include Mason Neck State Park, Washington and Old Dominion Railroad Regional Park, and Potomac Overlook Regional Park. Other attractions include children's museums, water parks, local parks, and other shopping and dining locations.

Prince William County and the City of Manassas

Manassas National Battlefield Park is in Prince William County and includes 5,100 acres of land, 40 miles of hiking trails, and is the site of the First Battle and Second Battle of Manassas (Bull Run) during the Civil War (NPS 2015a). In 2018, there were approximately 542,000 visitors at Manassas National Battlefield Park (NPS 2018a) and there are no entrance fees.

Prince William Forest Park is also in Prince William County. This forest is a 15,000-acre secondary growth forest that was once the Chopawamsic Recreational Demonstration Area, a recreational area designated for struggling farmers, unemployed men, and poor children during the Great Depression (NPS 2019a). In 2018, there were over 310,000 visitors to Prince William Forest Park (NPS 2018a) and entrance fees range from $7 to $15.

There are several other parks, wildlife refuges, and management areas and in Prince William County that are tourist destinations such as the National Museum of the Marine Corps, Jiffy Lube Live (outdoor amphitheater), Potomac Mills, Leesylvania State Park, IKEA, and Cabela's (Visit Prince William Virginia 2019).

Spotsylvania County and the City of Fredericksburg

Fredericksburg and Spotsylvania National Military Park, one of the largest military parks in the world at almost 8,400 acres (Virginia is for Lovers 2016). The Military Park is free to the public and includes sites of four major Civil War battles (Fredericksburg, Chancellorsville, The Wilderness, and Spotsylvania) and several related historic buildings (NPS 2019b). In 2018, over 926,000 tourists visited the Fredericksburg and Spotsylvania National Military Park (NPS 2018a).

Mid-Region (York, James City, Gloucester, Surry Counties and the City of Williamsburg)

Colonial National Historic Park, an 8,600-acre park spanning the counties of. This park includes the site of the first permanent English settlement in North America on Historic Jamestown Island and the Yorktown Battlefield, which is the site of the last major battle of the Revolutionary War (NPS 2015b). In 2018, there were over 3.3 million visitors to Colonial National Historic Park (NPS 2018a) and entrance fees range from $10 to $20 for ages 15 and older.

Both Colonial Williamsburg and Busch Gardens Williamsburg are two of the most popular tourist attractions (by attendance) in the mid-region of the Study Area.

Annual festivals in this region include the Annual Fredericksburg Fall Fairy Festival (September) in Fredericksburg and the Jazz in the Country Annual Benefit Jazz Festival (August) in King George County.

City of Richmond

In 2018, 7.7 million people visited the Greater Richmond Area (which includes the surrounding counties of Chesterfield and Hanover) and spent over $2.6 billion (Richmond Region Tourism 2019). The main attractions in Richmond are shopping, dining, landmarks and historic sites, museums, and National and State Parks. As such, this is a year-round destination with no true peak tourist season (Richmond Region Tourism 2019).

Tourist attractions include many museums such as the Virginia Museum of Fine Arts, Holocaust Museum, Museum of History and Culture, White House of the Confederacy, Edgar Allan Poe Museum, Science Museum of Virginia, American Civil War Museum, Black History Museum, the Valentine, and Children's Museum. Other popular destinations in the Richmond Region include the Maggie L Walker National Historic Site, Richmond National Battlefield Park, and Pocahontas State Park.

Annual festivals in the city of Richmond include, but not limited to, the Richmond Folk Festival (October), Church Hill Hogtober (October), Jackson Ward 2nd Street Festival (October), St. Thomas' Episcopal Church Oystoberfest (October), Richmond Folk Festival (October), Dog Fest Walk 'n Roll (October). Other annual festivals in the area include the Virginia State Fair (September) in Hanover County and the Richmond Cattle Baron's Ball (October) in Chesterfield County (everfest 2019).

Accomack and Northampton Counties (Eastern Shore).

A majority of the ocean-related jobs in both Accomack and Northampton Counties are related to tourism. Nature tourism, agri-tourism, and beach/resort tourism are popular pursuits in these counties and many small businesses provide various amenities in these areas (ICF Incorporated 2012). In these counties are several National Wildlife Management Areas and NWRs that are also considered recreational attractions. In 2016, visitors to the Eastern Shore spent almost $274 million at hotels, shops, restaurants, campgrounds, galleries, museums, and attractions (Creed 2017). Most notable in Accomack County are Assateague Island National Seashore, Saxis (and Guard Shore) Wildlife Management Area, and NASA Wallops Flight Facility Visitor Center. Assateague Island is a 37-mile-long island along the coast of Maryland and Virginia known for its herds of wild horses. In Virginia, the island is managed by the USFWS, as Chincoteague NWR (NPS 2018b). Assateague Island is open year-round for visitors to go camping, biking and hiking, canoeing and kayaking, horseback riding, and seasonal swimming. In 2018, there were 1.4 million visitors (NPS 2018a) and entrance fees range from $15 to $20. Saxis (and Guard Shore) Wildlife Management Area is a marshland of approximately 5,678 acres that is maintained to is natural state and primarily open for boating, hunting (April 1 to May 31, and September 1 through February 28) and fishing. There is little active management or development in the area (VDGIF 2019). In Northampton County, notable recreational locations include Kiptopeke State Park, Eastern Shore of Virginia NWR, Cape Charles Naturals Area Preserve, and Mockhorn Island State Wildlife Management Area. Annual festivals on the Eastern Shore include the Eastern Shore Birding Festival (October), Annual Chincoteague Volunteer Fireman's Carnival (July-August), Oyster Festival (November), Annual Chincoteague Island Pony Swim and Auction (July), Patriotic Band Concert and Ice Cream Social (July), Festive Fridays – Cape Charles (December), Artisans Guild Open Holiday Tour (November), Christmas Manor Comes to Life (December), Cape Charles Annual Oyster Roast (November), Annual Holiday Tree Lighting Ceremony (December), "Savor the Season" Progressive Home Tour (December), Old-Fashioned Christmas Parade in Chincoteague (December), Christmas Homes and Tour Music Festival (December), New Year's Eve Pony Island Horseshoe Drop and Costume Promenade (December), Death By Chocolate Scavenger Hunt (February), Annual Chincoteague Easter Decoy and Art Festival (March-April), Historic

Garden Week (April), Annual Chincoteague Seafood Festival (May), and Clean the Bay Day on Onancock Creek (June) (visitesva.com 2019).

Cities of Virginia Beach, Norfolk, Portsouth, Chesapeake, Newport News, Hampton, and Suffolk (Southern Coast)

On the southern coast of the Study Area, tourists travel to the city of Virginia Beach and the surrounding cities of Norfolk, Portsouth, Chesapeake, Newport News, Hampton, and Suffolk. Virginia Beach is largest city in Virginia as well as the top vacation destination in Virginia. Tourism in Virginia Beach is a $2.45 billion industry with nearly 10.1 million overnight visitors each year with the peak season beginning in late May through early September (Visit Virginia Beach 2019, U.S. News Travel 2019). Visitors enjoy the miles of beaches along the coast, as well as the 9,250-acre Back Bay NWR in Chesapeake County (USFWS 2016a). Tourists can visit State parks (False Cape State Park and First Landing State Park), walk along the beach and boardwalk, and go sailing, canoeing, kayaking, and fishing. Specific attractions include the Virginia Aquarium, Norfolk Botanical Garden, Virginia Zoo, Military Aviation Museum, Norfolk Naval Shipyard, Harbor Park Stadium (minor league baseball), and Virginia Living Museum. There are also several fun parks, water parks, golf courses, mini golf courses, outlet malls, and hundreds of options for dining and shopping. A majority of ocean-going jobs are related to tourism in Virginia Beach (ICF Incorporated 2012). Annual festivals in the Virginia Beach Region include the Ella Fitzgerald Music Festival (April) in the city of Newport News; Virginia International Tattoo Festival (April), Norfolk Harbor Fest (June), and Norfolk NATO Festival (April) in the city of Norfolk; PANorama Caribbean Music Festival (May), American Music Festival (September), Oceana Air Show (September), Pungo Strawberry Festival (May), Stars and Stripes Explosion (July), Neptune Festival (September), East Coast Surfing Championship (August), and Holiday Lights at the Beach (November-December) in Virginia Beach; Hampton Bay Days (September) in Hampton County; and 100 Miles of Light (November-January) spanning Hampton, Newport News, Norfolk, Portsmouth, Richmond, Virginia Beach, and Williamsburg (Top Events USA 2014a). There are also several fishing tournaments including the Double Clutch Bass Fishing Tournament in Virginia Beach.

Spanning Suffolk and Chesapeake Counties is the Great Dismal Swamp NWR. This refuge is 112,000 acres of forested wetlands and a 3,100-acre lake (Lake Drummond) (USFWS 2019b). Visitors can go hiking, biking, hunting in October and November for black bear and white-tailed deer, fishing, boating, and observe wildlife. It was also designated as an important landmark on the National Underground Railroad Network to Freedom (USFWS 2019k).

Summary

In summary, there are many recreational activities within the Study Area found in areas along the coast, as well as inland, natural settings, urban settings, parks/greenspaces, and built attractions. Activities in the northern region (Fairfax, Arlington, and Alexandrea) and Richmond area of the Study Area tend to be related to national monuments, historical landmarks and museums, and dining and shopping. There is no official peak season for tourism to these regions so it is likely that travel costs (e.g., hotels) will be consistent year-round. However, peak travel to the eastern shore (Accomack and Northampton Counties) and Virginia Beach Region occurs between Memorial Day and Labor Day because the beaches and water-related activities are the primary attractions. Therefore, travel costs will be higher during the summer months in this portion of the Study Area. Also, there are several annual festivals and events that occur through the Study Area, especially in Virginia Beach, Richmond and northern Virginia (Fairfax, Alexandria, and Arlington). Therefore, future analysis should consider the potential impacts on these events and attractions during the planning phase and site selection process. Local information on additional attractions and events should also be considered by checking relevant city and county tourism websites and event pages.

13.3.2.8 Transportation Resources

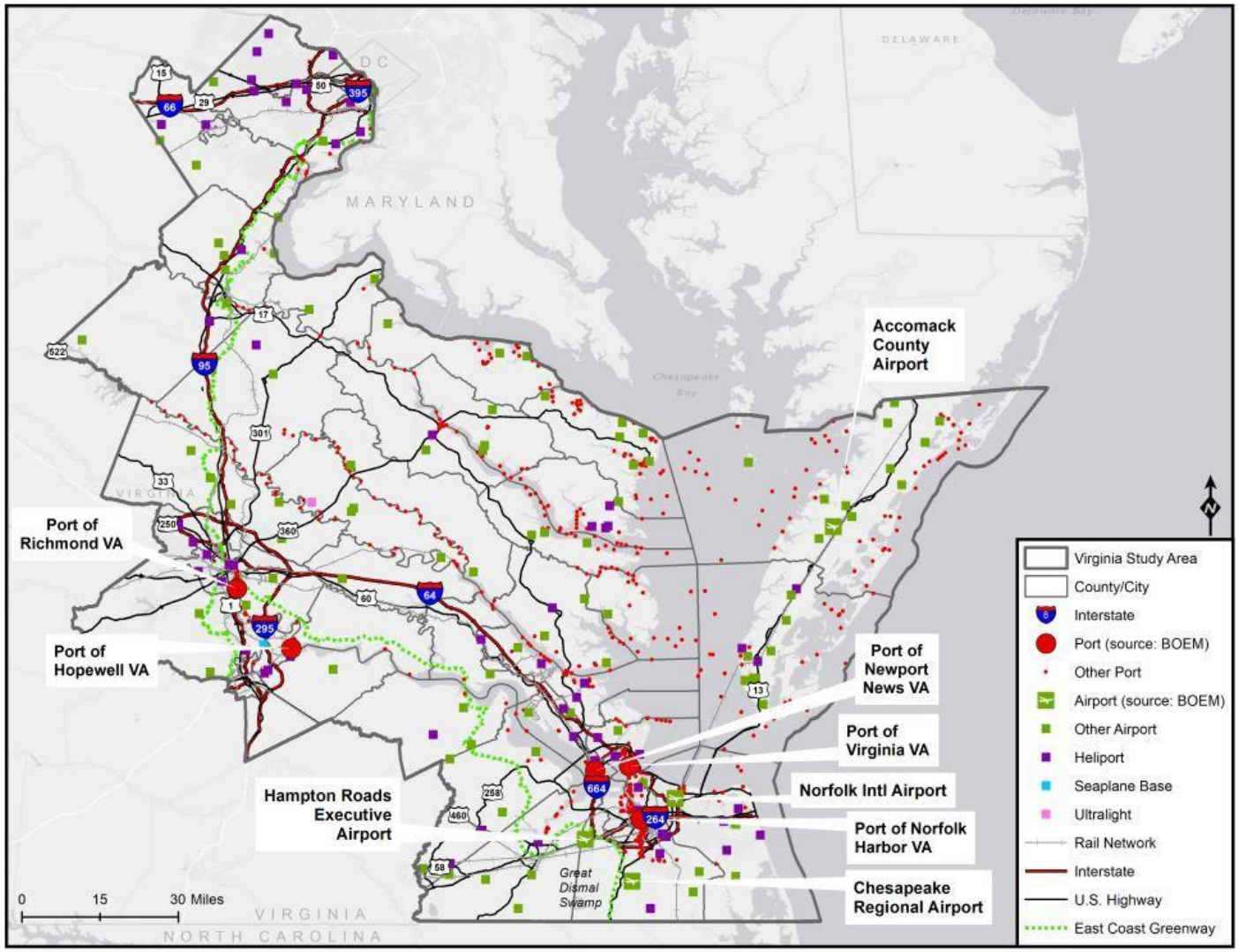
There are a variety of transportation resources throughout the Study Area, including major Interstate and State highways; national, international, regional, and local public airports; interstate railroads and some local railroad spurs; and ports. Figure 13-24 shows the transportation resources throughout the Study Area.

Surface transportation routes throughout the Study Area are largely driven by the region's unique geography. One major national and State highway (US-13/SR-175) traverses roughly north to south along the spine of the Eastern Shore, and a railroad parallels this highway. On the northern end, this highway and the railroad cross the border into the Maryland Eastern Shore area from which travelers can continue north and reach mainland areas via either US-50 to Annapolis or continue moving north to Wilmington, Delaware at the northern end of the peninsula. On the southern end of the Virginia Eastern Shore peninsula, US-13/SR-175 and the railroad traverse separate bridges over the Chesapeake Bay connecting to Virginia Beach and other mainland areas. Therefore, surface transportation within the Eastern Shore peninsula is somewhat more limited than other areas within the Study Area.

There are two major interstate corridors on the mainland portion of the Study Area: I-64 connects the Virginia Beach/Norfolk area to Richmond and points west, and the I-95/I-85 corridor runs roughly north/south bisecting much of the mainland portion of the Study Area. A number of national and State highways also crisscross the region as shown in Figure 13-24. Surface transportation routes in other portions of the Study Area are also guided by local geography, specifically the Chesapeake Bay, four major rivers, and the Great Dismal Swamp NWR. The Rappahannock, York, and James Rivers flow generally from the northwest to southeast into the Chesapeake Bay within the Study Area. The Potomac River is located immediately adjacent to the Study Area and roughly parallels the other rivers within the region. The size of these rivers limits the number of bridge crossings providing access to points along either bank. On the southern end of the Study Area the Great Dismal Swamp NWR straddles the border with North Carolina, and transportation resources in the vicinity are routed around this resource due to both the wetland ecosystem and the general transportation restrictions associated with national parks.

Waterways and ports are a significant part of the transportation and commerce network in Virginia. Ports throughout the Study Area are centers of import goods which are then distributed throughout the U.S. and export of goods produced in the U.S. that are then transported to global destinations. Waterways also serve as transportation routes for passenger travel to local, State, national, and international destinations.

Any potential future development will depend on the integrated transportation network during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways, or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. However, existing ports within the Study Area (see Figure 13-24) are expected to be large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.



Sources: VGIN 2019, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 13-24. Transportation Resources within the Virginia Study Area

A potential transportation constraint within the Study Area is associated with vulnerabilities (see Chapter 13.2.2) related to recurrent flooding in Tidewater and Eastern Shore localities along with existing and projected congestion. Tidewater Virginia includes all of the counties and independent cities within the Study Area. The Eastern Shore consists of two counties (Accomack and Northampton) on the Atlantic coast detached from the Virginia mainland. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in seal level and an increase in the frequency and intensity of large storm systems). Flooding in tunnels and near bridges is of concern, since road closures in these areas can be a hindrance to evacuation and emergency services. Coastal Virginia's unique geography (a series of peninsulas connected by bridges and tunnels) means that there are few alternative routes, and that a closure on a main road can result in long and complicated detours (VIMS 2013).

Existing and projected traffic and congestion is another transportation constraint within the Study Area. Transportation congestion is especially problematic in Northern Virginia in Prince William County along the I-95 corridor and in the southern portion of the State in Norfolk and Hampton counties, especially in the rapidly growing Hampton Roads Region. In addition to congestion that results from local and regional commuter traffic there is also congestion associated with freight truck and rail bottlenecks. Some of this freight congestion has the potential to be relieved through the Maritime Administration Marine Highway Program, which has the goal to expand the use of navigable waterways and partly serve as extensions of the surface transportation system, which can provide relief to landside corridors suffering from congestion (MARAD 2019a). A portion of Marine Highway M-95 is located within the Study Area and includes the Atlantic Ocean coastal waters, Atlantic Intracoastal Waterway, and connecting commercial navigation channels, ports, and harbors. A major project within the Study Area is the Wallops Island M95 Intermodal Barge Service, which will expand short sea shipping near Virginia Space's Mid-Atlantic Regional Spaceport at the Wallops Flight Facility on the Eastern Shore (MARAD 2019b).

13.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area varies greatly. Land cover equates closely with actual land use. Typically, as would be expected, the metropolitan areas are primarily comprised of developed land uses (developed open space, developed low intensity, developed medium intensity, or developed high intensity). The developed high-intensity areas are the urban downtown centers where there are higher concentrations of impervious surfaces, more buildings, more development, and more transportation resources (road, rail, air, and port). Areas with a larger population size also tend to have a larger surface area covered by developed land uses and tend to have more advanced transportation networks or serve as transportation hubs. There are higher concentrations of business, commercial, and industrial facilities near the metropolitan centers as would be expected. Suburban areas may be a mix of developed and other land cover types. In the Study Area, forest is a common land cover type in suburban areas.

The Virginia Eastern Shore and the counties distributed along the northern portion of the Chesapeake Bay tend to have more natural and/or agricultural land cover. Correspondingly, there are fewer and smaller urban areas, more limited transportation resources, and a more diffuse distribution of business, commercial, and industrial facilities in this part of the Study Area.

All the counties and independent cities within the Study Area have future land use plans, and many have zoning ordinances. These future land use plans and ordinances often consider preservation of existing protected areas, cultural and historic areas, and recreation resources and may plan for expansion of such land uses in the future. Additionally, the entirety of the Study Area is located within the Virginia CZM program; all counties and independent cities within the Study Area are part of one of the Virginia CZM planning district commissions. Future development will need to be consistent with existing future land use plans, existing zoning ordinances, and would need to be consistent with all CZM enforceable policies.

There are several organizations that support economic development and are designed to help draw businesses to the Commonwealth of Virginia. These organizations are presumably experienced in helping businesses coordinate with local and State governments and regulatory bodies during the project planning and site selection phases. Coordination with such organizations would be beneficial to both project developers and the local community. Projects that are consistent with planned future development and project developers interested in working in partnership with the communities during the planning and siting process to minimize potential impacts will receive more support for a potential project.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternative sites may have lesser impacts to these areas.

There are a variety of transportation resources throughout the Study Area, including major Interstate and State highways; national, international, regional, and local public airports; interstate railroads and some local railroad spurs; and ports. Any potential future development will depend on the integrated transportation network during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site selection process.

13.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

13.4.1 Population

After decades of rapid growth, the Commonwealth of Virginia's population is increasing, but at a slower rate than previously. According to the USCB, the Commonwealth's estimated population was 8.3 million in 2017. As shown in Table 13-8, the population of Virginia grew 4.4% since the 2010 Census, having added approximately 364,928 people. During the same period, the population of the U.S. grew just 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Table 13-8. 2010 and 2017 Total Population and Population Projections Through 2040 in the Virginia Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Central	Caroline	28,545	29,889	30,740	34,821	38,372	4.7	28.4
	Charles City	7,256	7,022	6,982	6,941	6,816	-3.2	-2.9
	Chesterfield	316,236	335,594	353,841	396,647	433,508	6.1	29.2
	Hanover	99,863	103,218	109,244	119,360	127,755	3.4	23.8
	Henrico	306,935	324,073	332,103	363,259	389,173	5.6	20.1
	King William	15,935	16,329	17,167	19,011	20,576	2.5	26.0
	New Kent	18,429	20,523	23,474	28,104	32,272	11.4	57.2
	Prince George	35,725	37,704	37,613	39,408	40,674	5.5	7.9
	Colonial Heights (city)	17,411	17,582	17,631	17,766	17,680	1.0	0.6
	Hopewell (city)	22,591	22,353	22,852	22,781	22,433	-1.1	0.4
	Petersburg (city)	32,420	32,037	31,671	30,166	28,328	-1.2	-11.6
	Richmond (city)	204,214	220,892	232,533	245,483	255,094	8.2	15.5
	Total Central	***1,105,560***	***1,167,216***	***1,215,851***	***1,323,748***	***1,412,680***	***5.6***	***21.0***
Eastern	Accomack	33,164	32,840	32,754	29,292	25,558	-1.0	-22.2
	Essex	11,151	11,083	10,725	11,019	11,171	-0.6	0.8
	King and Queen	6,945	7,052	6,953	7,033	7,024	1.5	-0.4
	Lancaster	11,391	10,848	10,916	10,452	9,871	-4.8	-9.0
	Middlesex	10,959	10,710	10,897	11,280	11,515	-2.3	7.5
	Northampton	12,389	11,998	11,778	10,949	10,008	-3.2	-16.
	Northumberland	12,330	12,254	12,047	11,789	11,393	-0.6	-7.0
	Richmond	9,254	8,873	9,141	9,206	9,157	-4.1	3.2
	Westmoreland	17,454	17,596	18,047	18,467	18,649	0.8	6.0
	Total Eastern	***125,037***	***123,254***	***123,258***	***119,488***	***114,347***	***-1.4***	***-7.2***

Table 13-8. 2010 and 2017 Total Population and Population Projections Through 2040 in the Virginia Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Hampton Roads	Gloucester	36,858	37,035	37,343	38,181	38,530	0.5	4.0
	Isle of Wight	35,270	36,090	38,060	41,823	44,977	2.3	24.6
	James City	67,009	73,028	78,016	92,210	104,915	9.0	43.7
	Mathews	8,978	8,830	8,665	8,277	7,796	-1.6	-11.7
	Surry	7,058	6,670	6,501	6,282	5,992	-5.5	-10.2
	York	65,464	67,196	69,582	75,492	80,327	2.6	19.5
	Chesapeake (city)	222,209	235,410	249,244	270,506	287,913	5.9%	22.3
	Hampton (city)	137,436	136,255	135,530	127,842	118,777	-0.9%	-12.8
	Newport News (city)	180,719	180,775	181,581	179,752	175,762	0.0%	-2.8
	Norfolk (city)	242,803	245,752	246,881	249,889	249,753	1.2%	1.6
	Poquoson (city)	12,150	12,022	12,382	12,635	12,726	-1.1%	5.9
	Portsmouth (city)	95,535	95,536	95,027	90,715	85,397	0.0%	-10.6
	Suffolk (city)	84,585	88,057	94,733	109,424	122,402	4.1%	39.0
	Virginia Beach (city)	437,994	450,057	457,699	467,187	470,700	2.8%	4.6
	Williamsburg (city)	14,068	14,817	15,463	17,008	18,306	5.3%	23.5
	Total Hampton Roads	***1,648,136***	***1,687,530***	***1,726,708***	***1,787,223***	***1,824,272***	***2.4%***	***8.1***
Northern	Arlington	207,627	229,534	249,298	274,339	295,383	10.6	28.7
	Fairfax	1,081,726	1,142,004	1,162,504	1,244,025	1,308,224	5.6	14.6
	King George	23,584	25,564	26,429	31,053	35,180	8.4	37.6
	Prince William	402,002	450,763	478,134	571,844	656,178	12.1	45.6
	Spotsylvania	122,397	130,159	136,192	158,025	177,369	6.3	36.3
	Stafford	128,961	141,159	154,093	183,161	209,250	9.5	48.2
	Alexandria (city)	139,966	154,710	166,261	182,067	195,240	10.5	26.2

Table 13-8. 2010 and 2017 Total Population and Population Projections Through 2040 in the Virginia Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Northern (continued)	Fairfax (city)	22,565	23,580	25,047	26,397	27,388	4.5	16.1
	Falls Church (city)	12,332	13,843	14,988	17,032	18,815	12.3	35.9
	Fredericksburg (city)	24,286	28,135	29,403	34,015	38,094	15.8	35.4
	Manassas (city)	37,821	41,379	43,099	46,332	48,916	9.4	18.2
	Manassas Park (city)	14,273	16,117	17,086	20,284	23,153	12.9	43.7
	Total Northern	***2,217,540***	***2,396,947***	***2,502,534***	***2,788,575***	***3,033,189***	***8.1***	***26.5***
	Study Area Total	**5,096,273**	**5,374,947**	**5,568,351**	**6,019,034**	**6,384,488**	**5.5**	**18.8**
	Virginia	**8,001,024**	**8,365,952**	**8,655,021**	**9,331,666**	**9,876,728**	**4.6**	**18.1**
	United States	**308,745,538**	**321,004,407**	**332,639,000[4]**	**355,101,000[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - UVA 2019d; 4 - USCB 2018b

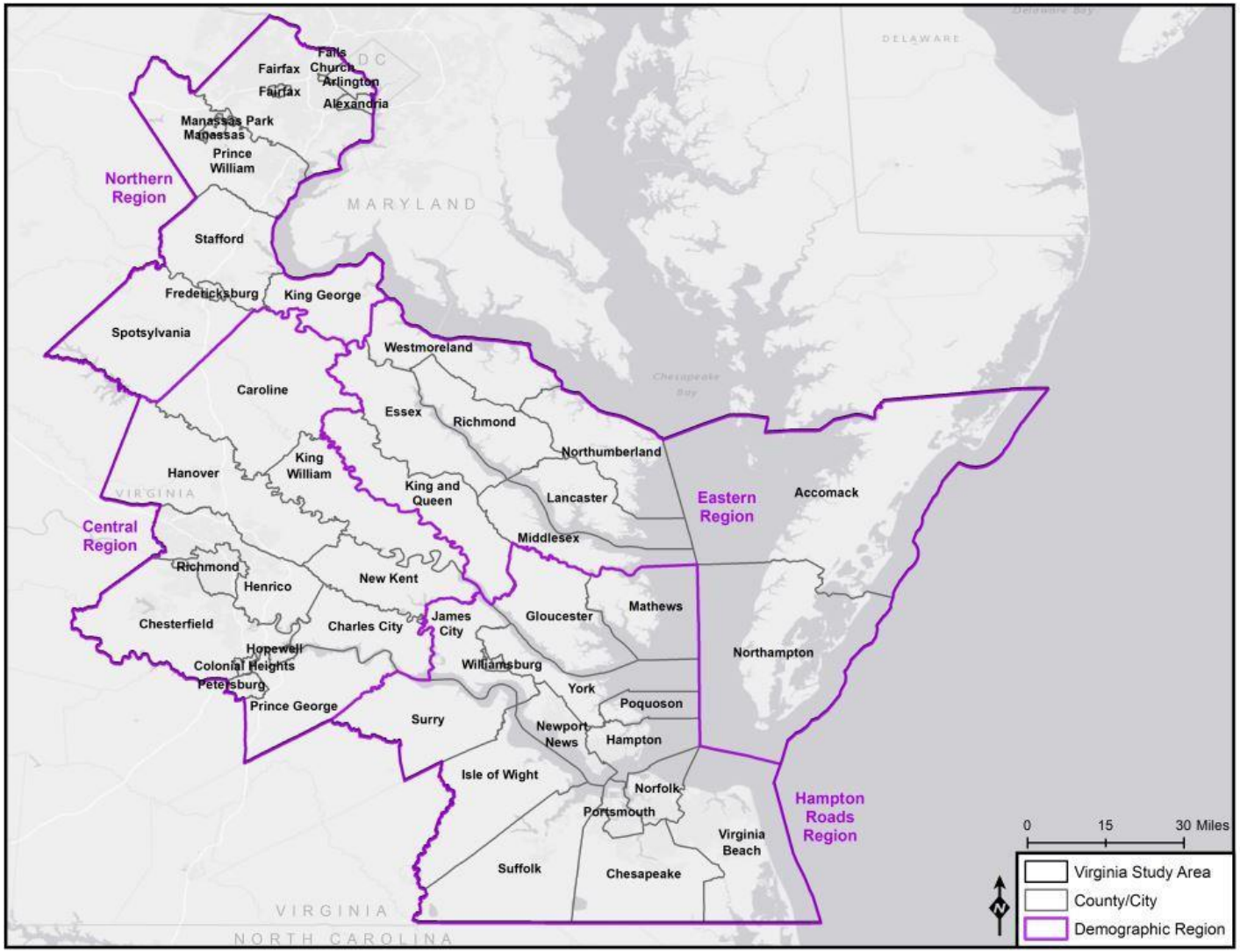
Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade, and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). This nationwide trend is also contributing to Virginia's declining growth rate, according to the University of Virginia's Weldon Cooper Center for Public Service (Cooper Center), an organization that provides demographic and economic analysis to the State of Virginia (UVA 2019c).

Nationally, migration remains at historic lows, as most of those who move tend to relocate relatively short distances away from their original residence (Governing.com 2018, UVA 2019e). However, Virginia is not part of this national trend. Much of the slowdown in the State's population growth is a result of domestic out-migration, as more people are moving out of Virginia than into the State. Many of those moving out of Virginia appear to be young families, which factored into the decline of public school enrollment in 2018 – the first decline since 1984. According to the Cooper Center, the shift to an out-migration pattern began in 2012-2013, about the same time as mandatory Federal spending cuts (sequestration) were enacted by Congress, resulting in the furlough or layoff of Federal workers living in the metropolitan Washington D.C. area. The contraction in Federal spending is the most obvious reason for the pattern of out-migration in Virginia, as well as Maryland, where many government employees reside (Murse 2019, UVA 2019c, UVA 2019a).

Other demographic factors have caused shifts in Virginia's population. Virginia's population growth is concentrated in the northern region of the State, reflective of a nationwide trend toward urbanization. Large numbers of people move away from rural and non-metropolitan areas towards better jobs in the metropolitan areas. As a result, a significant rural-urban divide pattern has emerged, as populations in rural communities decline, a pattern which is projected to continue over future decades (UVA 2019c, UVA 2019e).

13.4.1.1 Study Area Trends

Figure 13-25 shows the four demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 13.2 (e.g., physiographic regions, VEDP Regions, etc.) because they are derived from official demographic regions used by the Cooper Center. The counties within the Study Area are located within four demographic regions defined as Northern, Central, Eastern and Hampton Roads (UVA 2019b). According to 2017 population estimates, the Study Area represented 64.2% (5.3 million residents) of the overall State population of 8.3 million. Table 13-8 shows population growth and decline in the Study Area counties, as well as their location with the demographic regions. Between 2010 and 2017, 32 out of 48 geographies gained population, while 14 geographies lost population, and 2 had stagnant growth. During the same period, the population of the Study Area grew 5.5%, faster than the State (4.6%) and the Nation (4.0%) (USCB 2017a, USCB 2017d).



Source: UVA 2019b

Figure 13-25. Demographic Regions of the Virginia Study Area

Between 2010 and 2017, the northern region grew 8.1%, led by strong growth in Virginia's independent cities of Fredericksburg, Manassas Park and Falls Church, reflecting the trend toward urbanization (USCB 2017a, USCB 2017d). Despite its location near the metropolitan area of Washington DC, the rate of population growth declined in both the county and city of Fairfax. According to demographers at the Cooper Center, the reason is out-migration of young professionals. Many young Virginians, particularly those who have graduated college, move to Fairfax for their first jobs. After they have become more established in their careers and often after starting a family, they relocate farther into Northern Virginia's suburbs, while a large number move out of Northern Virginia altogether (UVA 2019a). Between 2010 and 2017, the Central Region grew 5.6%, led by fast growth in New Kent County. The Hampton Roads Region grew only 2.4%, while the sparsely populated Eastern Region decreased 1.4%, reflecting a widening rural-urban divide (USCB 2017a, USCB 2017d).

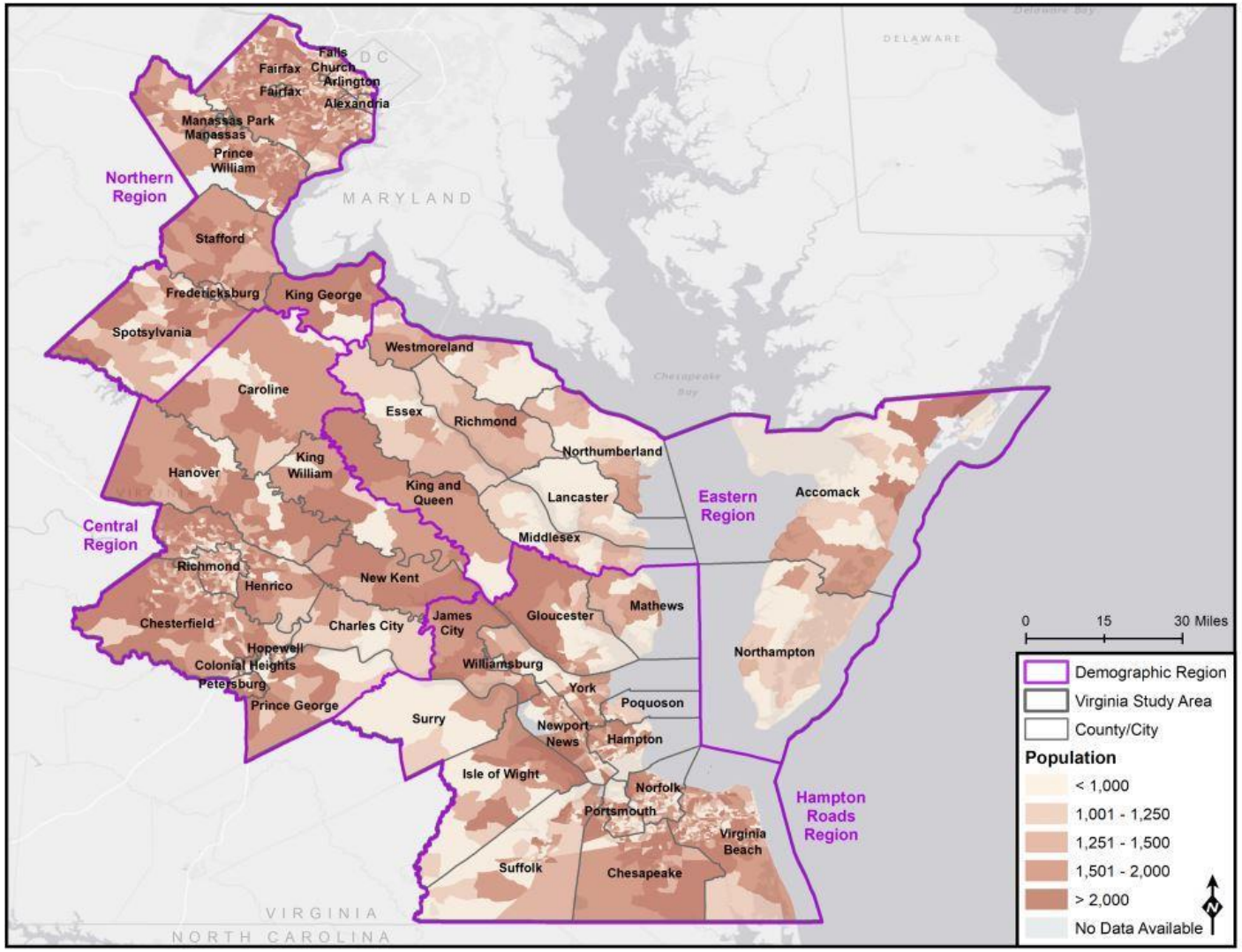
Figure 13-26 shows population counts in census block groups within the 48 counties and independent cities located in the Study Area. The Figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 13-27 the MSAs present in the Study Area are:

- Richmond, VA,
- Washington-Arlington-Alexandria,
- DC-VA-MD-WV, and
- Virginia Beach-Norfolk-Newport News, VA-NC.

The MSAs are located within the Northern, Central, and Hampton Roads Regions of the Study Area. Principal cities contained in the MSAs are Washington D.C., Richmond, Fredericksburg, Newport News and Virginia Beach. No portion of any MSA is located within the sparsely populated Eastern Region, reflecting the rural-urban divide (Data.gov 2017).

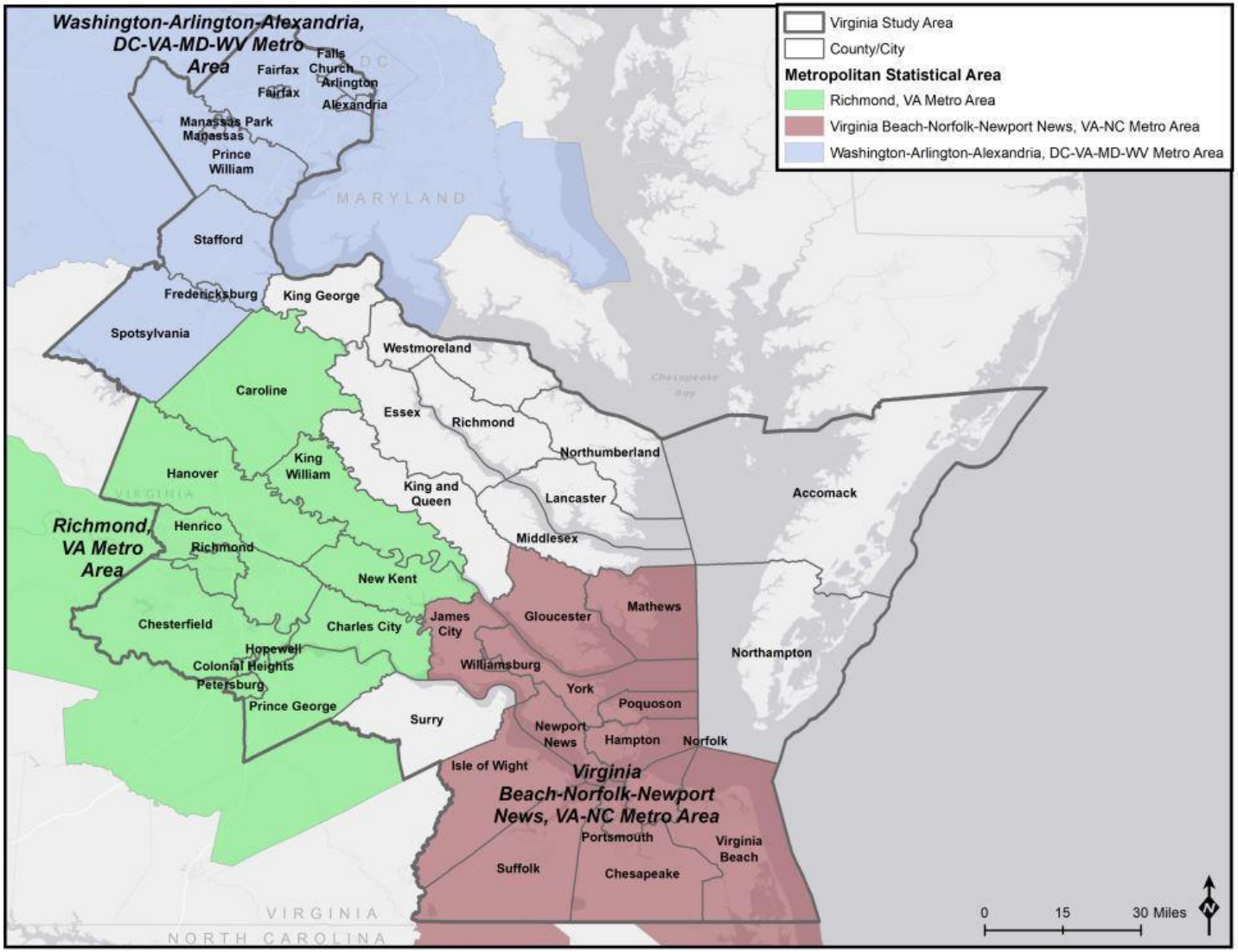
More people live near the Nation's coasts than inland counties of the U.S. According to NOAA, Coastal Watershed Counties are home to 52% of the Nation's population, but account for less than 20% the Nation's land mass (excluding Alaska) (NOAA Fisheries 2013). This population trend is also reflected in Virginia. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 13-8, the Study Area is 8,803 square miles, representing 22.3% of the State's total land area of 39,490 square miles. Therefore, more than half (64.2%) of Virginia's population resided in 22.3% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.

According to NOAA, approximately 319 persons per square mile live in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 13-28, which shows population per square mile in the Study Area. Population densities in the Study Area ranged from 15 persons per square mile in Northampton County (located in the sparsely-populated Eastern Region) to 8,793 persons per square mile in Arlington County (located in the populous Northern Region near the Washington DC metropolitan area) (USCB 2017d, USCB 2017c).



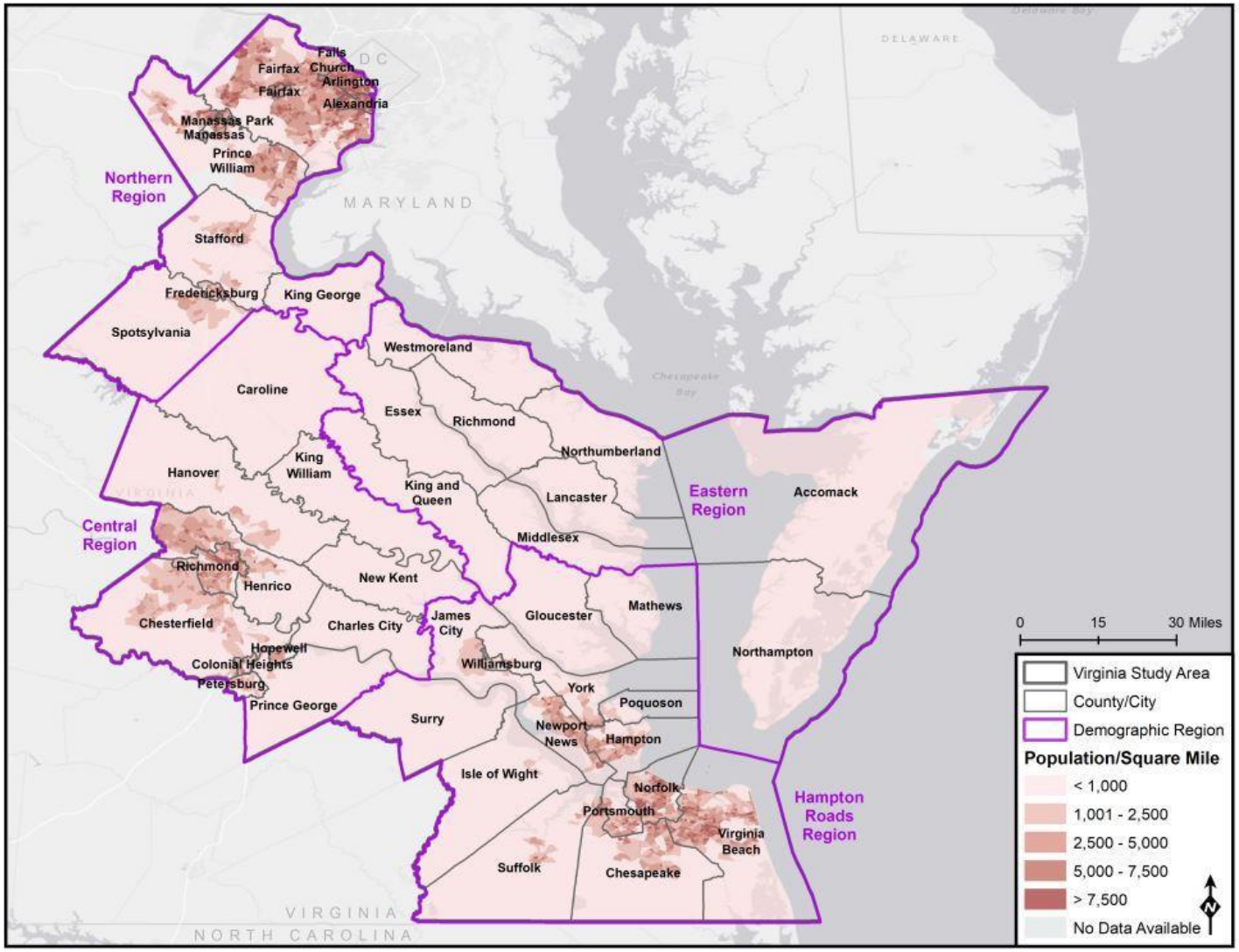
Source: USCB 2017r

Figure 13-26. Population in Virginia Study Area Counties and Independent Cities by Census Block Group



Source: USCB 2017s

Figure 13-27. Metropolitan Statistical Areas Located within the Virginia Study Area



Source: USCB 2017r

Figure 13-28. Population Density in Virginia Study Area Counties and Independent Cities by Census Block Group

13.4.1.2 Population Projections

According to the Cooper Center, Virginia's population is projected to grow 18.1% (9.87 million residents) by 2040. Population in the Study Area is projected to follow a similar pattern to that of the State, growing 18.8% (6.3 million residents) by 2040. The Nation's population is projected to grow 16.4% (373.5 million), less than the State and the Study Area. Table 13-8 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040, delineated by region (USCB 2017d, USCB 2017c, USCB 2018b, UVA 2019d). Figure 13-29 shows the overall projected percent change in population in each county during the same period.

As shown in Table 13-8, projections indicate that 64.3% (6.4 million people) of the State's population will reside in the Study Area by 2040 as compared to 64.2% (5.4 million people) in 2017. Projections show this trend continuing to 2040, when 64.3% (6,384,488 people) of the population is predicted to reside in the Study Area. Projected growth by study region is Central (21%), Hampton Roads (8.1%) and Northern (26.5%). Population decline of 7.2% is projected for the Eastern Region (UVA 2019a, USCB 2017d).

As shown in Table 13-8, growth will not be uniform across the Study Area. Strong growth trends are expected to continue in the Northern and Central Regions, projected to be 26.5% and 21.0%, respectively, between 2017 and 2040. Continued rapid growth is projected in northern region counties of Stafford and Prince William, as younger families move to suburbs in search of relatively cheaper housing and less crowded schools (Olivio 2018). Continued rapid population growth is predicted for the Central Region counties of New Kent and King William, located in the Richmond metropolitan area. The city of Richmond is also projected to experience population growth, although at a lesser rate than the cities of Fredericksburg and Manassas Park located in the northern region. Gains in these counties help offset the projected stagnation and population decline predicted in the rural counties in the Study Area. Relatively modest growth of 8.1% is predicted for the Hampton Roads Region, likely due to a combination of out-migration and low birth rates (Jones 2019). The Eastern Region is projected to decrease 1.4% in population, as the rural urban divide continues to widen. Of the 48 counties and independent cities in the Study Area, 36 geographic units are projected to increase population, while 12 are projected to decrease population (UVA 2019d, USCB 2017d).

Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future (NOAA 2013). As shown in Table 13-9, this trend is apparent in the Study Area, as population density is projected to increase from 610 persons per square mile to 632 persons per square mile in the Study Area between 2017 and 2040 (UVA 2019d, USCB 2017d, USCB 2017c). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

Source: UVA 2019f

Figure 13-29. Overall Projected Population Change from 2017-2040 in the Virginia Study Area by County

Table 13-9. 2017 and 2040 Population Density in the Virginia Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Central	Caroline	29,889	38,372	527.6	55.6	72.7
	Charles City	7,022	6,816	182.8	34.4	37.2
	Chesterfield	335,594	433,508	423.6	768.0	1022.4
	Hanover	103,218	127,755	467.9	218.3	273.0
	Henrico	324,073	389,173	233.7	1,323.7	1663.1
	King William	16,329	20,576	273.9	57.1	75.1
	New Kent	20,523	32,272	210.0	91.7	153.7
	Prince George	37,704	40,674	265.3	133.7	153.5
	Colonial Heights (city)	17,582	17,680	7.5	2,249.6	2210.0
	Hopewell (city)	22,353	22,433	10.4	2,068.1	2243.3
	Petersburg (city)	32,037	28,328	22.7	1,396.3	1231.7
	Richmond (city)	220,892	255,094	59.9	3,530.4	4251.6
	Total Central	***1,167,216***	***1,412,680***	***2685.4***	***NA***	***NA***
Eastern	Accomack	32,840	25,558	449.3	25.1	56.9
	Essex	11,083	11,171	257.1	38.8	43.5
	King and Queen	7,052	7,024	315.2	21.6	22.3
	Lancaster	10,848	9,871	133.3	46.9	74.2
	Middlesex	10,710	11,515	130.3	50.8	88.6
	Northampton	11,998	10,008	211.7	15.1	47.2
	Northumberland	12,254	11,393	191.4	42.9	59.6
	Richmond	8,873	9,157	191.5	41.0	47.9
	Westmoreland	17,596	18,649	229.3	69.6	81.4
	Total Eastern	***123,254***	***114,347***	***2109.1***	***NA***	***NA***
Hampton Roads	Gloucester	37,035	38,530	217.8	128.6	176.7
	Isle of Wight	36,090	44,977	315.7	99.5	142.3
	James City	73,028	104,915	142.4	407.7	738.8
	Mathews	8,830	7,796	85.9	35.0	90.7
	Surry	6,670	5,992	278.9	21.5	21.5
	York	67,196	80,327	104.6	312.8	765.0
	Chesapeake (city)	235,410	287,913	338.5	670.8	849.3
	Hampton (city)	136,255	118,777	51.4	1,000.0	2329.0
	Newport News (city)	180,775	175,762	69.1	1,510.6	2547.3

Table 13-9. 2017 and 2040 Population Density in the Virginia Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Hampton Roads (continued)	Norfolk (city)	245,752	249,753	53.3	2,549.3	4712.3
	Poquoson (city)	12,022	12,726	15.4	153.2	848.4
	Portsmouth (city)	95,536	85,397	33.3	2,046.5	2587.8
	Suffolk (city)	88,057	122,402	399.2	205.3	306.8
	Virginia Beach (city)	450,057	470,700	244.7	904.6	1921.2
	Williamsburg (city)	14,817	18,306	8.9	1,628.0	2034.0
	Total Hampton Roads	***1,687,530***	***1,824,272***	***2359.1***	***NA***	***NA***
Northern	Arlington	229,534	295,383	26.0	8,793.4	11360.9
	Fairfax	1,142,004	1,308,224	391.0	2,809.4	3345.8
	King George	25,564	35,180	179.6	136.2	195.4
	Prince William	450,763	656,178	335.7	1,296.5	1952.9
	Spotsylvania	130,159	177,369	401.5	314.2	441.2
	Stafford	141,159	209,250	269.2	504.0	777.9
	Alexandria (city)	154,710	195,240	14.9	10,080.5	13016.0
	Fairfax (city)	23,580	27,388	6.2	3,759.0	4564.7
	Falls Church (city)	13,843	18,815	2.0	6,764.4	9407.5
	Fredericksburg (city)	28,135	38,094	10.5	2,674.5	3809.4
	Manassas (city)	41,379	48,916	9.8	4,177.3	4891.6
	Manassas Park (city)	16,117	23,153	2.5	6,383.3	7717.7
	Total Northern	***2,396,947***	***3,033,189***	***1649.1***	***NA***	***NA***
	Study Area Total	**5,374,947**	**6,384,488**	**8,802.6**	**610.6**	**632.6**
	Virginia	**8,365,952**	**9,876,728**	**39,490.1**	**211.80**	**219.2**
	United States	**321,004,407**	**373,528,000**	**3,531,905.43**	**90.9**	**94.2**

Sources: USCB 2017d, USCB 2017c, USCB 2018b, UVA 2019d

The Cooper Center predicts that rural areas will lose population to metropolitan areas and out-migration, and 70% of the State's population will reside in metropolitan areas by 2040. Overall, people moving into the State will offset the declining natural population increase, resulting in a population that continues to grow, although at less than historical rates (UVA 2019c).

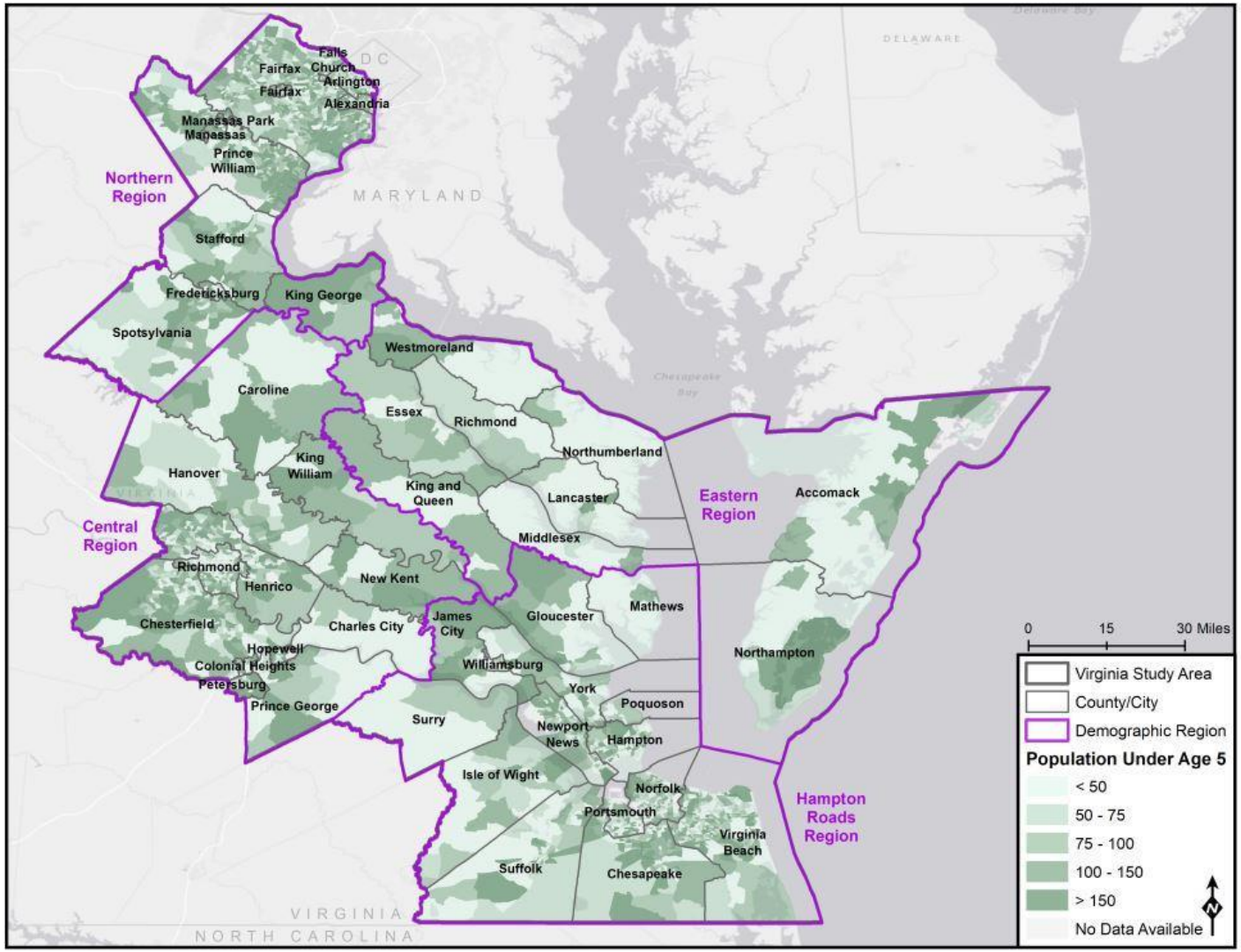
13.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Virginia and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A

projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 13-30 and Figure 13-31 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 13-32 and Figure 13-33 show the projected change in these groups by 2040. Table 13-10 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Virginia and the Study Area (Brookings Institute 2018, UVA 2019d, USCB 2017b).

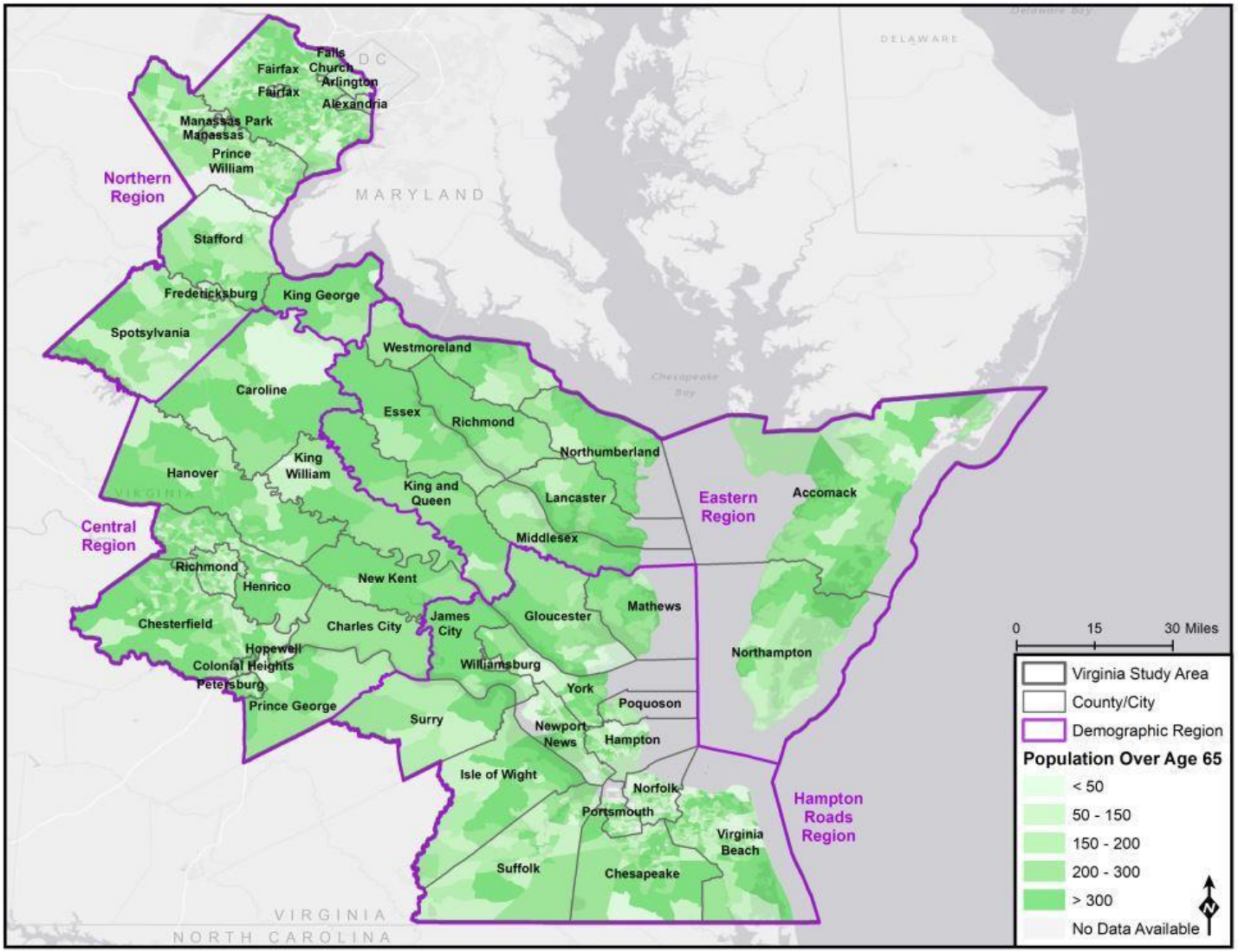
Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population, 6.1% in Virginia, and 6.4% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 13-10 shows the breakdown by demographic region. Projections by the year 2040 indicate this group's decline to 5.7% in the Nation, the Commonwealth (5.9%) and the Study Area (6.3%). Within the demographic regions, however, the Central and Northern Regions maintain the same proportion of young children in 2017 as compared to 2040. The rural Eastern Region had the smallest percentage (5.0%) of young children in 2017; a further decrease to 4.7% is projected by 2040 as the rural-urban divide become more prominent. For the study area, this is an overall decrease of 0.1% in the proportion of the population under age 5 from 2017-2040 (UVA 2019d, USCB 2017b).

According to 2017 estimates shown in Table 13-10, the elderly represented 14.9% of the U.S. population; 14.1% in Virginia, and 12.7% in the Study Area. The number and proportion of elderly to the overall population are projected to rise, fueled by aging baby boomers. The percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 18.3% in the State, and 16.7% in the Study Area. Each region in the Study Area projects an increase in the elderly population. The sparsely populated Eastern Region had the largest percentage (25.3%) of elderly in 2017; a further increase to 28.3% is projected by 2040. For the study area, this is an overall increase of 4.0% in the proportion of the population over age 65 from 2017-2040, reflecting urbanization and out-migration trends. (USCB 2017b, USCB 2018b, UVA 2019d, Luminary Labs 2019)



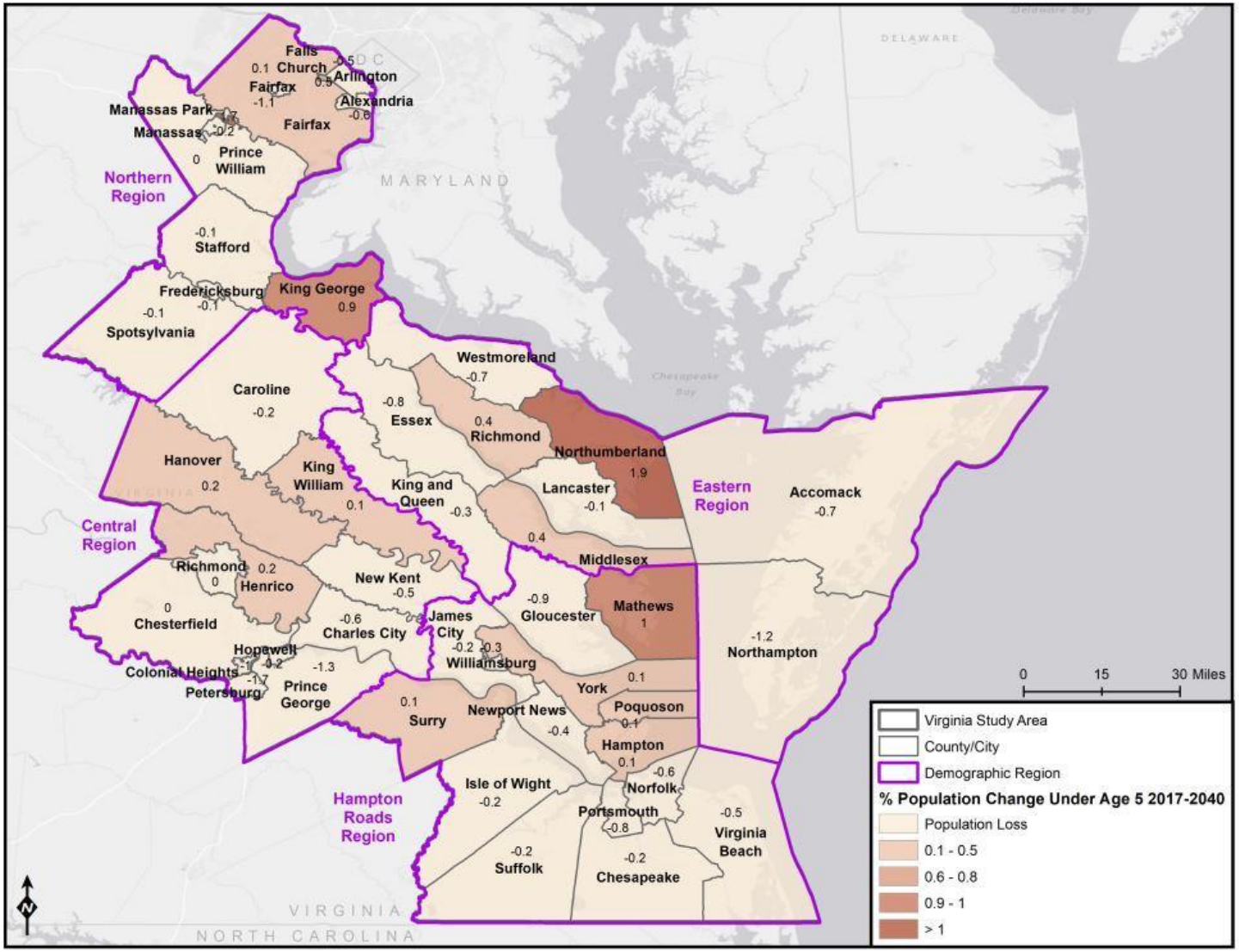
Source: USCB 2017r

Figure 13-30. Population Under Age 5 in the Virginia Study Area by Census Block Group



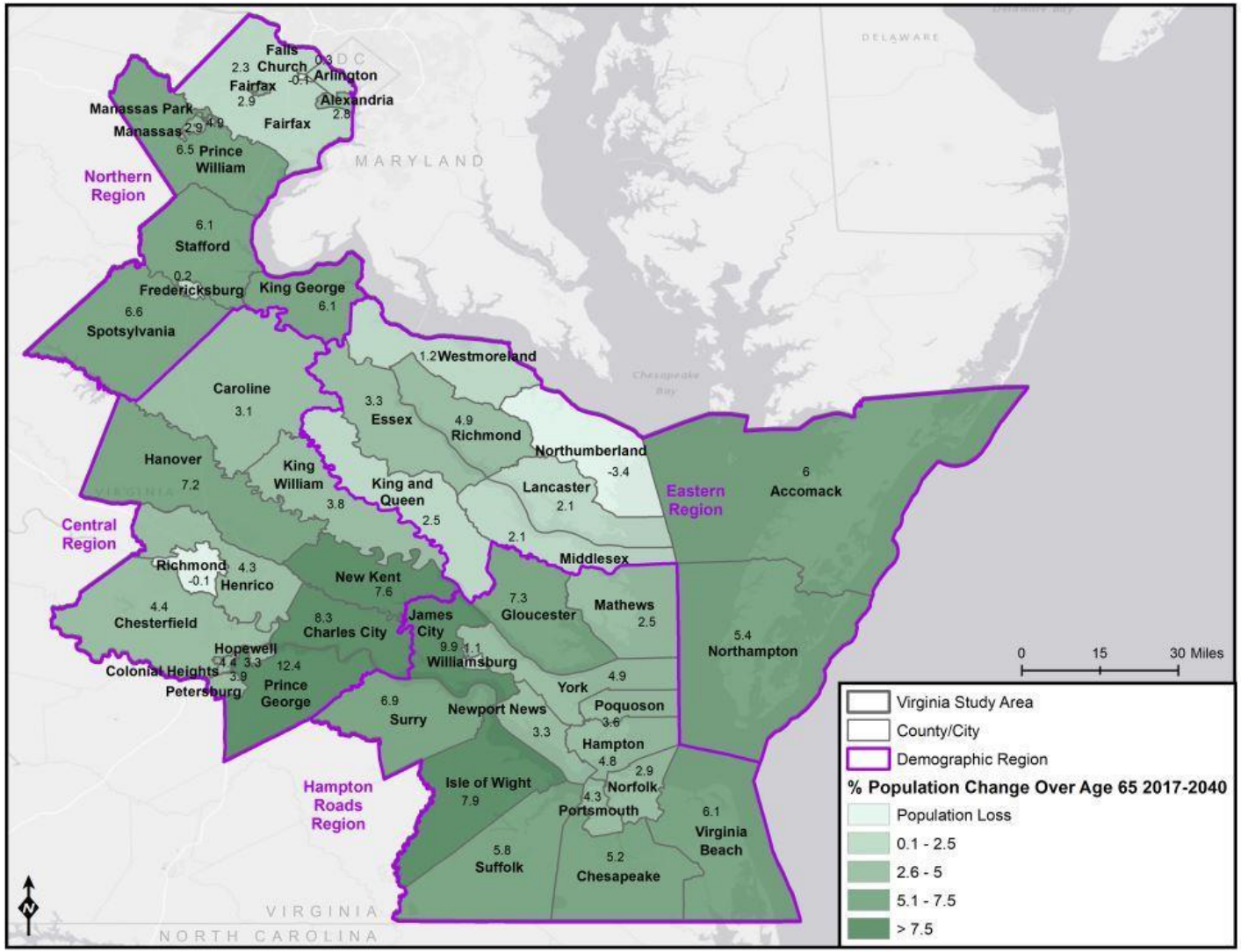
Source: USCB 2017r

Figure 13-31. Population Over Age 65 in the Virginia Study Area by Census Block Group



Source: UVA 2019f

Figure 13-32. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Virginia Study Area by 2040



Source: UVA 2019f

Figure 13-33. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Virginia Study Area by 2040

Table 13-10. Population Under Age 5 and Over Age 65 in Virginia and the Virginia Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Age Over Age 65 (%)	Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Central	Caroline County	29,889	2,052	6.9	4,599	15.4	38,372	2,577	6.7	7,089	18.5
	Charles City County	7,022	289	4.1	1,546	22.0	6,816	240	3.5	2,067	30.3
	Chesterfield County	335,594	19,991	6.0	44,886	13.4	433,508	26,134	6.0	77,053	17.8
	Hanover County	103,218	5,114	5.0	16,526	16.0	127,755	6,668	5.2	29,635	23.2
	Henrico County	324,073	20,322	6.3	45,872	14.2	389,173	25,149	6.5	71,976	18.5
	King William County	16,329	999	6.1	2,421	14.8	20,576	1,271	6.2	3,834	18.6
	New Kent County	20,523	1,091	5.3	3,260	15.9	32,272	1,559	4.8	7,587	23.5
	Prince George County	37,704	2,064	5.5	4,766	12.6	40,674	1,705	4.2	10,187	25.0
	Colonial Heights (city)	17,582	1,126	6.4	3,562	20.3	17,680	963	5.4	4,074	23.0
	Hopewell (city)	22,353	1,660	7.4	3,463	15.5	22,433	1,622	7.2	4,225	18.8
	Petersburg (city)	32,037	2,364	7.4	5,230	16.3	28,328	1,603	5.7	5,715	20.2
	Richmond (city)	220,892	13,393	6.1	26,622	12.1	255,094	15,643	6.1	30,649	12.0
	Total Central	***1,167,216***	***70,465***	***6.0***	***162,753***	***13.9***	***1,412,680***	***85,132***	***6.0***	***254,091***	***18.0***
Eastern	Accomack County	32,840	1,898	5.8	7,033	21.4	25,558	1,294	5.1	7,002	27.4
	Essex County	11,083	704	6.4	2,285	20.6	11,171	624	5.6	2,667	23.9
	King and Queen County	7,052	367	5.2	1,537	21.8	7,024	346	4.9	1,709	24.3
	Lancaster County	10,848	436	4.0	3,755	34.6	9,871	383	3.9	3,619	36.7
	Middlesex County	10,710	344	3.2	3,206	29.9	11,515	420	3.6	3,682	32.0
	Northampton County	11,998	729	6.1	3,019	25.2	10,008	494	4.9	3,063	30.6
	Northumberland County	12,254	328	2.7	4,308	35.2	11,393	522	4.6	3,622	31.8
	Richmond County	8,873	308	3.5	1,834	20.7	9,157	358	3.9	2,347	25.6
	Westmoreland County	17,596	997	5.7	4,158	23.6	18,649	933	5.0	4,618	24.8
	Total Eastern	***123,254***	***6,111***	***5.0***	***31,135***	***25.3***	***114,347***	***5,373***	***4.7***	***32,330***	***28.3***

Table 13-10. Population Under Age 5 and Over Age 65 in Virginia and the Virginia Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Age Over Age 65 (%)	Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Hampton Roads	Gloucester County	37,035	1,954	5.3	6,558	17.7	38,530	1,683	4.4	9,636	25.0
	Isle of Wight County	36,090	1,788	5.0	6,276	17.4	44,977	2,159	4.8	11,383	25.3
	James City County	73,028	3,481	4.8	17,264	23.6	104,915	4,860	4.6	35,106	33.5
	Mathews County	8,830	253	2.9	2,611	29.6	7,796	303	3.9	2,501	32.1
	Surry County	6,670	293	4.4	1,322	19.8	5,992	268	4.5	1,602	26.7
	York County	67,196	3,704	5.5	9,904	14.7	80,327	4,526	5.6	15,733	19.6
	Chesapeake (city)	235,410	14,930	6.3	28,596	12.1	287,913	17,543	6.1	49,823	17.3
	Hampton (city)	136,255	8,414	6.2	19,193	14.1	118,777	7,436	6.3	22,425	18.9
	Newport News (city)	180,775	13,302	7.4	21,787	12.1	175,762	12,311	7.0	26,986	15.4
	Norfolk (city)	245,752	16,601	6.8	25,271	10.3	249,753	15,419	6.2	33,086	13.2
	Poquoson (city)	12,022	502	4.2	2,226	18.5	12,726	543	4.3	2,811	22.1
	Portsmouth (city)	95,536	7,219	7.6	13,344	14.0	85,397	5,784	6.8	15,607	18.3
	Suffolk (city)	88,057	5,925	6.7	11,759	13.4	122,402	7,929	6.5	23,484	19.2
	Virginia Beach (city)	450,057	29,075	6.5	57,339	12.7	470,700	28,318	6.0	88,276	18.8
	Williamsburg (city)	14,817	501	3.4	2,159	14.6	18,306	568	3.1	2,879	15.7
	Total Hampton Roads	***1,687,530***	***107,942***	***6.4***	***225,609***	***13.4***	***1,824,272***	***109,651***	***6.0***	***341,338***	***18.7***

Table 13-10. Population Under Age 5 and Over Age 65 in Virginia and the Virginia Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Age Over Age 65 (%)	Total Population	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Northern	**Arlington County**	229,534	13,690	6.0	22,553	9.8	295,383	16,166	5.5	29,746	10.1
	Fairfax County	1,142,004	74,377	6.5	138,977	12.2	1,308,224	86,930	6.6	189,337	14.5
	King George County	25,564	1,617	6.3	3,096	12.1	35,180	2,536	7.2	6,390	18.2
	Prince William County	450,763	34,235	7.6	39,436	8.7	656,178	49,793	7.6	99,623	15.2
	Spotsylvania County	130,159	8,149	6.3	16,487	12.7	177,369	10,943	6.2	34,261	19.3
	Stafford County	141,159	8,981	6.4	13,257	9.4	209,250	13,183	6.3	32,436	15.5
	Alexandria (city)	154,710	11,307	7.3	16,239	10.5	195,240	13,015	6.7	25,931	13.3
	Fairfax (city)	23,580	1,662	7.0	3,375	14.3	27,388	1,610	5.9	4,724	17.2
	Falls Church (city)	13,843	878	6.3	1,725	12.5	18,815	1,279	6.8	2,331	12.4
	Fredericksburg (city)	28,135	1,949	6.9	2,960	10.5	38,094	2,573	6.8	4,057	10.7
	Manassas (city)	41,379	3,460	8.4	3,646	8.8	48,916	4,013	8.2	5,723	11.7
	Manassas Park (city)	16,117	1,058	6.6	1,200	7.4	23,153	1,927	8.3	2,837	12.3
	Total Northern	***2,396,947***	***161,363***	***6.7***	***262,951***	***11.0***	***3,033,189***	***203,970***	***6.7***	***437,395***	***14.4***
	Study Area Total	**5,374,947**	**345,881**	**6.4**	**682,448**	**12.7**	**6,384,488**	**404,126**	**6.3**	**1,065,154**	**16.7**
	Virginia	**8,365,952**	**509,922**	**6.1**	**1,187,867**	**14.1**	**9,876,728**	**587,465**	**5.9**	**1,809,786**	**18.3**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: UVA 2019d, USCB 2017b, USCB 2018b

13.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 13-11.

As shown in Table 13-11, in 2017 homeownership in Virginia was 66.2%, higher than the Nation (63.8%) and the Study Area (63.5%). Renters comprised approximately 33.8% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was higher (36.5%) (USCB 2017m). Homeownership has significantly increased in Virginia, driven by an aging population more likely to own than rent. However, the rate of young adults (18- to 34- year-olds) starting new households was stagnant, as over 45% of this group live with their parents or older relatives (Pope 2018).

As shown in Table 13-11, median home values were higher in the State ($255,800) and the Study Area ($232,700) as compared to the Nation ($193,500) (USCB 2017g, USCB 2017j, USCB 2017l). Figure 13-34 illustrates median home values in the Study Area. The figure portrays higher values in the counties located in the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan area. Zillow, an online real estate database company that provides information about housing market trends, categorized the market temperature of the metropolitan area as "very hot." This indicates market conditions favorable to sellers. Washington-Arlington-Alexandria Metro home values have gone up 2.3% during the 12-month period ending October 2019 (USCB 2017l, Zillow.com 2019a). Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including Virginia.

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area. (National Low Income Housing Coalition 2018)

Figure 13-35 illustrates median gross rent, indicating the lack of affordable rental housing at a cost of less than $1,250 per month in the Study Area. According to the National Low Income Housing Coalition, as of 2019, a minimum wage worker in Virginia would have to work approximately three or more full time jobs in order to afford a two bedroom fair market rate home. Virginia has a shortage of approximately 140,000 rental homes affordable and available to extremely low-income households. Approximately 235,533 (23%) of renter households in Virginia are considered extremely low income; approximately 162,517 (69%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (42%), seniors (23%), and disabled persons (23%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions. (National Low Income Housing Coalition 2019a)

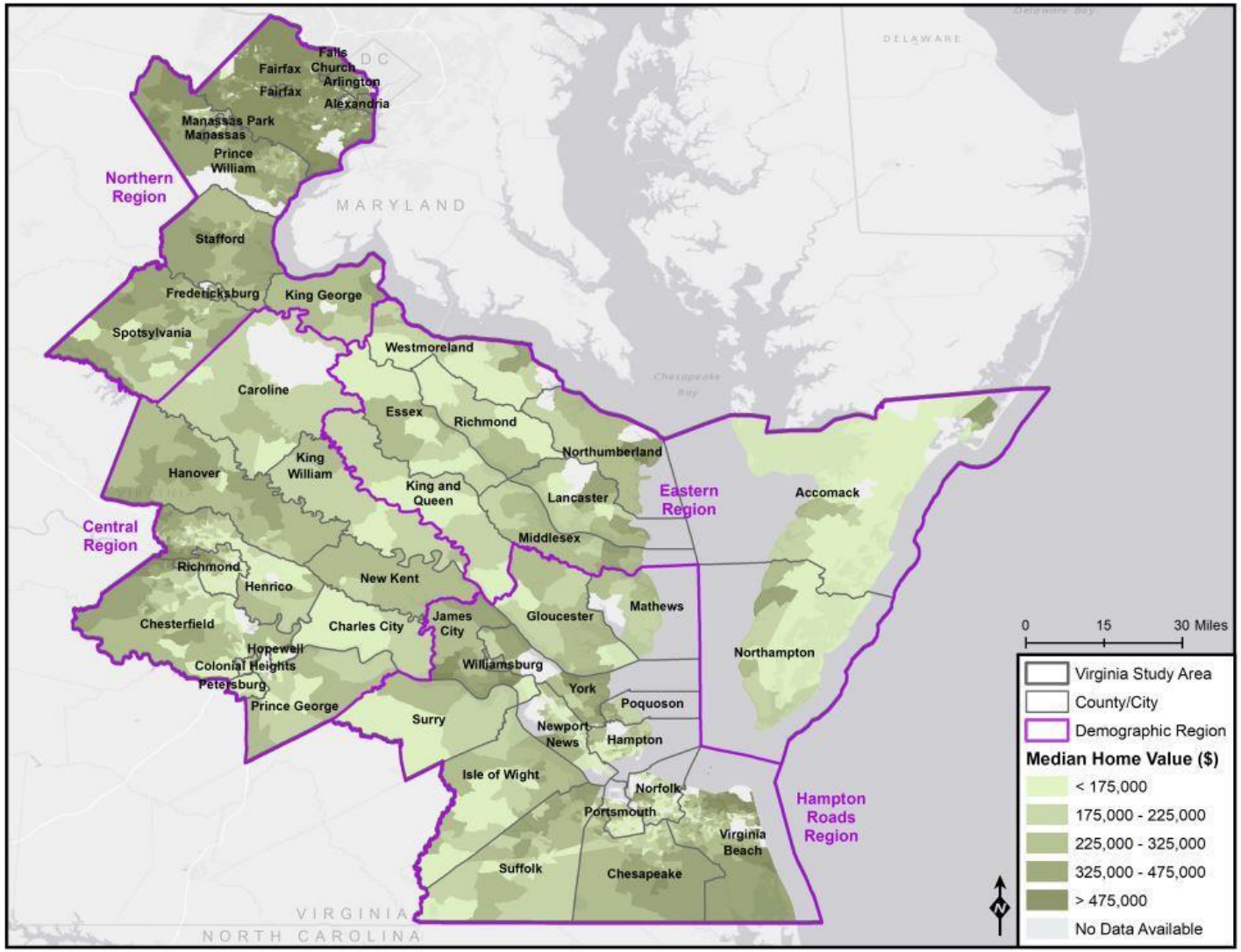
Table 13-11. Housing Utilization and Vacancy Rates in the Virginia Study Area

Region	Geographic Unit	Total Housing Units (2017)	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Central	**Caroline**	12,107	10,815	1,292	10.7	8,668	80.1	2,147	19.9	$193,200	$996
	Charles City	3,323	2,899	424	12.8	2,415	83.3	484	16.7	$163,000	$885
	Chesterfield	127,750	120,907	6,843	5.4	91,047	75.3	29,860	24.7	$224,200	$1,180
	Hanover	40,325	38,208	2,117	5.2	31,070	81.3	7,138	18.7	$267,600	$1,113
	Henrico	135,397	126,115	9,282	6.9	79,311	62.9	46,804	37.1	$223,900	$1,095
	King William	6,760	6,079	681	10.1	5,233	86.1	846	13.9	$199,700	$1,094
	New Kent	8,071	7,555	516	6.4	6,182	81.8	1,373	18.2	$256,600	$882
	Prince George	12,336	11,298	1,038	8.4	7,710	68.2	3,588	31.8	$212,100	$1,295
	Colonial Heights (city)	7,754	7,092	662	8.5	4,471	63.0	2,621	37.0	$163,300	$1,001
	Hopewell (city)	10,271	9,123	1,148	11.2	4,653	51.0	4,470	49.0	$122,400	$831
	Petersburg (city)	16,385	13,262	3,123	19.1	5,532	41.7	7,730	58.3	$112,900	$882
	Richmond (city)	99,737	89,238	10,499	*10.5*	37,190	41.7	52,048	58.3	$209,200	$942
	Total Central	***480,216***	***442,591***	***37,625***	***7.8***	***283,482***	***64.1***	***159,109***	***35.9***	***NA***	***NA***
Eastern	**Accomack**	21,243	13,528	7,715	36.3	9,466	70.0	4,062	30.0	$157,200	$771
	Essex	5,833	4,470	1,363	23.4	3,153	70.5	1,317	29.5	$177,200	$864
	King and Queen	3,477	2,811	666	19.2	2,213	78.7	598	21.3	$170,000	$845
	Lancaster	7,581	5,081	2,500	33.0	3,719	73.2	1,362	26.8	$226,900	$817
	Middlesex	7,285	4,522	2,763	37.9	3,659	80.9	863	19.1	$248,400	$793
	Northampton	7,384	5,177	2,207	29.9	3,344	64.6	1,833	35.4	$165,800	$713
	Northumberland	9,203	5,774	3,429	37.3	4,917	85.2	857	14.8	$277,900	$754
	Richmond	3,916	3,250	666	17.0	2,338	71.9	912	28.1	$163,200	$816
	Westmoreland	10,860	7,412	3,448	31.7	5,695	76.8	1,717	23.2	$203,100	$961
	Total Eastern	***76,782***	***52,025***	***24,757***	***32.2***	***38,504***	***74.0***	***13,521***	***26.0***	***NA***	***NA***

Table 13-11. Housing Utilization and Vacancy Rates in the Virginia Study Area

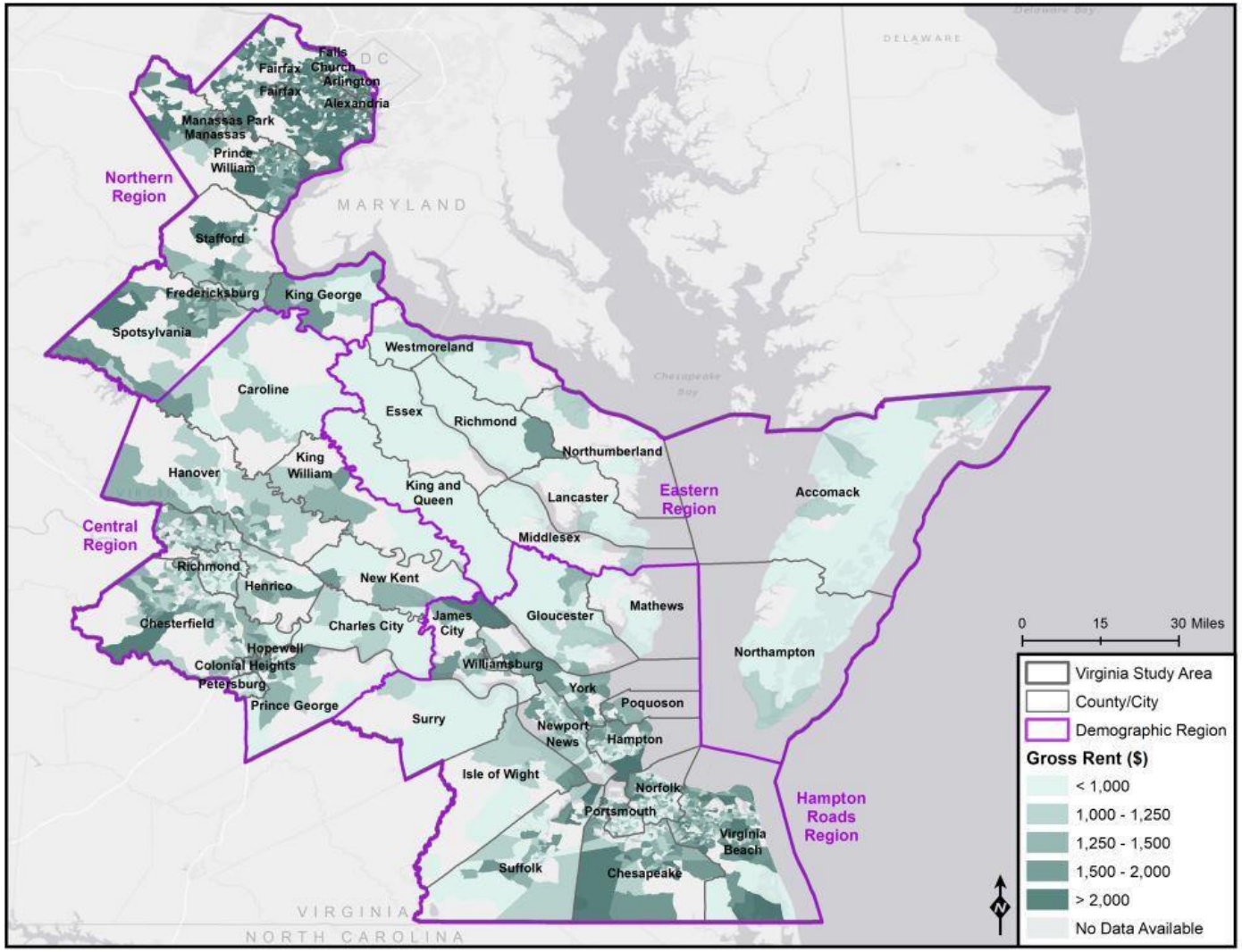
Region	Geographic Unit	Total Housing Units (2017)	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Hampton Roads	**Gloucester**	16,334	14,746	1,588	9.7	11,378	77.2	3,368	22.8	$224,100	$923
	Isle of Wight	15,358	14,157	1,201	7.8	10,939	77.3	3,218	22.7	$249,100	$1,018
	James City	32,357	28,410	3,947	12.2	21,117	74.3	7,293	25.7	$328,700	$1,202
	Mathews	5,736	3,766	1,970	34.3	3,248	86.2	518	13.8	$227,200	$924
	Surry	3,545	2,773	772	21.8	2,110	76.1	663	23.9	$172,700	$920
	York	27,497	24,333	3,164	11.5	17,547	72.1	6,786	27.9	$315,400	$1,458
	Chesapeake (city)	88,856	83,031	5,825	6.6	58,843	70.9	24,188	29.1	$260,900	$1,201
	Hampton (city)	60,092	53,555	6,537	10.9	30,471	56.9	23,084	43.1	$186,600	$1,062
	Newport News (city)	77,442	68,665	8,777	11.3	34,345	50.0	34,320	50.0	$189,300	$985
	Norfolk (city)	96,700	87,249	9,451	9.8	37,854	43.4	49,395	56.6	$194,800	$1,003
	Poquoson (city)	4,775	4,583	192	4.0	3,659	79.8	924	20.2	$316,800	$1,173
	Portsmouth (city)	40,889	36,616	4,273	10.5	19,936	54.4	16,680	45.6	$169,400	$988
	Suffolk (city)	35,591	32,331	3,260	9.2	22,380	69.2	9,951	30.8	$238,200	$1,083
	Virginia Beach (city)	182,723	167,731	14,992	8.2	107,096	63.8	60,635	36.2	$267,300	$1,296
	Williamsburg (city)	5,132	4,649	483	9.4	2,198	47.3	2,451	52.7	$307,000	$1,118
	Total Hampton Roads	***693,027***	***626,595***	***66,432***	***9.6***	***383,121***	**61.1**	***243,474***	**38.9**	***NA***	***NA***
Northern	**Arlington**	111,646	102,310	9,336	*8.4*	45,525	44.5	56,785	55.5	$643,300	$1,895
	Fairfax	411,223	393,380	17,843	*4.3*	266,707	67.8	126,673	32.2	$534,800	$1,823
	King George	9,925	8,972	953	*9.6*	6,780	75.6	2,192	24.4	$294,300	$1,178
	Prince William	145,961	139,306	6,655	*4.6*	100,948	72.5	38,358	27.5	$358,300	$1,620
	Spotsylvania	46,594	43,279	3,315	*7.1*	33,482	77.4	9,797	22.6	$265,600	$1,400
	Stafford	47,345	45,345	2,000	*4.2*	34,377	75.8	10,968	24.2	$327,600	$1,481
	Alexandria (city)	75,489	68,663	6,826	*9.0*	29,576	43.1	39,087	56.9	$537,900	$1,663
	Fairfax (city)	8,843	8,499	344	*3.9*	5,949	70.0	2,550	30.0	$501,900	$1,803
	Falls Church (city)	5,805	5,308	497	*8.6*	3,178	59.9	2,130	40.1	$742,000	$1,775
	Fredericksburg (city)	11,545	10,419	1,126	*9.8*	3,746	36.0	6,673	64.0	$341,200	$1,123
	Manassas (city)	13,451	12,540	911	*6.8*	7,979	63.6	4,561	36.4	$307,000	$1,439
	Manassas Park (city)	4,895	4,778	117	*2.4*	3,224	67.5	1,554	32.5	$263,300	$1,635
	Total Northern	***892,722***	***842,799***	***49,923***	***5.6***	***541,471***	***64.2***	***301,328***	***35.8***	***NA***	***NA***
	Study Area Total	**2,142,747**	**1,964,010**	**178,737**	***8.3***	**1,246,578**	**63.5**	**717,432**	**36.5**	**$232,700**	**$1,073**
	Virginia	**3,466,921**	**3,105,636**	**361,285**	***10.4***	**2,055,073**	**66.2**	**1,050,563**	**33.8**	**$255,800**	**$1,166**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	***12.2***	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 13-34. Median Home Value in the Virginia Study Area by Census Block Group



Source: USCB 2017r

Figure 13-35. Median Gross Rent in the Virginia Study Area by Census Block Group

According to Virginia Business, there is demand for affordable, workforce-priced housing in many cities across America driven by market demand from millennials who prefer housing in walkable, urban environments and corporations seeking prime working age employees (Foster 2018). Some Virginia municipalities are struggling to provide more affordable housing through inclusionary zoning programs which directs or encourages below-market rate units in new housing developments (Housing Virginia 2018). When Amazon announced plans to locate a second headquarters in Northern Virginia in 2018, it caused a housing market frenzy in Alexandria City, Arlington County, Fairfax County, Fairfax City, and Falls Church City. According to MarketWatch, the average selling price in March 2019 was 4.3% higher than the average selling price in February 2019, which in turn was 1.1% higher than the average in January (Riquier 2019).

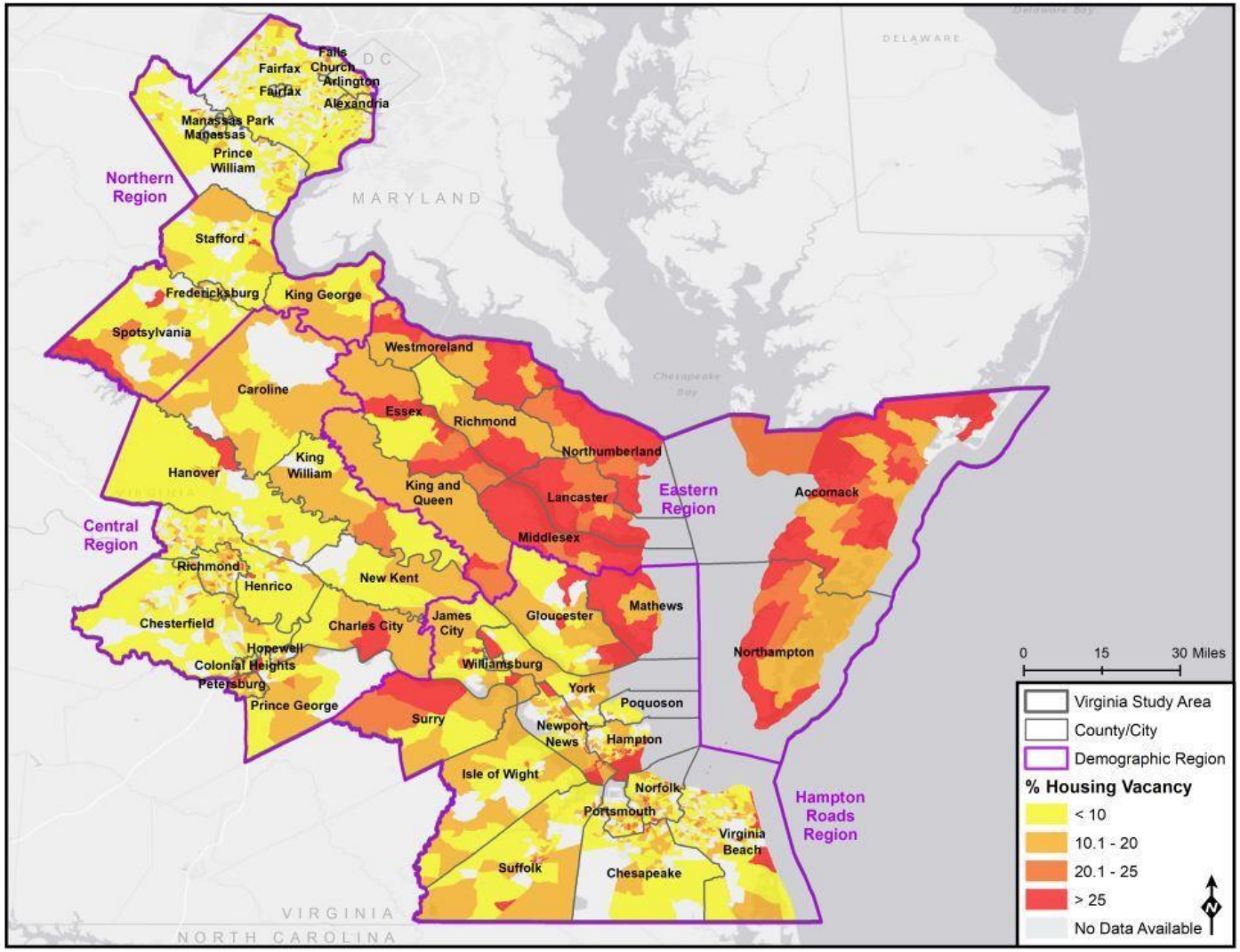
As shown in Table 13-11, home vacancy rates in Virginia (10.4%) in 2017 were lower than the Nation (12.2%) but higher than the Study Area (8.3%). Figure 13-36 shows vacancy rates in the Study Area by census block group. The Figure illustrates the highest vacancy rates (32.2%) in the rural Eastern Region, and the lowest in the Northern Region (5.6%) (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals. According to an Airbnb press release, short-term rentals businesses are growing in Virginia. Virginia Airbnb hosts earned a combined $41.4 million in supplemental income while welcoming approximately 280,000 guests to the State in 2016. Within the Study Area, the city of Arlington in the Washington, DC metropolitan area county had the highest number of guest arrivals (31,000), followed by Richmond (27,000), Virginia Beach (16,900), and Alexandria (15,800) (Squires 2017). The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb “landlords” who own multiple area properties (CityLab 2019).

13.4.4 Employment

13.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 13-12. In 2017, the Study Area had a total employment of 2.7 million jobs, representing approximately 66.1% of the total jobs in Virginia, and 1.7% of the total jobs in the U.S. (USCB 2017p).

Virginia’s 2018 Annual Gross Domestic Product was 532.8 billion, which represented 2.6% of the Nation’s gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 13-36. Housing Vacancy Rates in the Virginia Study Area by Census Block Group

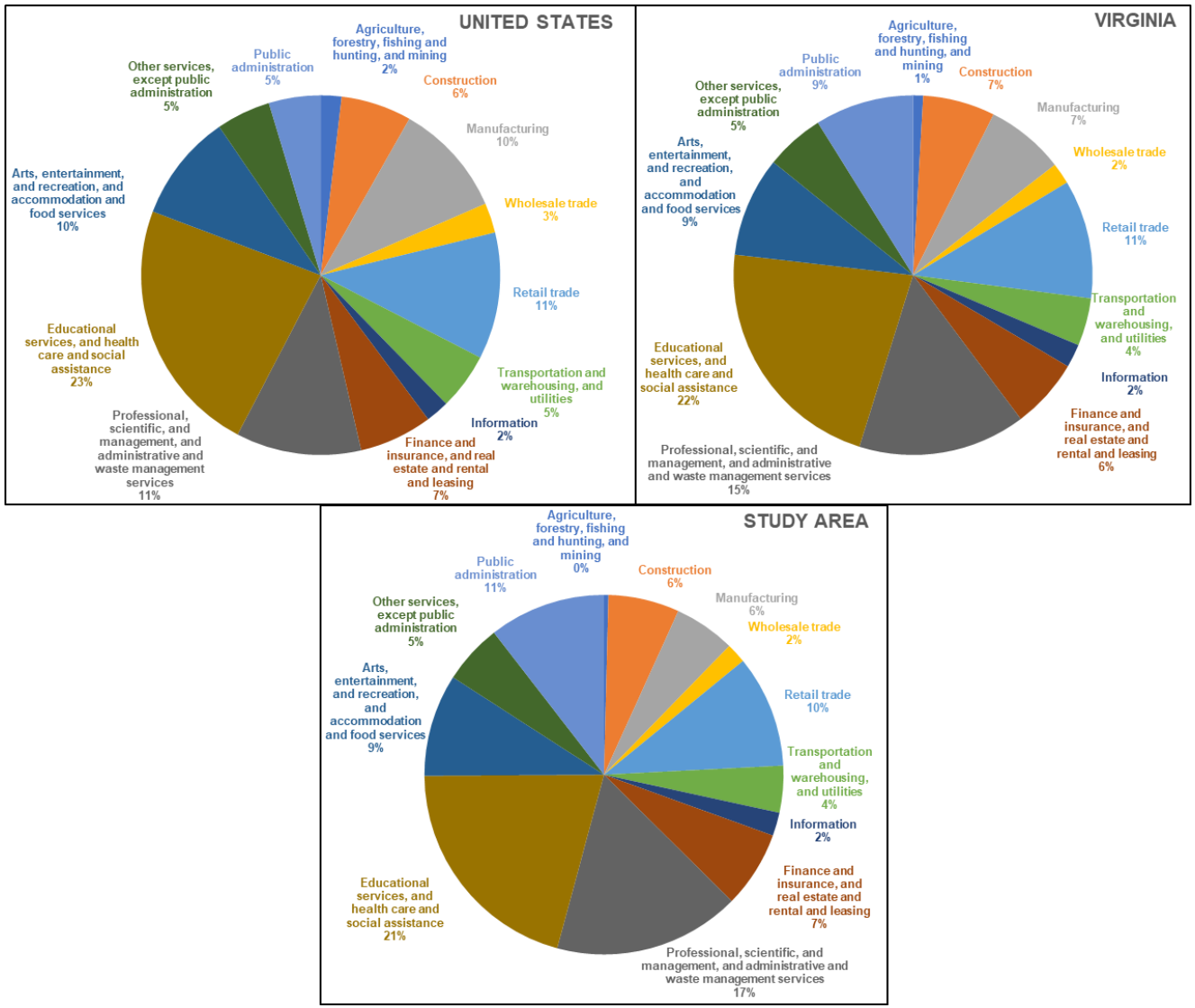
Table 13-12. Census Bureau Labor and Industry Statistics for the U.S., Virginia, and the Virginia Study Area (number of jobs)

Industry	United States	Percent (%)	Virginia	Percent (%)	Study Area	Percent (%)
TOTAL	150,599,165		4,084,035		2,703,400	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	38,728	0.9	10,751	0.4
Construction	9,564,541	6.4	264,774	6.5	171,830	6.4
Manufacturing	15,477,389	10.3	289,635	7.1	149,480	5.5
Wholesale trade	4,042,867	2.7	76,314	1.9	48,222	1.8
Retail trade	17,167,000	11.4	435,812	10.7	273,164	10.1
Transportation and warehousing, and utilities	7,681,579	5.1	176,211	4.3	114,701	4.2
Information	3,173,300	2.1	83,770	2.1	56,754	2.1
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	257,752	6.3	187,119	6.9
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	615,423	15.1	453,916	16.8
Educational services, and health care and social assistance	34,781,348	23.1	899,719	22.0	558,382	20.7
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	366,232	9.0	248,982	9.2
Other services, except public administration	7,371,226	4.9	216,211	5.3	146,664	5.4
Public administration	7,025,870	4.7	363,454	8.9	283,435	10.5

Source: USCB 2017p

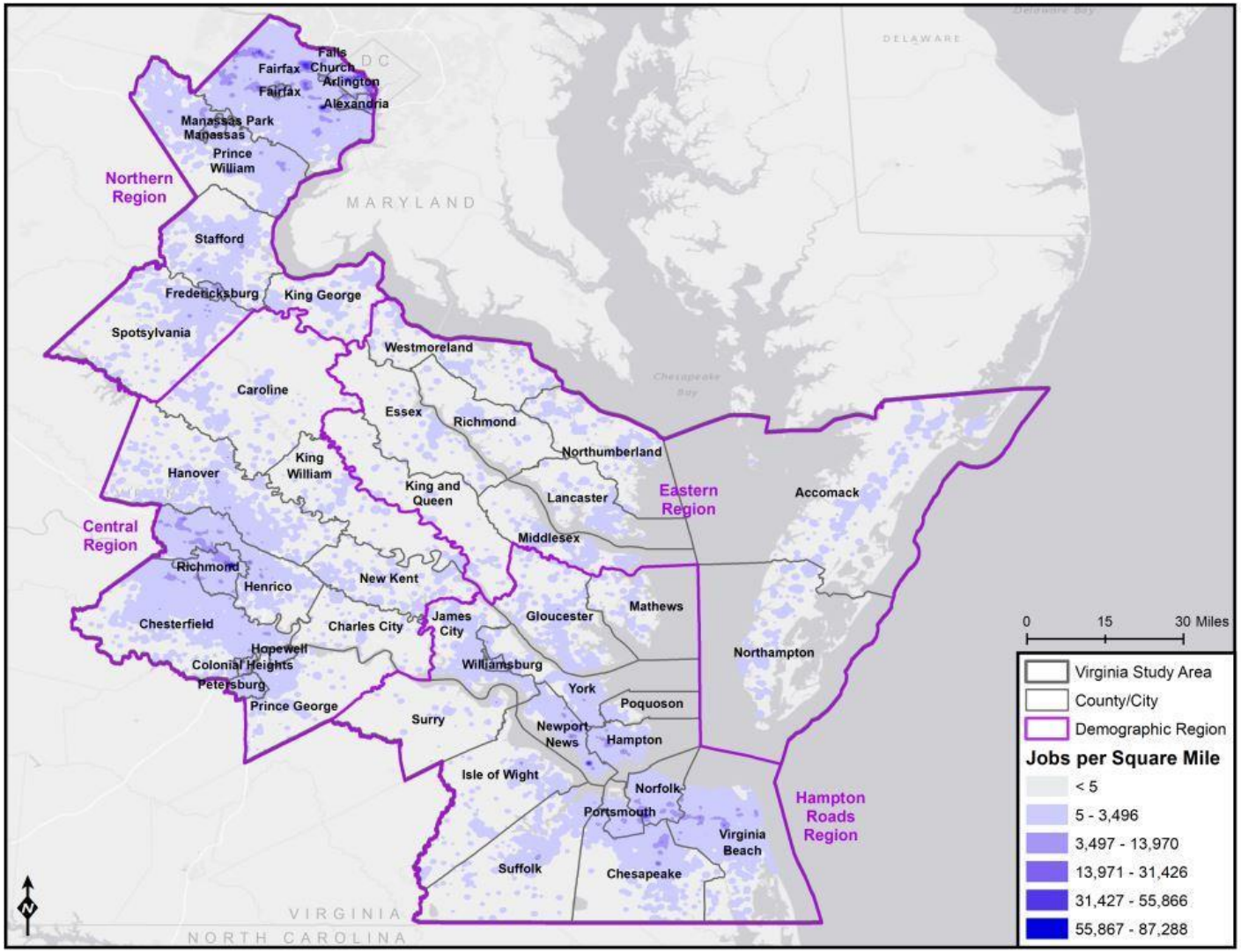
Table 13-12 and Figure 13-37 show the number of jobs in each major industry sector for the U.S., the State and the Study Area. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (20.7%), professional, scientific, and management, and administrative and waste management (16.8%), public administration (10.5%) and retail trade (10.1%). Generally, the dominant employment categories in the Study Area are similar to those of the State. Reflecting its proximity to the government jobs in the Washington D.C. metropolitan area, 10.5% of people work in public administration in the Study Area, more than the Commonwealth (8.9%) and the Nation (4.7%). The Commonwealth has more manufacturing jobs (7.1%) than the Study Area (5.5%) but significantly less than the Nation (10.3%) (USCB 2017p).

Figure 13-38 shows the location of jobs within the Study Area. The greater portion of jobs are located in the Northern, Central, and Hampton Roads Region near the high-density MSAs of Richmond, VA, Washington-Arlington-Alexandria, DC-VA-MD-WV, and Virginia Beach-Norfolk-Newport News, VA-NC. Population density increases the demand for all goods, services, space and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the rural Eastern Region. Rural areas tend to have fewer locally available options and less economic development.



Source: (USCB 2017p

Figure 13-37. Number of Jobs by Industry Sector for the U.S., Virginia, and the Virginia Study Area



Source: USCB 2017r

Figure 13-38. Jobs Per Square Mile in the Virginia Study Area by Census Block Group

13.4.4.1.1 Virginia's Ocean Economy

Overall Virginia's ocean economy ranked 7th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 13-13, Virginia's ocean economy accounted for 126,812 maritime jobs in 2016, accounting for 3.4% of Virginia's employment (NOAA 2016c, USCB 2017i). Home to several major shipyards, Virginia was the largest employer in the Nation's ship and boat building sector in 2016. The State employed approximately 34,650 workers accounting for approximately 27.9% of employment in the sector (NOAA 2016d). Within the State, 51.3% of maritime jobs were in the tourism and recreation sector. The sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 99,353 maritime jobs, representing 78.3% of total maritime jobs in the State (USCB 2017i, NOAA 2016c). The Hampton Roads Region had the greatest number of maritime jobs (85,509) representing 12.2% of maritime jobs in the Study Area. This is due to the contributions of the cities of Virginia Beach, Portsmouth and Norfolk to the ocean economy. Portsmouth city was the second largest contributor in the Nation's ship and boat building sector among all the coastal counties (NOAA 2019c).

Figure 13-39 shows the percent of maritime related jobs to total jobs in each county in the Study Area. The counties in the Eastern Region and Hampton Roads Region have a higher percentage of maritime related jobs, reflecting their proximity to the ocean and maritime employment opportunities.

13.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 13-13, in 2017 Virginia had higher median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, Virginia had a median income of $68,766 (19.3% higher than the Nation's median income), and a per capita income of $36,268 (16.3% higher than the Nation's per capita income). Median and per capita income in the Study Area were lower than the State at $65,164 and $33,825, respectively (USCB 2017k, USCB 2017n).

Figure 13-40 and Figure 13-41 show median household and per capita income in the Study Area, respectively. The figures portray high median household and per capita incomes near the high-paying jobs in metropolitan areas and nearby suburbs (particularly in the Northern Region near the Washington DC metropolitan area) and lower paying jobs in rural areas (USCB 2017k, USCB 2017n).

While the State and Study Area have higher income metrics as compared to the Nation, many of Virginia's service sector jobs in accommodations, retail and food service remain low paying. The Commonwealth Institute says service sector employees in Virginia have lived with stubbornly low wages for years, while wages of employees in other sectors benefited from the Nation's recovery from the Great Recession (which lasted from 2007 to 2009) (Rich 2013). Currently, the minimum wage in Virginia is the Federal minimum — $7.25 an hour (Pope 2018).

Table 13-13. Employment Data in the Virginia Study Area (from the Longitudinal Employer-Household Dynamics dataset)

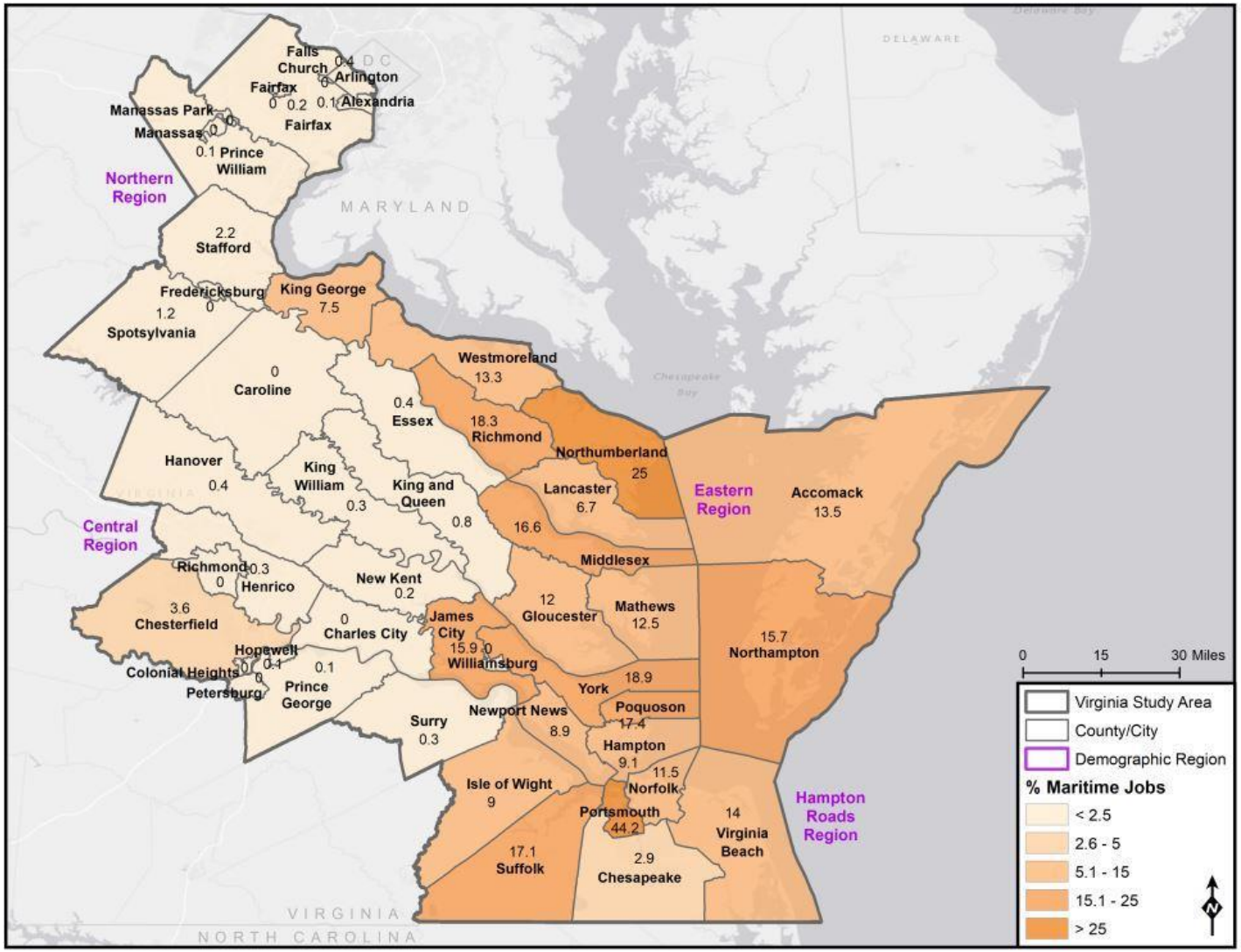
Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	% Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Central	Caroline	15,681	14,117	13,227	890	6.3	5,041	0	0.0	$60,925	$28,039
	Charles City	3,582	3,569	3,348	221	6.2	1,762	0	0.0	$55,069	$32,689
	Chesterfield	182,854	181,993	171,886	10,107	5.6	139,625	4,784	3.4	$76,969	$35,370
	Colonial Heights (city)	8,552	8,450	7,587	863	10.2	53,322	196	0.4	$84,955	$37,924
	Hanover	56,384	56,253	54,324	1,929	3.4	201,116	606	0.3	$66,447	$36,497
	Henrico	179,506	179,282	168,806	10,476	5.8	3,908	12	0.3	$67,423	$31,192
	Hopewell (city)	10,687	10,554	9,503	1,051	10.0	4,028	8	0.2	$78,429	$36,768
	King William	8,600	8,600	8,284	316	3.7	10,445	7	0.1	$68,461	$27,970
	New Kent	10,818	10,799	10,248	551	5.1	9,720	NA	NA	$50,952	$27,608
	Petersburg (city)	15,646	15,201	13,348	1,853	12.2	8,078	5	0.1	$40,712	$22,668
	Prince George	17,680	16,308	14,926	1,382	8.5	13,303	NA	NA	$33,939	$21,992
	Richmond (city)	120,393	119,924	109,362	10,562	8.8	158,787	40	0.0	$42,356	$30,113
	Total Central	***630,383***	***625,050***	***584,849***	***40,201***	***6.4***	***609,135***	***5,658***	***0.9***	***NA***	***NA***
Eastern	Accomack	14,769	14,630	13,837	793	5.4	11,381	1,564	13.7	$42,260	$24,266
	Essex	5,582	5,582	5,272	310	5.6	3,607	15	0.4	$50,629	$25,730
	King and Queen	3,302	3,302	3,157	145	4.4	1,114	7	0.6	$51,495	$25,831
	Lancaster	4,584	4,584	4,384	200	4.4	4,421	285	6.4	$51,495	$33,997
	Middlesex	4,680	4,680	4,385	295	6.3	3,386	409	12.1	$50,483	$29,871
	Northampton	5,145	5,118	4,892	226	4.4	4,192	672	16.0	$41,468	$24,835
	Northumberland	5,136	5,136	4,733	403	7.8	2,287	560	24.5	$56,677	$33,364
	Richmond	3,466	3,461	3,240	221	6.4	2,636	484	18.4	$47,341	$19,728
	Westmoreland	8,413	8,302	7,696	606	7.3	3,286	422	12.8	$55,688	$32,265
	Total Eastern	***55,077***	***54,795***	***51,596***	***3,199***	***5.8***	***36,310***	***4,418***	***12.2***	***NA***	***NA***

Table 13-13. Employment Data in the Virginia Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	% Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Hampton Roads	Chesapeake (city)	121,815	115,278	108,589	6,689	5.8	8,937	1,148	12.8	$63,881	$32,271
	Gloucester	18,744	18,382	17,770	612	3.3	10,840	971	9.0	$67,767	$33,172
	Hampton (city)	71,759	67,299	62,042	5,257	7.8	30,308	4,493	14.8	$80,772	$42,047
	Isle of Wight	18,921	18,638	17,338	1,300	7.0	1,364	162	11.9	$63,622	$35,252
	James City	35,379	34,751	33,064	1,687	4.9	2,542	7	0.3	$54,656	$27,162
	Mathews	4,219	4,208	4,151	57	1.4	20,407	3,625	17.8	$86,781	$38,193
	Newport News (city)	96,389	88,222	81,596	6,626	7.5	102,255	2,954	2.9	$72,214	$32,123
	Norfolk (city)	138,020	113,769	104,089	9,680	8.5	50,592	4,871	9.6	$52,021	$27,053
	Poquoson (city)	6,369	6,199	5,908	291	4.7	94,772	8,612	9.1	$51,082	$26,028
	Portsmouth (city)	49,063	46,178	41,692	4,486	9.7	129,853	14,863	11.4	$47,137	$26,670
	Suffolk (city)	45,632	43,965	41,009	2,956	6.7	1,868	284	15.2	$88,328	$39,305
	Surry	3,357	3,357	3,099	258	7.7	31,229	14,476	46.4	$48,727	$24,291
	Virginia Beach (city)	254,059	231,822	219,573	12,249	5.3	28,175	4,492	15.9	$68,089	$31,239
	Williamsburg (city)	6,819	6,727	6,235	492	7.3	180,542	24,551	13.6	$70,500	$34,607
	York	35,692	32,246	30,172	2,074	6.4	11,396	0	0.0	$54,606	$26,921
	Total Hampton Roads	***906,237***	***831,041***	***776,327***	***54,714***	***6.6***	***705,080***	***85,509***	***12.1***	***NA***	***NA***
Northern	Alexandria (city)	101,214	99,197	95,344	3,853	3.9	148,348	655	0.4	$112,138	$67,061
	Arlington	151,548	148,564	143,798	4,766	3.2	616,811	1,198	0.2	$117,515	$52,976
	Fairfax	648,816	638,577	609,859	28,718	4.5	6,131	463	7.6	$84,770	$35,676
	Fairfax (city)	13,475	13,380	12,834	546	4.1	127,085	173	0.1	$101,059	$38,225
	Falls Church (city)	8,065	8,010	7,672	338	4.2	36,588	428	1.2	$81,434	$33,859
	Fredericksburg (city)	15,666	15,549	14,674	875	5.6	37,747	770	2.0	$103,005	$39,158
	King George	13,501	13,176	12,525	651	4.9	81,671	81	0.1	$93,370	$57,019
	Manassas (city)	23,681	23,595	21,846	1,749	7.4	24,882	NA	NA	$106,870	$46,489
	Manassas Park (city)	8,897	8,854	8,326	528	6.0	10,668	NA	NA	$114,795	$65,510
	Prince William	248,785	243,363	231,096	12,267	5.0	24,098	NA	NA	$57,258	$32,359
	Spotsylvania	68,543	68,140	64,416	3,724	5.5	20,869	NA	NA	$77,551	$30,572
	Stafford	75,048	71,277	68,238	3,039	4.3	4,088	NA	NA	$79,131	$29,641
	Total Northern	***1,377,239***	***1,351,682***	***1,290,628***	***61,054***	***4.5***	***1,138,986***	***3,768***	***0.3***	***NA***	***NA***
	Study Area Total	**2,968,936**	**2,862,568**	**2,703,400**	**159,168**	**5.6**	**2,489,511**	**99,353**	**4.0**	**$65,164**	**$33,825**
	Virginia	**4,431,500**	**4,320,683**	**4,084,035**	**236,648**	**5.5**	**3,683,091**	**126,812**	**3.4**	**$68,766**	**$36,268**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

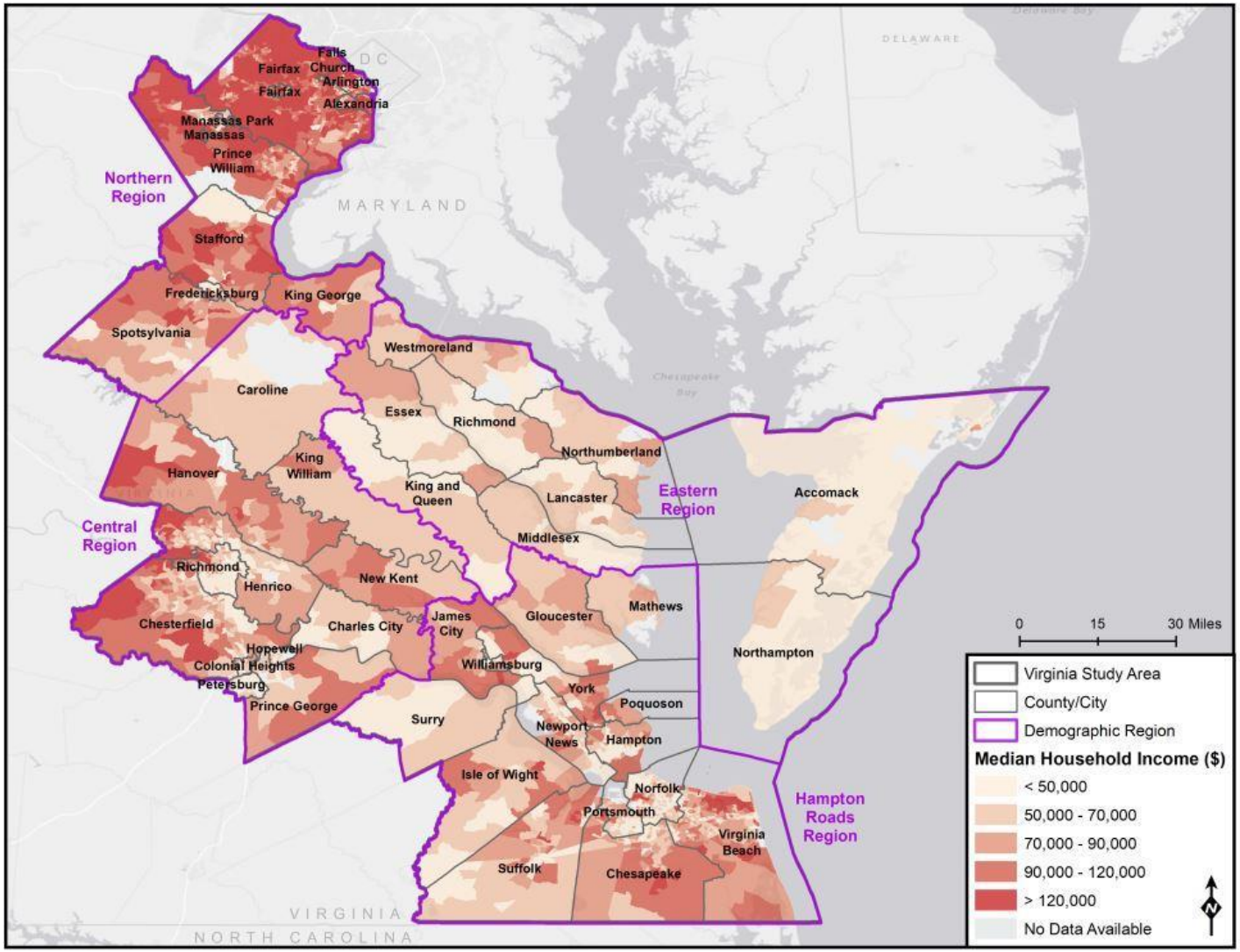
Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n

Note: Job data are based on the geographic location of the employer. Labor force data are based on the residential location of workers. As a result, labor force and job data numbers do not match as workers may live in one county or State yet be employed in another county or State."



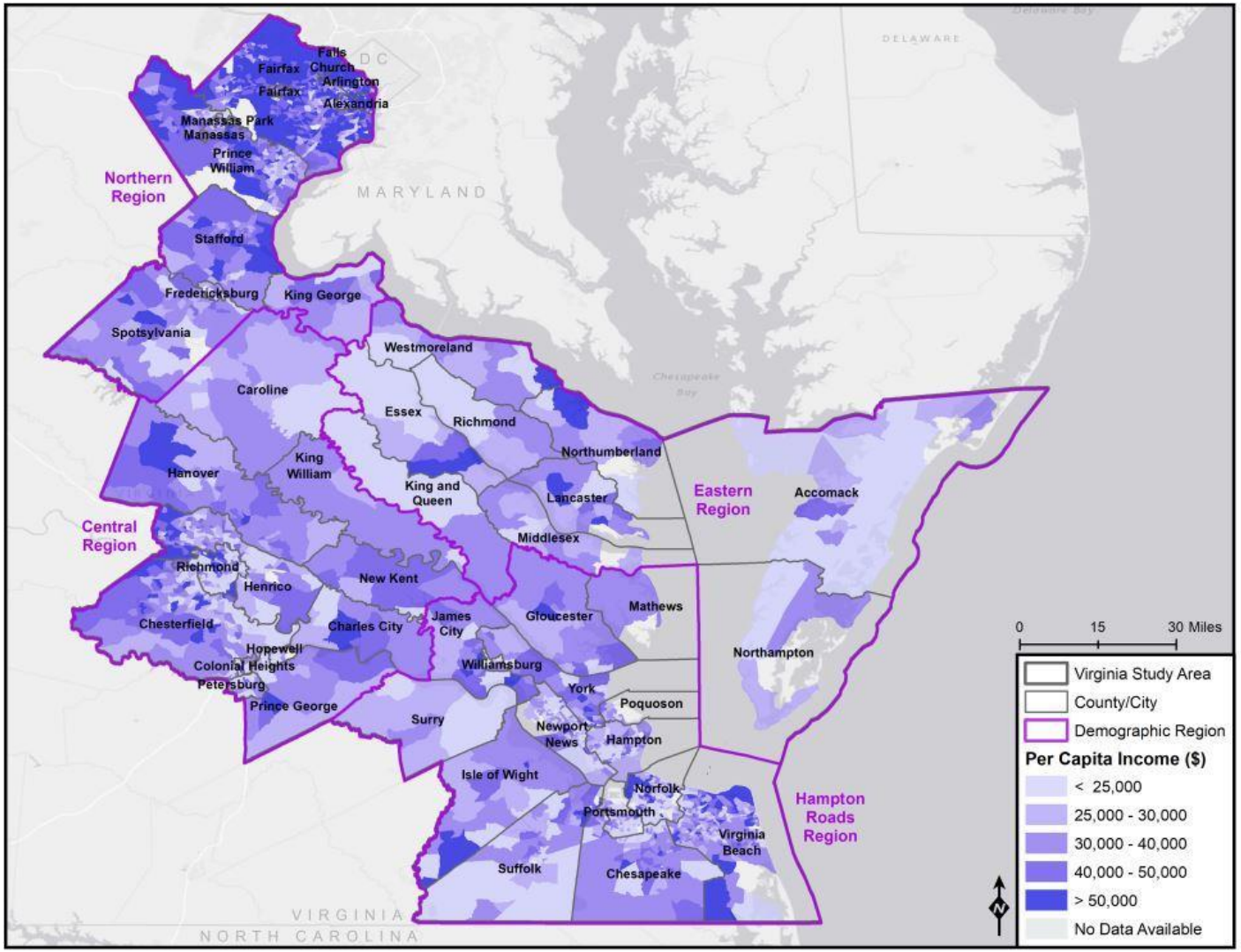
Source: NOAA 2017b

Figure 13-39. Maritime Jobs in Virginia Study Area by County



Source: USCB 2017r

Figure 13-40. Median Household Income in the Virginia Study Area by Census Block Group



Source: USCB 2017r

Figure 13-41. Per Capita Income in the Virginia Study Area by Census Block Group

13.4.4.3 Unemployment Rates

Figure 13-42 shows the 2017 unemployment rates in the counties and independent cities in the Study Area by census block group. Table 13-13 presents unemployment rates for each county and independent city in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 5.6%, similar to the State (5.5%) but less than the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area, unemployment rates ranged from 1.4% in Mathews County (Hampton Roads Region) to 12.2% in Petersburg city (Central Region) in 2017 (USCB 2017h).

The unemployment rate was 6.5% in the Central Region in 2017, with the highest rates occurring in the four cities in the region (Petersburg [12.2%], Colonial Heights [10.2%], Hopewell [10.0%] and Richmond [8.2%]) and the lowest in Hanover County (3.4%) (USCB 2017h).

The unemployment rate was 5.8% in the Eastern Region in 2017, with counties in this region ranging from 7.8% (Northumberland County) to 4.4% (Lancaster County). There are no independent cities in this region (USCB 2017h).

The unemployment rate was 6.6% in the Hampton Roads Region in 2017, which is the highest rate of the four demographic regions in the Study Area. Rates range from 9.7% (city of Portsmouth) to 1.4% in sparsely populated Mathews County (USCB 2017h).

The Northern Region has the lowest unemployment rate (4.5%). Rates ranged from 7.4% (city of Manassas) to 3.2% (Arlington County) (USCB 2017h).

13.4.4.4 Educational Attainment

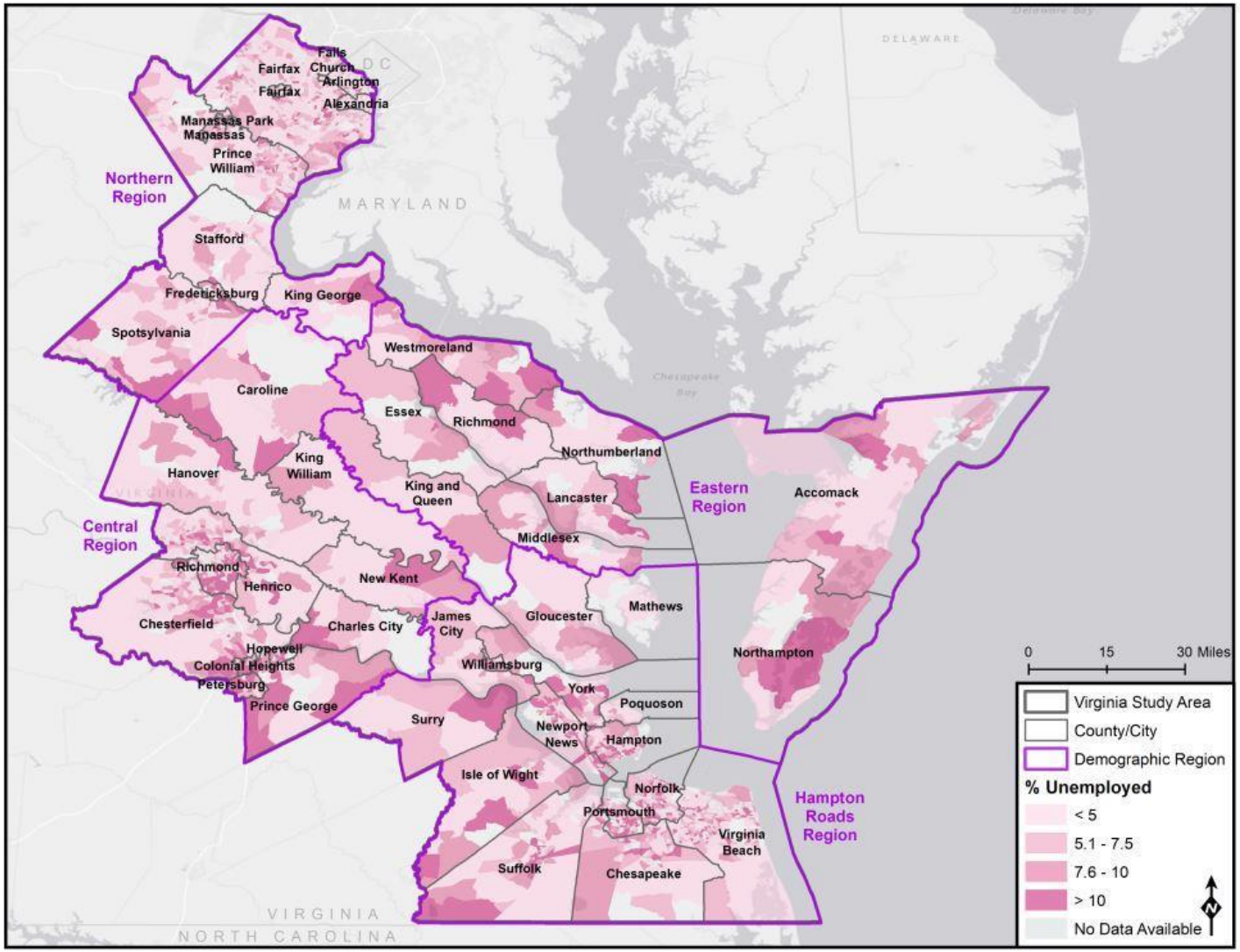
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 13-14 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate’s degree, bachelor's degree, and graduate degree in the independent cities and counties comprising the Study Area, the State and the Nation (USCB 2017t).

Figure 13-43 shows the percentage of the working-age population who earned only a high school diploma and the percentage who earned a college or advanced degree (associate’s, bachelor’s, and/or graduate degree) in the Nation, the State and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Virginia, 25.0% of the working-age population earned only a high school diploma; 42.5% earned a college or advanced degree.
- In the Study Area, 22.3% of the working-age population earned only a high school diploma; 45.4% earned a college or advanced degree. (USCB 2017q).

Figure 13-44 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).



Source: USCB 2017q

Figure 13-42. Unemployment Rates in the Virginia Study Area by Census Block Group

Table 13-14. Educational Attainment in the Virginia Study Area

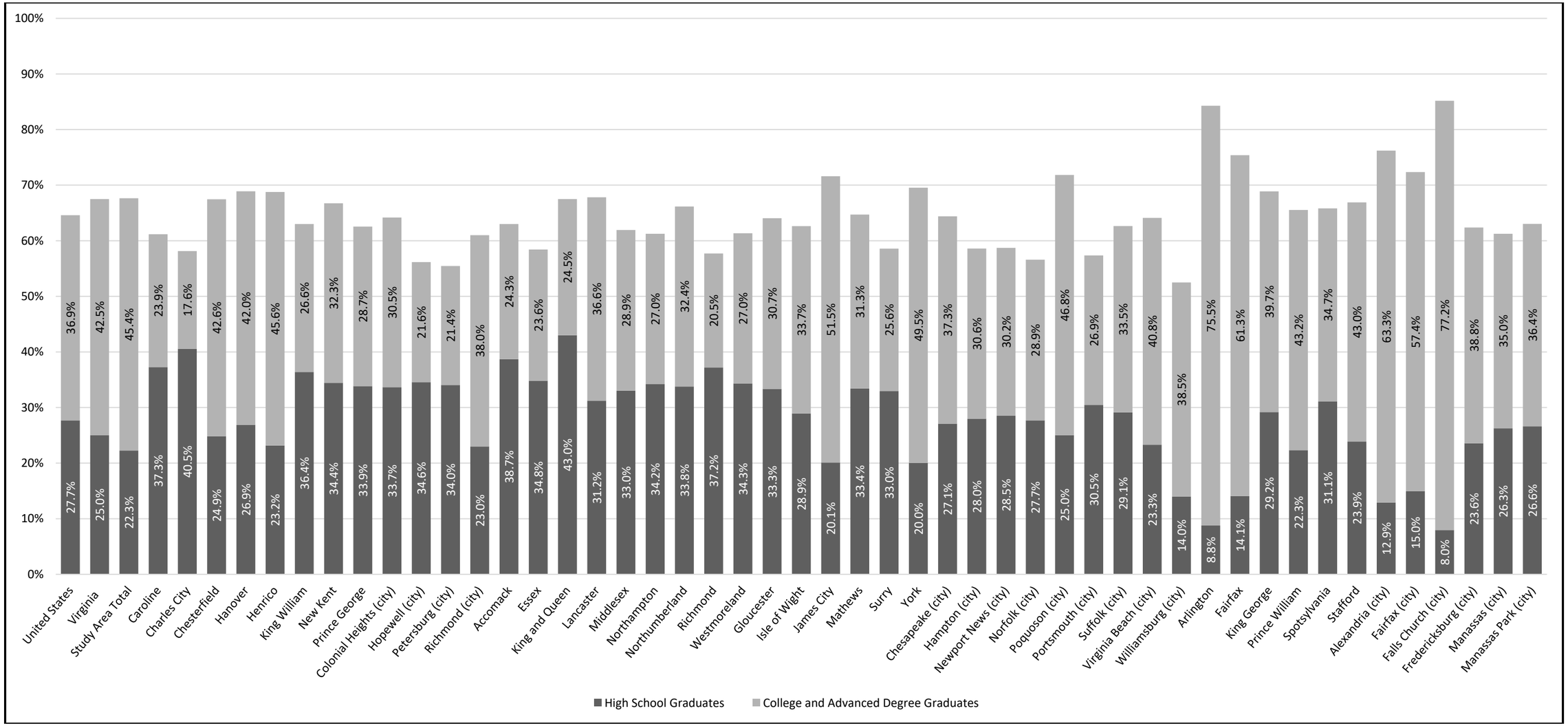
Region	Geographic Unit	Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree	Total	Percent Less Than 9th Grade (%)	Percent 9th to 12th Grade, No Diploma (%)	Percent High School Graduate (includes equivalent) (%)	Percent Some College, No Degree (%)	Percent Associate's Degree (%)	Percent Bachelor's Degree (%)	Percent Graduate or Professional Degree (%)
Central	Caroline	1,044	2,544	8,571	5,343	1,486	2,850	1,159	22,997	4.5	11.1	37.3	23.2	6.5	12.4	5.0
	Charles City	291	925	2,388	1,252	323	453	259	5,891	4.9	15.7	40.5	21.3	5.5	7.7	4.4
	Chesterfield	6,902	14,943	63,174	60,993	19,086	56,559	32,532	254,189	2.7	5.9	24.9	24.0	7.5	22.3	12.8
	Hanover	1,495	4,438	21,462	18,899	5,799	18,717	8,999	79,809	1.9	5.6	26.9	23.7	7.3	23.5	11.3
	Henrico	7,482	15,574	57,594	54,636	15,375	62,129	35,748	248,538	3.0	6.3	23.2	22.0	6.2	25.0	14.4
	King William	506	814	4,559	3,315	1,103	1,639	590	12,526	4.0	6.5	36.4	26.5	8.8	13.1	4.7
	New Kent	217	1,128	5,604	4,061	1,111	2,656	1,496	16,273	1.3	6.9	34.4	25.0	6.8	16.3	9.2
	Prince George	833	2,336	10,022	7,917	2,327	4,120	2,047	29,602	2.8	7.9	33.9	26.7	7.9	13.9	6.9
	Colonial Heights (city)	498	791	4,575	3,574	1,089	2,029	1,032	13,588	3.7	5.8	33.7	26.3	8.0	14.9	7.6
	Hopewell (city)	946	2,255	5,745	4,097	1,194	1,722	668	16,627	5.7	13.6	34.6	24.6	7.2	10.4	4.0
	Petersburg (city)	1,538	3,235	8,649	6,531	1,206	2,613	1,629	25,401	6.1	12.7	34.0	25.7	4.7	10.3	6.4
	Richmond (city)	8,561	17,592	41,658	44,550	8,033	37,838	22,874	181,106	4.7	9.7	23.0	24.6	4.4	20.9	12.6
	Total Central	***30,313***	***66,575***	***234,001***	***215,168***	***58,132***	***193,325***	***109,033***	***906,547***	***3.3***	***7.3***	***25.8***	***23.7***	***6.4***	***21.3***	***12.0***
Eastern	Accomack	1,677	3,205	10,050	4,734	1,484	2,900	1,921	25,971	6.5	12.3	38.7	18.2	5.7	11.2	7.4
	Essex	407	1,055	3,042	2,174	459	1,137	462	8,736	4.7	12.1	34.8	24.9	5.3	13.0	5.3
	King and Queen	328	496	2,452	1,027	398	608	394	5,703	5.8	8.7	43.0	18.0	7.0	10.7	6.9
	Lancaster	318	632	2,864	2,001	563	1,384	1,411	9,173	3.5	6.9	31.2	21.8	6.1	15.1	15.4
	Middlesex	306	697	2,987	2,439	761	1,143	711	9,044	3.4	7.7	33.0	27.0	8.4	12.6	7.9
	Northampton	598	1,159	3,291	1,963	503	1,317	779	9,610	6.2	12.1	34.2	20.4	5.2	13.7	8.1
	Northumberland	226	732	3,502	2,547	781	1,544	1,039	10,371	2.2	7.1	33.8	24.6	7.5	14.9	10.0
	Richmond	481	921	2,747	1,723	578	666	269	7,385	6.5	12.5	37.2	23.3	7.8	9.0	3.6
	Westmoreland	697	1,131	4,897	3,690	1,001	1,866	978	14,260	4.9	7.9	34.3	25.9	7.0	13.1	6.9
	Total Eastern	***5,038***	***10,028***	***35,832***	***22,298***	***6,528***	***12,565***	***7,964***	***100,253***	***5.0***	***10.0***	***35.7***	***22.2***	***6.5***	***12.5***	***7.9***
Hampton Roads	Gloucester	861	2,148	9,849	7,602	2,788	4,014	2,272	29,534	2.9	7.3	33.3	25.7	9.4	13.6	7.7
	Isle of Wight	1,174	2,401	8,236	7,064	2,412	4,417	2,773	28,477	4.1	8.4	28.9	24.8	8.5	15.5	9.7
	James City	1,186	2,527	11,675	12,759	3,954	14,497	11,495	58,093	2.0	4.3	20.1	22.0	6.8	25.0	19.8
	Mathews	175	497	2,495	1,964	364	1,299	674	7,468	2.3	6.7	33.4	26.3	4.9	17.4	9.0
	Surry	282	634	1,798	1,344	389	695	310	5,452	5.2	11.6	33.0	24.7	7.1	12.7	5.7
	York	1,109	2,235	10,211	12,179	4,774	11,309	9,148	50,965	2.2	4.4	20.0	23.9	9.4	22.2	17.9
	Chesapeake (city)	3,315	11,640	48,183	48,354	14,830	32,849	18,686	177,857	1.9	6.5	27.1	27.2	8.3	18.5	10.5
	Hampton (city)	2,415	7,418	29,951	34,479	8,522	15,242	8,984	107,011	2.3	6.9	28.0	32.2	8.0	14.2	8.4
	Newport News (city)	3,871	10,269	39,525	43,037	11,289	19,547	11,044	138,582	2.8	7.4	28.5	31.1	8.1	14.1	8.0
	Norfolk (city)	5,398	15,972	54,422	63,888	12,807	27,650	16,388	196,525	2.7	8.1	27.7	32.5	6.5	14.1	8.3
	Poquoson (city)	142	310	2,334	2,177	772	2,154	1,435	9,324	1.5	3.3	25.0	23.3	8.3	23.1	15.4
	Portsmouth (city)	2,542	7,485	22,249	21,129	5,122	9,709	4,810	73,046	3.5	10.2	30.5	28.9	7.0	13.3	6.6
	Suffolk (city)	2,126	5,578	19,283	16,998	5,590	10,106	6,482	66,163	3.2	8.4	29.1	25.7	8.4	15.3	9.8
	Virginia Beach (city)	6,110	17,569	81,198	101,435	31,997	73,086	36,870	348,265	1.8	5.0	23.3	29.1	9.2	21.0	10.6

Table 13-14. Educational Attainment in the Virginia Study Area

Region	Geographic Unit	Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree	Total	Percent Less Than 9th Grade (%)	Percent 9th to 12th Grade, No Diploma (%)	Percent High School Graduate (includes equivalent) (%)	Percent Some College, No Degree (%)	Percent Associate's Degree (%)	Percent Bachelor's Degree (%)	Percent Graduate or Professional Degree (%)
	Williamsburg (city)	75	439	1,845	5,748	378	2,706	1,990	13,181	0.6	3.3	14.0	43.6	2.9	20.5	15.1
	Total Hampton Roads	***30,781***	***87,122***	***343,254***	***380,157***	***105,988***	***229,280***	***133,361***	***1,309,943***	***2.3***	***6.7***	***26.2***	***29.0***	***8.1***	***17.5***	***10.2***
Northern	Arlington	6,498	5,439	16,666	18,437	5,908	69,115	67,769	189,832	3.4	2.9	8.8	9.7	3.1	36.4	35.7
	Fairfax	35,265	38,366	122,614	140,541	41,660	261,844	230,706	870,996	4.0	4.4	14.1	16.1	4.8	30.1	26.5
	King George	295	1,050	5,535	4,560	1,534	3,887	2,109	18,970	1.6	5.5	29.2	24.0	8.1	20.5	11.1
	Prince William	16,077	21,032	72,783	75,276	22,192	72,634	45,897	325,891	4.9	6.5	22.3	23.1	6.8	22.3	14.1
	Spotsylvania	2,928	7,318	30,179	22,906	6,447	17,420	9,804	97,002	3.0	7.5	31.1	23.6	6.6	18.0	10.1
	Stafford	1,842	5,674	24,763	26,753	7,967	22,393	14,221	103,613	1.8	5.5	23.9	25.8	7.7	21.6	13.7
	Alexandria (city)	5,902	5,402	16,380	18,822	5,226	36,687	38,353	126,772	4.7	4.3	12.9	14.8	4.1	28.9	30.3
	Fairfax (city)	653	755	2,758	3,695	856	5,270	4,460	18,447	3.5	4.1	15.0	20.0	4.6	28.6	24.2
	Falls Church (city)	21	214	829	1,310	405	3,593	4,029	10,401	0.2	2.1	8.0	12.6	3.9	34.5	38.7
	Fredericksburg (city)	562	1,072	5,256	6,739	888	4,637	3,131	22,285	2.5	4.8	23.6	30.2	4.0	20.8	14.0
	Manassas (city)	3,041	2,622	7,957	6,082	2,228	5,199	3,175	30,304	10.0	8.7	26.3	20.1	7.4	17.2	10.5
	Manassas Park (city)	777	1,339	3,156	2,264	873	2,419	1,021	11,849	6.6	11.3	26.6	19.1	7.4	20.4	8.6
	Total Northern	***73,861***	***90,283***	***308,876***	***327,385***	***96,184***	***505,098***	***424,675***	***1,826,362***	***4.0***	***4.9***	***16.9***	***17.9***	***5.3***	***27.7***	***23.3***
	Study Area Total	**139,993**	**254,008**	**921,963**	**945,008**	**266,832**	**940,268**	**675,033**	**4,143,105**	**3.4**	**6.1**	**22.3**	**22.8**	**6.4**	**22.7**	**16.3**
	Virginia	**240,260**	**432,649**	**1,650,344**	**1,475,203**	**456,210**	**1,380,247**	**967,026**	**6,601,939**	**3.6**	**6.6**	**25.0**	**22.3**	**6.9**	**20.9**	**14.6**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

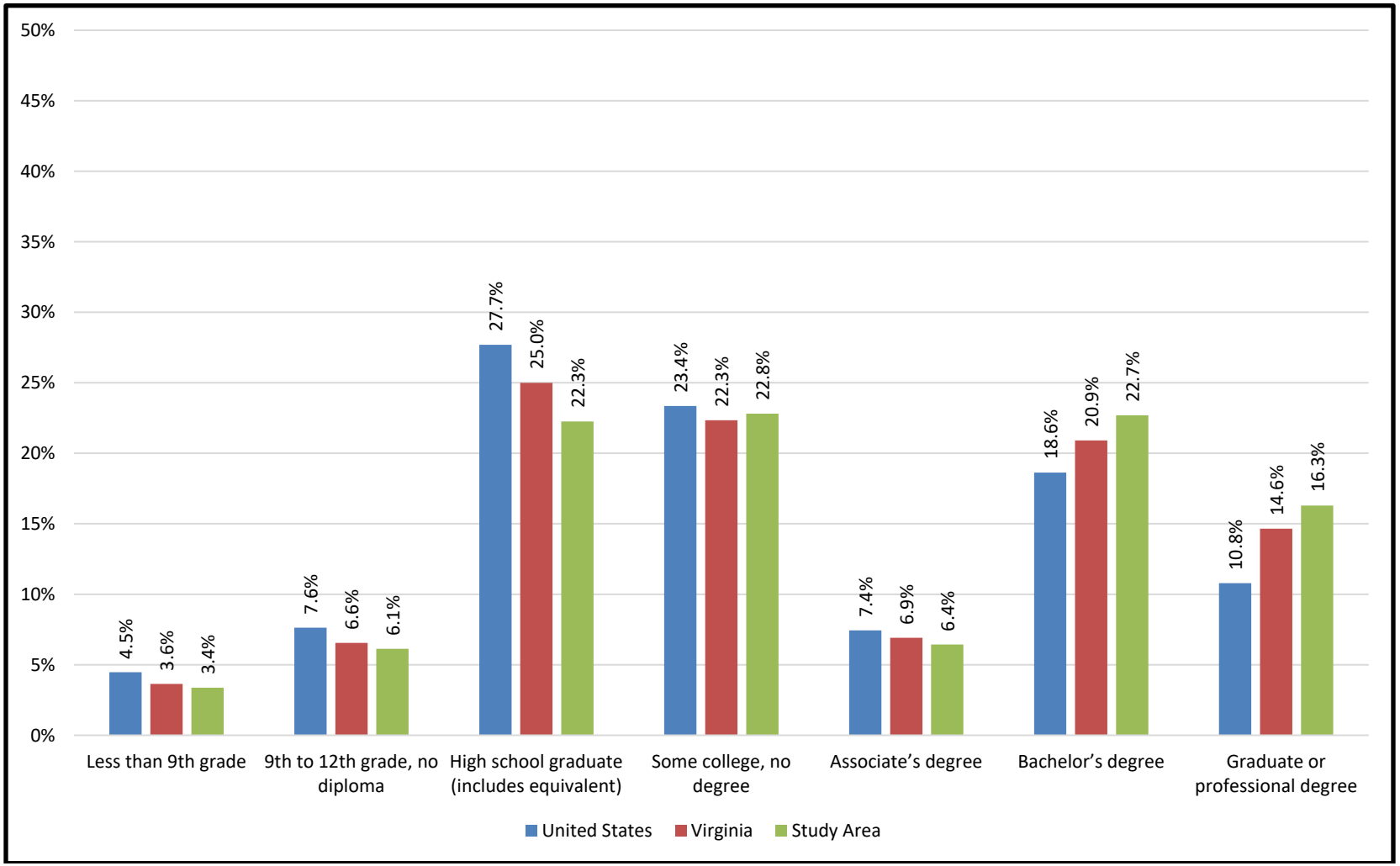
Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 13-43. High School, College, and Advanced Degree Graduate Rates in the Virginia Study Area



Source: USCB 2017q

Figure 13-44. Educational Attainment in the Virginia Study Area

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

13.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are:

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the CEQ and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

13.4.5.1 Environmental Justice Communities of Concern

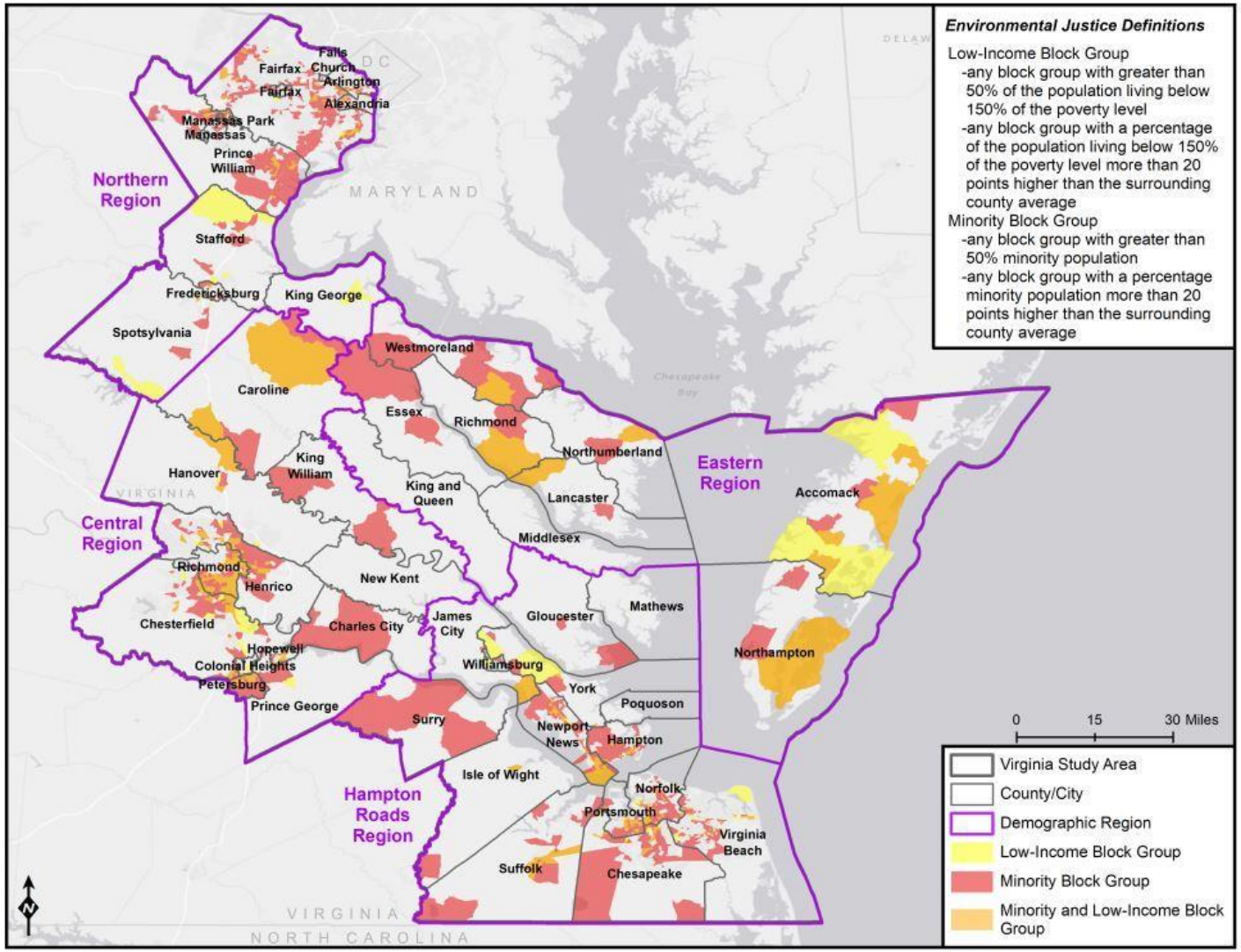
Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 13-45 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.

13.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential Environmental Justice communities of concern. Table 13-15 presents population and Environmental Justice-related characteristics for the Study Area regarding minority populations. Of the 5,374,947 people living in the Study Area, approximately 2,424,373 (45.1%) are minority. This is significantly more than the State (37.4%) and the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 3,324 block groups in the Study Area, approximately 38.7% (1,288 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with high percentages of minority populations. As shown in Table 13-15, the Central, Hampton Roads, and Northern Regions all have similar percentages of minority block groups at 40.7%, 40.9%, and 37.5%, respectively. The Eastern Demographic Region has 21.7% of minority block groups (USCB 2017f).



Source: USCB 2017r

Figure 13-45. Minority and Low-Income Population in the Virginia Study Area by Census Block Group

Table 13-15. Low-Income and Minority Populations in the Virginia Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent of Low-Income Block Groups (%)	Number of Minority Block Groups	Percent of Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Central	Caroline	29,889	19,001	10,888	36.4	18	2	11.1	4	22.2	27,713	7,044	25.4
	Charles City	7,022	2,915	4,107	58.5	6	0	0.0	4	66.7	6,994	1,997	28.6
	Chesterfield	335,594	210,795	124,799	37.2	168	25	14.9	51	30.4	331,055	59,097	17.9
	Hanover	103,218	87,131	16,087	15.6	55	4	7.3	3	5.5	101,303	13,140	13.0
	Henrico	324,073	175,647	148,426	45.8	171	25	14.6	64	37.4	321,074	69,048	21.5
	King William	16,329	12,438	3,891	23.8	10	0	0.0	2	20.0	16,258	3,417	21.0
	New Kent	20,523	16,326	4,197	20.5	10	0	0.0	0	0.0	19,899	2,025	10.2
	Prince George	37,704	20,978	16,726	44.4	21	1	4.8	6	28.6	33,653	7,718	22.9
	Colonial Heights (city)	17,582	13,068	4,514	25.7	11	2	18.2	1	9.1	17,468	4,336	24.8
	Hopewell (city)	22,353	10,905	11,448	51.2	17	5	29.4	7	41.2	22,037	9,192	41.7
	Petersburg (city)	32,037	4,806	27,231	85.0	28	11	39.3	28	100.0	31,363	15,357	49.0
	Richmond (city)	220,892	88,320	132,572	60.0	161	65	40.4	105	65.2	210,151	90,818	43.2
	Total Central	***1,167,216***	***662,330***	***504,886***	***43.3***	***676***	***140***	***20.7***	***275***	***40.7***	***1,138,968***	***283,189***	***24.9***
Eastern	Accomack	32,840	19,815	13,025	39.7	33	10	30.3	8	24.2	32,345	13,728	42.4
	Essex	11,083	6,083	5,000	45.1	9	0	0.0	3	33.3	11,006	3,331	30.3
	King and Queen	7,052	4,658	2,394	33.9	5	0	0.0	0	0.0	7,052	2,640	37.4
	Lancaster	10,848	7,401	3,447	31.8	13	1	7.7	2	15.4	10,757	3,330	31.0
	Middlesex	10,710	8,318	2,392	22.3	12	0	0.0	0	0.0	10,360	3,050	29.4
	Northampton	11,998	6,485	5,513	45.9	13	1	7.7	4	30.8	11,659	4,389	37.6
	Northumberland	12,254	8,568	3,686	30.1	13	1	7.7	2	15.4	12,237	3,368	27.5
	Richmond	8,873	5,406	3,467	39.1	6	1	16.7	2	33.3	7,147	2,693	37.7
	Westmoreland	17,596	11,234	6,362	36.2	16	1	6.3	5	31.3	17,529	4,943	28.2
	Total Eastern	***123,254***	***77,968***	***45,286***	***36.7***	***120***	***15***	***12.5***	***26***	***21.7***	***120,092***	***41,472***	***34.5***

Table 13-15. Low-Income and Minority Populations in the Virginia Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent of Low-Income Block Groups (%)	Number of Minority Block Groups	Percent of Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Hampton Roads	Gloucester	37,035	31,508	5,527	14.9	24	0	0.0	2	8.3	36,760	7,203	19.6
	Isle of Wight	36,090	25,551	10,539	29.2	24	1	4.2	2	8.3	35,728	7,624	21.3
	James City	73,028	55,458	17,570	24.1	27	2	7.4	4	14.8	72,089	11,707	16.2
	Mathews	8,830	7,573	1,257	14.2	8	0	0.0	0	0.0	8,753	1,942	22.2
	Surry	6,670	3,474	3,196	47.9	7	0	0.0	3	42.9	6,670	2,057	30.8
	York	67,196	48,357	18,839	28.0	41	5	12.2	6	14.6	65,830	9,681	14.7
	Chesapeake (city)	235,410	137,401	98,009	41.6	122	17	13.9	42	34.4	228,702	46,069	20.1
	Hampton (city)	136,255	53,475	82,780	60.8	98	8	8.2	61	62.2	131,484	39,990	30.4
	Newport News (city)	180,775	79,598	101,177	56.0	127	34	26.8	80	63.0	171,657	57,132	33.3
	Norfolk (city)	245,752	107,229	138,523	56.4	189	39	20.6	105	55.6	220,044	83,459	37.9
	Poquoson (city)	12,022	11,095	927	7.7	11	0	0.0	0	0.0	11,966	1,377	11.5
	Portsmouth (city)	95,536	36,631	58,905	61.7	80	22	27.5	50	62.5	92,246	32,234	34.9
	Suffolk (city)	88,057	43,750	44,307	50.3	75	14	18.7	32	42.7	87,124	20,402	23.4
	Virginia Beach (city)	450,057	281,070	168,987	37.5	302	27	8.9	80	26.5	438,641	89,974	20.5
	Williamsburg (city)	14,817	10,062	4,755	32.1	9	2	22.2	1	11.1	10,595	3,754	35.4
	Total Hampton Roads	***1,687,530***	***932,232***	***755,298***	***44.8***	***1,144***	***171***	***14.9***	***468***	***40.9***	***1,618,289***	***414,605***	***25.6***
Northern	Arlington	229,534	142,962	86,572	37.7	181	17	9.4	41	22.7	226,736	35,030	15.4
	Fairfax	1,142,004	590,582	551,422	48.3	649	60	9.2	258	39.8	1,132,298	156,472	13.8
	King George	25,564	18,864	6,700	26.2	11	1	9.1	0	0.0	25,348	4,074	16.1
	Prince William	450,763	201,113	249,650	55.4	230	23	10.0	128	55.7	445,147	73,560	16.5
	Spotsylvania	130,159	90,467	39,692	30.5	71	4	5.6	5	7.0	129,250	23,636	18.3
	Stafford	141,159	89,967	51,192	36.3	62	4	6.5	11	17.7	137,222	18,962	13.8
	Alexandria (city)	154,710	80,143	74,567	48.2	106	14	13.2	43	40.6	153,420	32,607	21.3
	Fairfax (city)	23,580	13,652	9,928	42.1	17	0	0.0	5	29.4	22,906	2,860	12.5
	Falls Church (city)	13,843	9,968	3,875	28.0	8	0	0.0	1	12.5	13,803	799	5.8
	Fredericksburg (city)	28,135	16,882	11,253	40.0	16	2	12.5	4	25.0	25,588	6,293	24.6
	Manassas (city)	41,379	17,644	23,735	57.4	25	3	12.0	15	60.0	41,257	7,093	17.2

Table 13-15. Low-Income and Minority Populations in the Virginia Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent of Low-Income Block Groups (%)	Number of Minority Block Groups	Percent of Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
	Manassas Park (city)	16,117	5,800	10,317	64.0	8	0	0.0	8	100.0	15,981	3,572	22.4
	Total Northern	***2,396,947***	***1,278,044***	***1,118,903***	***46.7***	***1,384***	***128***	***9.2***	***519***	***37.5***	***2,368,956***	***364,958***	***15.4***
	Study Area Total	**5,374,947**	**2,950,574**	**2,424,373**	**45.1**	**3,324**	**454**	**13.7**	**1,288**	**38.7**	**5,246,305**	**1,104,224**	**21.0**
	Virginia	**8,365,952**	**5,238,967**	**3,126,985**	**37.4**						**8,116,130**	**1,494,189**	**18.4**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

As illustrated in Figure 13-45, many counties and independent cities contain census block groups with high percentages of minority populations. The independent cities are located in the Central, Northern and Hampton Roads Regions.

Table 13-15 provides detail of the high percentages of minority block group populations. The cities are Petersburg (100%), Manassas Park (100%), Richmond (65.2%), Newport News (63.0%), Portsmouth (62.5%), Hampton (62.2%), Manassas (60.0%), Norfolk (55.6%), Suffolk (42.7%), Hopewell (41.2%) and Alexandria (40.6%). The counties are Charles City (66.7%), Prince William (55.7%), Surry (42.9%), Fairfax (39.8%) and Henrico (37.4%). The counties are located in each of the four regions within the Study Area. (USCB 2017f)

13.4.5.1.2 Low Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 13-15 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 5,236,305 people for whom poverty status is determined living in the Study Area, approximately 1,104,224 (21.0%) individuals have incomes less than 150% of the poverty level. This is higher than the State (18.4%) and similar to the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 3,324 census block groups in the Study Area, approximately 13.7% (454 block groups) are considered low-income populations (USCB 2017o).

Many regions contain high percentages of low-income populations. As shown in Table 13-15, The Eastern Demographic Region has the highest percentage of low-income population at 34.5%. The Central and Hampton Roads Regions have similar low-income populations at 24.9% and 25.6%, respectively. The Northern Region has the lowest percentage of low-income populations at 15.4% (USCB 2017o).

As illustrated in Figure 13-45, many counties and independent cities contain census block groups with high percentages of low-income populations. The independent cities are located in the Central and Hampton Roads Regions.

Table 13-15 provides detail of the high percentages of low-income block groups in Study Area cities and counties. The cities are: Richmond (40.4%), Petersburg (39.3%), Hopewell (29.4%), Portsmouth (27.5%), Newport News (26.8), Williamsburg (22.2%), Norfolk (20.6%), Suffolk (18.7%), and Colonial Heights (18.2%). The counties are located in the Central and Eastern Regions. The counties are: Accomack (30.3%), Richmond (16.7%), Chesterfield (14.9%) and Henrico (14.6%).(USCB 2017o)

13.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools

developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in Fishing Communities (Chapter 13.4.5.3.1).

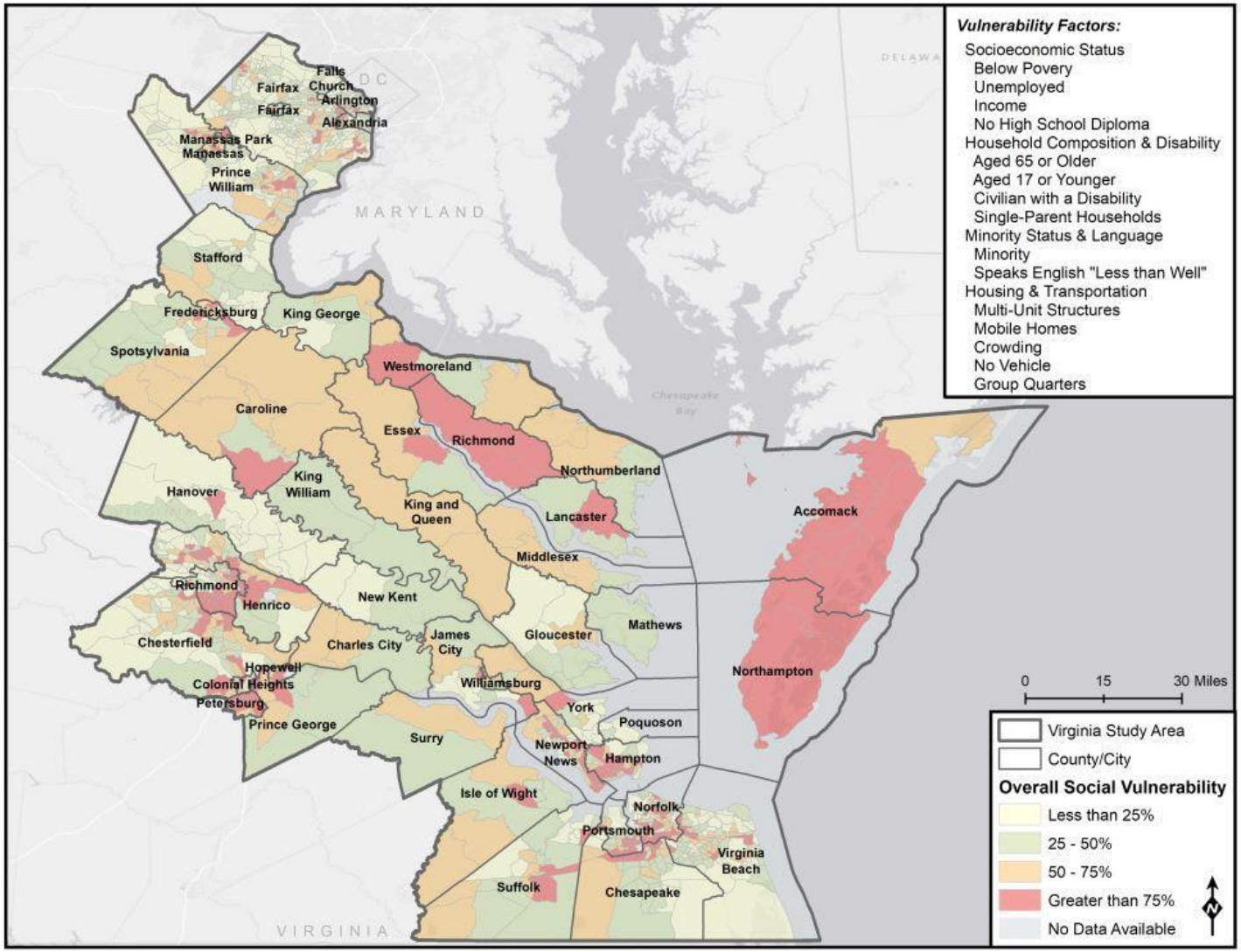
The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 13-46 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. As shown in Figure 13-46, Accomack, Northampton, Richmond, and most of Westmoreland Counties (all located in the Eastern Demographic Region) have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 13-47 combines the CDC SoVI index (as shown in Figure 13-46) with minority and low-income populations (as shown in Figure 13-45) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; particularly notable in Accomack and Northampton counties.

Figure 13-48 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 13-48 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 13.2.2.2 above), are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

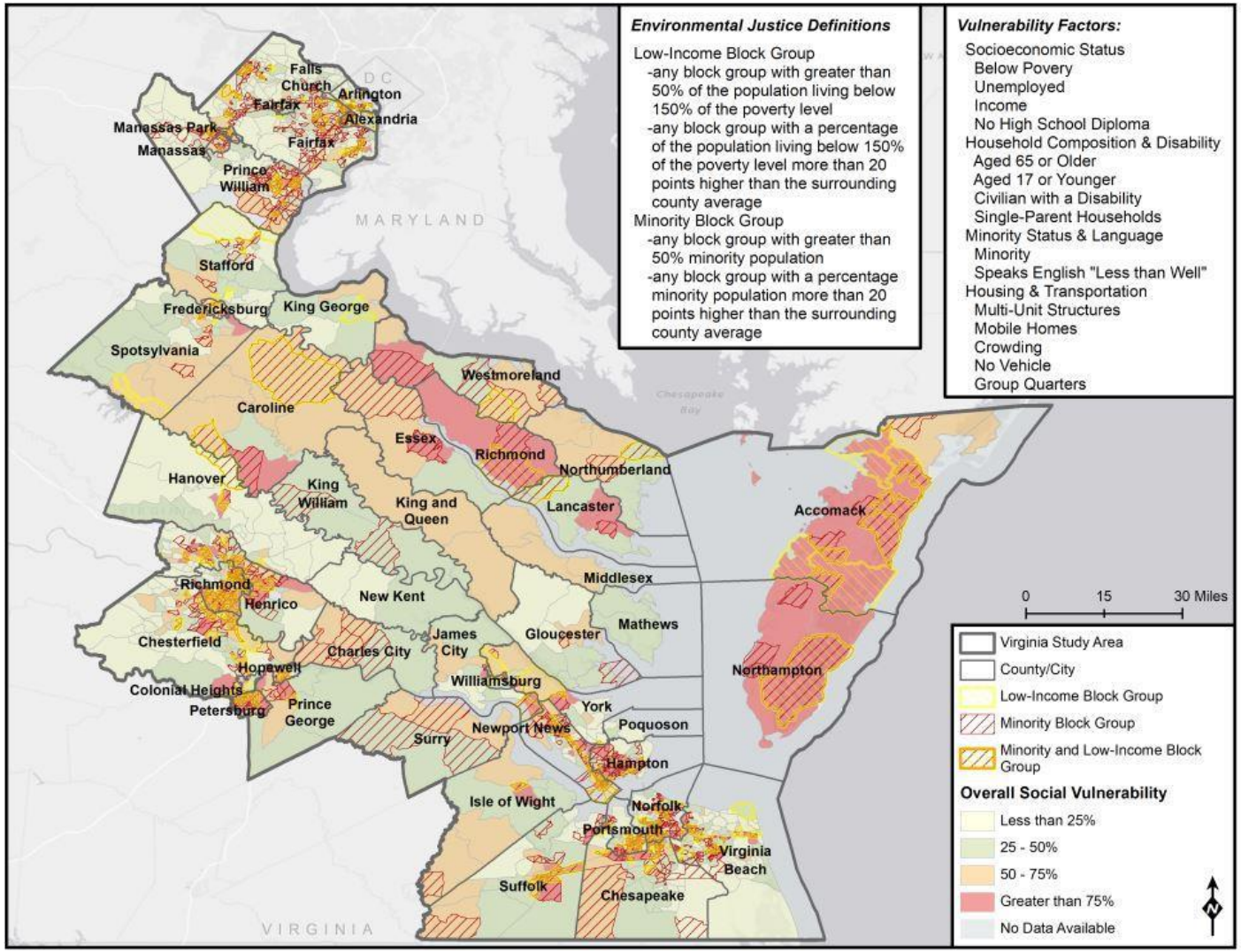
As discussed in Chapter 13.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the Eastern Shore and coasts of the Study Area (CDC 2016).



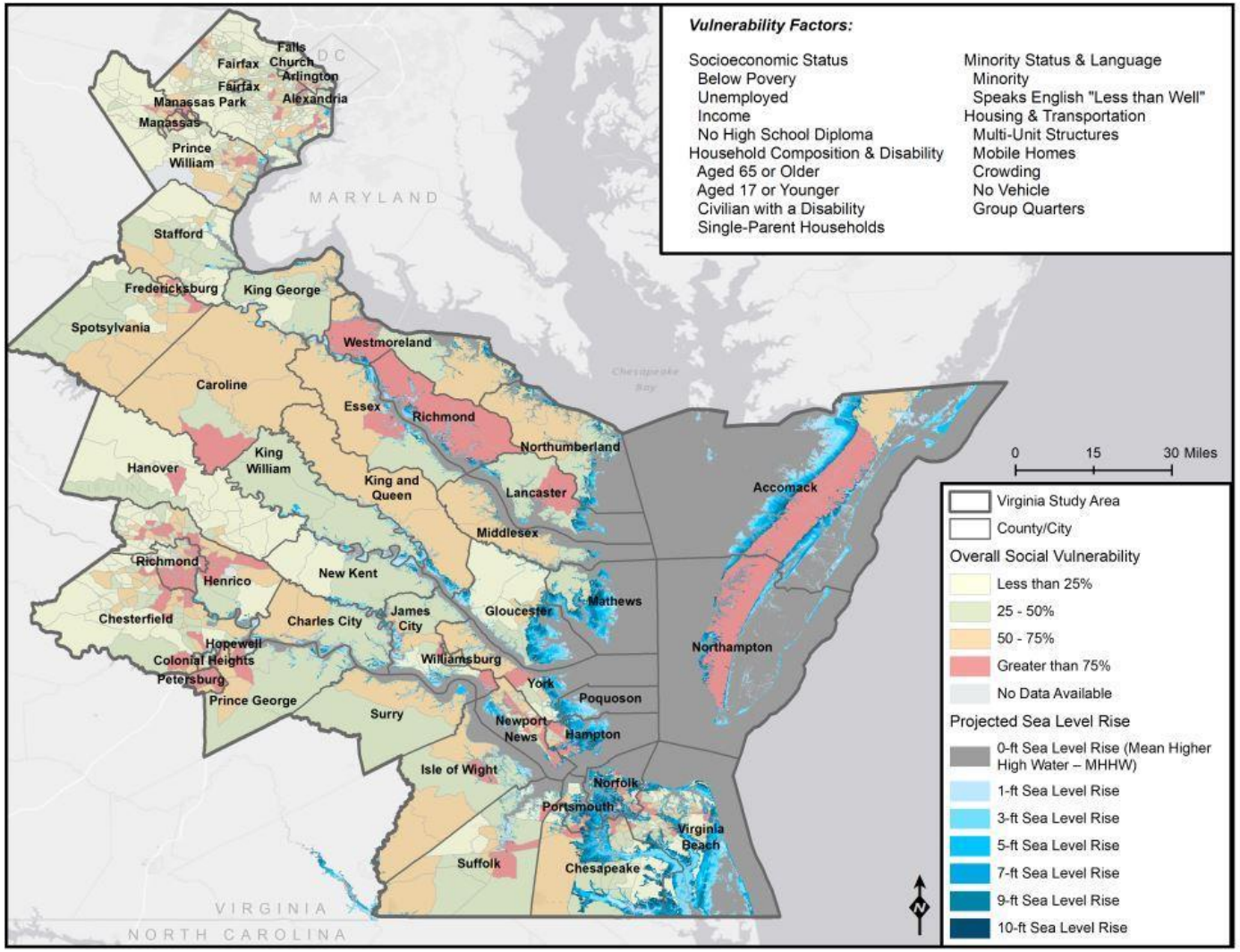
Source: CDC 2016

Figure 13-46. Overall Social Vulnerability using the CDC Social Vulnerability Index in the Virginia Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 13-47. Overall Social Vulnerability using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Virginia Study Area



Sources: CDC 2016, NOAA 2018a

Figure 13-48. Overall Social Vulnerability using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Virginia Study Area by Census Tract

13.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.

13.4.5.3.1 Fishing Communities

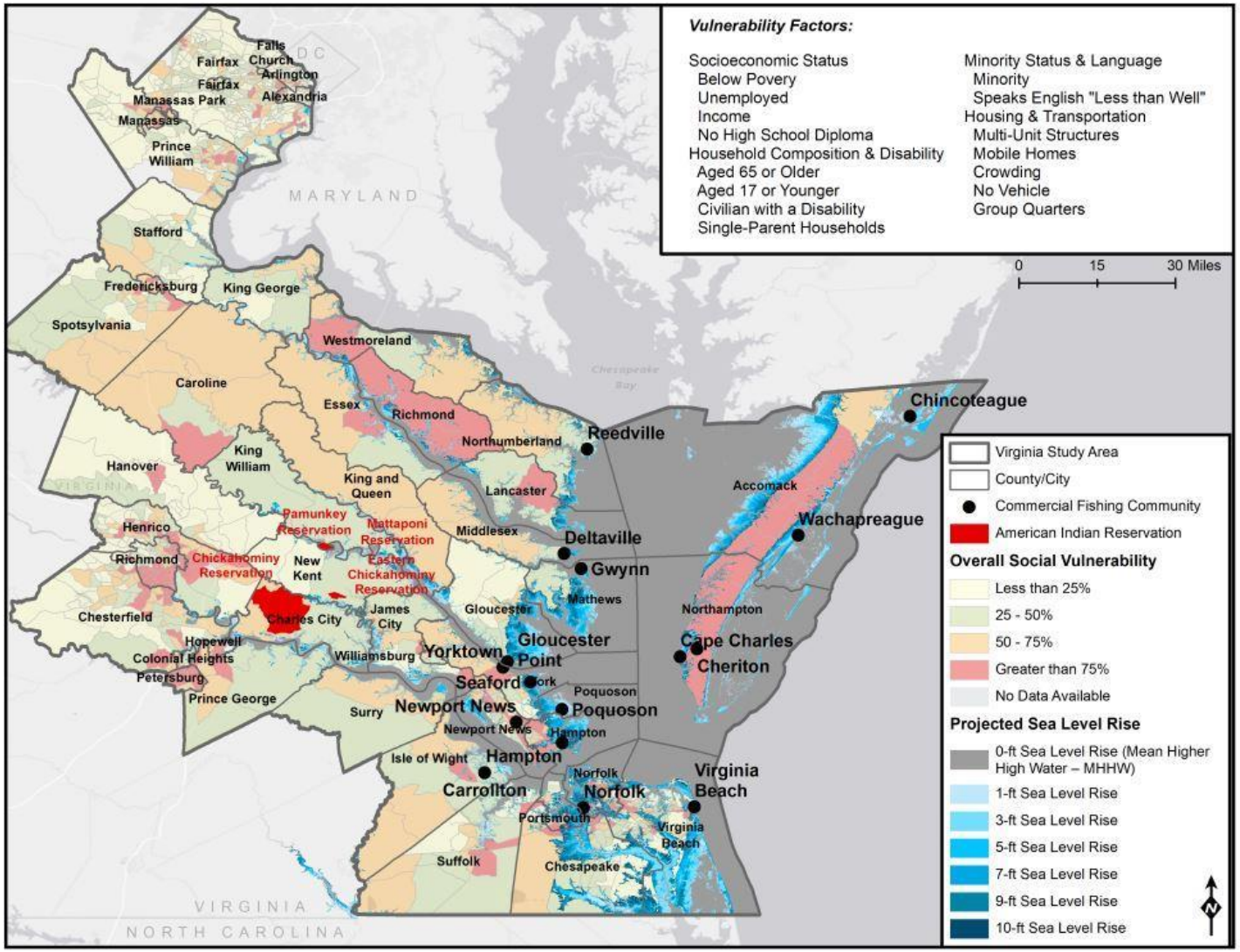
There are 16 fishing communities in the Study Area, all of which are located in the Eastern and Hampton Roads demographic regions, as illustrated in Figure 13-49.

The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Cape Charles, Northampton County
- Carrolton, Isle of Wight County
- Cheriton, Northampton County
- Chincoteague, Accomack County
- Deltaville, Middlesex County
- Gloucester Point, Gloucester County
- Gwynn County, Mathews County
- Hampton (city)
- Newport News (city)
- Norfolk (city)
- Poquoson (city)
- Reedville, Northumberland County
- Seaford, York County
- Virginia Beach (city)
- Wachapreague, Accomack
- Yorktown, York County

As can be seen on Figure 13-49, all 16 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 13.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of Environmental Impact Statements required under NEPA. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website (NOAA Fisheries 2019d).

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 13-49. Potential Vulnerable Communities in the Virginia Study Area by Census Tract

13.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the *Council on Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 13-49). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

13.4.5.4 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3. Amish and Mennonite groups are present within the Study Area. Figure 13-49 shows the locations of Amish and Mennonite places of worship. Amish populations tend to rely largely on horse-and-buggy transportation; therefore, it can be assumed that most people live in the vicinity of places of worship. The following counties/independent cities within the Study Area have Amish and Mennonite places of worship: Fairfax County, Hampton city, James City County, Lancaster County, Newport News city, Prince George County, and Virginia Beach city.

Proximity of unique religious populations to prospective sites for future OCS-related development should be considered in analysis. For example, in the Study Area, it is unlikely that industrial areas, supporting services, or a local workforce would be located within an Amish or Mennonite community. These communities may be more sensitive to technological intrusions such as installation of pipelines, utilities, or modifications to transportation resources.

13.4.5.5 Tribes

The Commonwealth of Virginia has 13 federally recognized tribes and 10 State-recognized tribes that have historical ties to Virginia, of which 6 are recognized both federally and by the State. Of these tribes, eight tribes currently reside in the Study Area (Secretary of the Commonwealth 2019, NCSL 2019). Table 13-16 lists the federally and State-recognized tribes in Virginia as well as their historical ties to the Study Area and locations:

Table 13-16. Federally and State-Recognized Tribes with Historical Ties to Virginia

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Resident Tribes within the Study Area			
Chickahominy Indian Tribe, Inc.	Federal	Yes	Tribal members in Virginia currently reside in Charles City County. They also have a reservation in Charles City County between Richmond and Williamsburg.
Chickahominy Tribe Eastern Division	Federal and State	Yes	Tribal members in Virginia currently reside in New Kent County and have historical ties to Charles City, Henrico, and James City.
Mattaponi	State	Yes	Tribal members in Virginia currently reside on a reservation along the Mattaponi River at West Point in King William County.
Nansemond Indian Nation	Federal and State	Yes	Tribal members in Virginia live mostly in the cities of Chesapeake and Suffolk.
Pamunkey Indian Tribe	Federal and State	Yes	Tribal members in Virginia currently reside on a reservation on the Pamunkey River adjacent to King William County.
Patawomeck	State	Yes	Tribal members in Virginia currently live in White Oak area of Stafford County along the Potomac River.
Rappahannock Tribe	Federal and State	Yes	Tribal center near Stephens Church, Virginia in King and Queen County.
Upper Mattaponi Tribe	Federal and State	Yes	Tribal lands in King William County but also have historical ties to Caroline, Essex, Hanover, Henrico, and Kent Counties.
Federally and State-Recognized Tribes Outside the Study Area			
Catawba Indian Nation	Federal	Yes	Tribal members currently reside outside Virginia (primarily in South Carolina), but have historical ties to several counties in the Study Area. .
Cheroenhaka (Nottoway)	State	Yes	Tribal members in Virginia currently reside outside the Study Area in Southampton County, but likely have historical ties to the Study Area.
Delaware Nation, Oklahoma	Federal	Yes	Tribal members currently reside outside Virginia (primarily in Oklahoma) but have historical ties to several counties in the Study Area.
Delaware Tribe of Indians	Federal	Yes	Tribal members currently reside outside Virginia (primarily in Oklahoma) but have historical ties to the Study Area (Accpomack and Northhampton Counties).
Eastern Band of Cherokee Indians	Federal	No	Tribal members currently reside outside Virginia (primarily in eastern North Carolina), but have historical ties to Virginia.

Table 13-16. Federally and State-Recognized Tribes with Historical Ties to Virginia

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Eastern Shawnee Tribe of Oklahoma	Federal	No	Tribal members currently reside outside Virginia, primarily in Oklahoma), but have historical ties to Virginia.
Monacan Indian Nation	Federal and State	No	Tribal members currently live in Virginia, but outside the Study Area, in Amherst County.
Muscogee (Creek) Nation	Federal	No	Tribal members currently reside outside Virginia (primarily in Oklahoma), but have historical ties to Virginia.
Nottoway of Virginia	State	Yes	Tribal members currently live in Virginia, but outside the Study Area. Their reservation is in Southampton and Sussex Counties on the Nottoway River, but likely have ties to the Study Area.

Sources: Secretary of the Commonwealth 2019, HUD 2019b, NCSL 2019

In January 2018, the Thomasina E. Jordan Indian Tribes of Virginia Federal Recognition Act was passed which granted federal recognition to six tribes in Virginia, five of which are in the Study Area. This included the Chickahominy, Eastern Chickahominy, Upper Mattaponi, Rappahannock, the Monacan, and Nansemond tribes. This bill omitted the Pamunkey and Mattaponi tribes because they chose to pursue the administrative process to obtain Federal recognition because they had the best documentation, dating back to a reservation established by treaty in 1646, and were most likely to meet the review requirements. The Paumenkey ended up receiving federal recognition in 2016, two years before the bill was passed; however, the Mattaponi application remains frozen in the administrative review conducted by the Bureau of Indian Affairs. Though three more tribes received state recognition by the Virginia General Assembly in 2010 (i.e., Patawomeck, Nottoway, and Cheroenhaka (Nottoway)), they were not added to the Thomasina E. Jordan Indian Tribes of Virginia bill (Virginia Places 2020).

Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC as shown in Figure 13-48, large portions of Charles City County (25% to 75%), King and Queen County (50% to 75%), and King William County (25% to 50%) are classified as socially vulnerable (CDC 2016). Overall social vulnerability for Stafford County is mixed and ranges from less than 25% to greater than 75%. New Kent is the only county in which tribal populations reside that does not have an overall population indicated as socially vulnerable (less than 25%). Also as shown in Figure 13-48, NOAA sea level rise data, indicating that all the counties and cities in which tribal populations are present are subject to some level of potential sea level rise vulnerability including inundation risk. However, the tribes that live close or along the Mattaponi River (Mattaponi and Upper Mattaponi Tribes), Pamunkey River (Pamunkey Tribe), Potomac River (Patawomeck Tribe), and the Rappahannock River (Rappahannock Tribe) are most vulnerable to sea level rise. Members of the Nansemond Tribe are also vulnerable to sea level rise because they live in the cities of Chesapeake and Suffolk, which are both located near the coast and the James River.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when a American Indian tribe attaches a religious or cultural significance to the historic

property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

13.4.5.6 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 13-17 provides an analysis people who speak a language other than English at home in counties and independent cities within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 19.6% of the population do not speak English at home. The Northern Region has the highest percentage (32.3%) of this population within the Study Area. Spanish is the language spoken by the majority (428,701 people or 8.5%) of non-English speakers at home within the Study Area population. Asian and Pacific Island languages are spoken at home by 238,995 people (4.8%) of the Study Area population (USCB 2017e).

Figure 13-50 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Fairfax (38.3%) Prince William (32.4%) Arlington (29.5%). Cities with the highest percentages of non-English speaking populations were Manassas Park (46.3%), Manassas (39.8%), Fairfax (33.7%) and Alexandria (33.3%). As seen on Figure 13-46 and Figure 13-48, large portions of Accomack and Northampton counties are ranked as over 75% vulnerable and impacted by rising sea levels.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

Table 13-17. People who Speak a Language Other than English at Home in the Virginia Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Central	Caroline	27,837	1,437	5.2	955	367	49	66
	Charles City	6,733	162	2.4	64	55	43	0
	Chesterfield	315,603	34,248	10.9	19,396	7,000	6,029	1,823
	Hanover	98,104	4,080	4.2	1,733	978	1,048	321
	Henrico	303,751	45,296	14.9	13,347	13,666	13,923	4,360
	King William	15,330	277	1.8	36	194	43	4
	New Kent	19,432	564	2.9	252	188	73	51
	Prince George	35,640	2,989	8.4	1,663	802	376	148
	Colonial Heights (city)	16,456	1,642	10.0	520	522	421	179
	Hopewell (city)	20,693	2,040	9.9	1,137	355	250	298
	Petersburg (city)	29,673	2,198	7.4	1,446	411	227	114
	Richmond (city)	207,499	19,103	9.2	11,282	3,531	2,487	1,803
	Total Central	***1,096,751***	***114,036***	***10.4***	***51,831***	***28,069***	***24,969***	***9,167***
Eastern	Accomack	30,942	3,441	11.1	2,538	829	74	0
	Essex	10,379	311	3.0	130	30	25	126
	King and Queen	6,685	165	2.5	165	0	0	0
	Lancaster	10,412	446	4.3	129	148	169	0
	Middlesex	10,366	199	1.9	114	34	32	19
	Northampton	11,269	987	8.8	821	113	48	5
	Northumberland	11,926	239	2.0	94	69	1	75
	Richmond	8,565	929	10.8	731	12	140	46
	Westmoreland	16,599	899	5.4	695	149	48	7
	Total Eastern	***117,143***	***7,616***	***6.5***	***5,417***	***1,384***	***537***	***278***

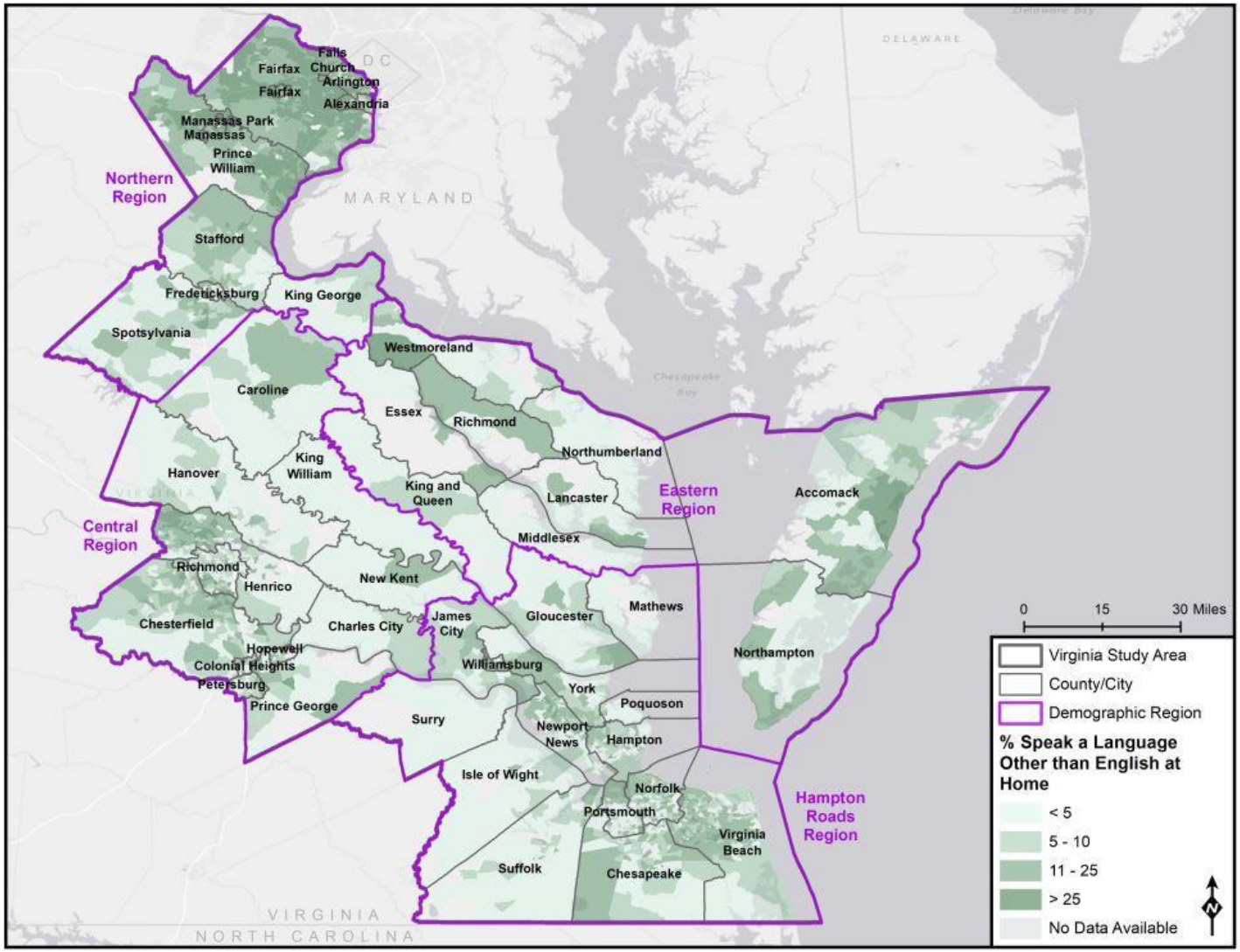
Table 13-17. People who Speak a Language Other than English at Home in the Virginia Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Hampton Roads	Gloucester	35,081	1,247	3.6	457	626	131	33
	Isle of Wight	34,302	1,148	3.3	544	344	148	112
	James City	69,547	5,077	7.3	2,256	1,461	1,087	273
	Mathews	8,577	107	1.2	43	12	29	23
	Surry	6,377	98	1.5	11	43	33	11
	York	63,492	6,609	10.4	2,166	2,079	2,184	180
	Chesapeake (city)	220,480	16,740	7.6	8,292	3,291	4,069	1,088
	Hampton (city)	127,841	8,841	6.9	4,154	1,337	2,255	1,095
	Newport News (city)	167,473	17,931	10.7	8,832	3,806	3,817	1,476
	Norfolk (city)	229,151	24,745	10.8	11,706	4,646	6,362	2,031
	Poquoson (city)	11,520	435	3.8	198	141	80	16
	Portsmouth (city)	88,317	4,443	5.0	2,399	915	1,026	103
	Suffolk (city)	82,132	3,951	4.8	1,851	1,069	738	293
	Virginia Beach (city)	420,982	51,051	12.1	19,289	10,160	19,659	1,943
	Williamsburg (city)	14,316	2,113	14.8	603	733	574	203
	Total Hampton Roads	***1,579,588***	***144,536***	***9.2***	***62,801***	***30,663***	***42,192***	***8,880***

Table 13-17. People who Speak a Language Other than English at Home in the Virginia Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Northern	Arlington	215,844	63,752	29.5	29,639	14,575	12,243	7,295
	Fairfax	1,067,627	409,314	38.3	140,175	94,281	127,850	47,008
	King George	23,947	992	4.1	646	180	126	40
	Prince William	416,528	134,814	32.4	77,200	23,502	17,270	16,842
	Spotsylvania	122,010	12,450	10.2	8,026	2,332	1,332	760
	Stafford	132,178	17,817	13.5	10,517	3,356	2,385	1,559
	Alexandria (city)	143,403	47,733	33.3	20,168	8,566	5,123	13,876
	Fairfax (city)	21,918	7,397	33.7	3,179	1,602	2,043	573
	Falls Church (city)	12,965	2,463	19.0	771	897	578	217
	Fredericksburg (city)	26,186	2,880	11.0	1,415	791	361	313
	Manassas (city)	37,919	15,081	39.8	11,921	1,306	1,130	724
	Manassas Park (city)	15,059	6,972	46.3	4,995	969	856	152
	Total Northern	***2,235,584***	***721,665***	***32.3***	***308,652***	***152,357***	***171,297***	***89,359***
	Study Area Total	**5,029,066**	**987,853**	**19.6**	**428,701**	**212,473**	**238,995**	**107,684**
	Virginia	**7,856,030**	**1,242,368**	**15.8**	**544,455**	**279,634**	**293,354**	**124,925**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017r, USCB 2017e

Figure 13-50. Percent of People Who Speak a Language Other than English at Home in the Virginia Study Area by Census Block Group

13.4.6 Summary – Demographics and Socioeconomics

Projections indicate the population within the Study Area will continue to increase through at least 2040. There will be corresponding changes in the population of children under the age of 5 and adults over the age of 65. It is projected that the Eastern Demographic Region (consisting of Accomack, Essex, King and Queen, Lancaster, Middlesex, Northampton, Northumberland, Richmond, and Westmoreland Counties) will have a combined decrease in children under the age of 5 and an increase in adults over the age of 65. This indicates the population in this demographic region is aging, which may be linked to the migration of rural populations to urban areas and to outmigration or a combination thereof; this may also be linked with a general decline in the birth rate. This Eastern Region also tends to have a higher proportion of natural land uses (as compared to urban land uses), which is common in areas with lower population density. Interestingly, Northumberland County, located within the Eastern Region, is projected to experience an increase in children under 5 and a decrease in adults over 65. The Eastern Demographic Region also has higher vacancy rates and a lower job density than the rest of the Study Area, which is consistent with the population distribution, land cover, and land use findings for this area. The projected shift in the people "Under Age 5" and "Over Age 65" age components may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force, in public and private retirement systems, and the allocation of many types of public funds. Population distribution will be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

Home values have been rising and are projected to continue to rise in the Nation and in Virginia. Rising prices make homeownership increasingly out of reach for more people especially millennials looking to purchase their first house (Zillow.com 2019b, Zillow.com 2019a).

The Study Area has a total employment of 2.7 million jobs. Approximately 4.1% of those jobs are maritime-related and concentrated along the Chesapeake Bay, Eastern Shore, or the along the major rivers (NOAA 2016c, USCB 2017i). The majority of the non-maritime jobs are concentrated in the urban areas throughout the Study Area. This is consistent with the population distribution, land use, and business/industrial facilities distribution. Correspondingly, the Eastern Region has a lower job density, which is consistent with the lower population density and more natural land uses in this region.

Types of employment vary across the Study Area, although maritime jobs are concentrated in the areas immediately adjacent to the coast. The highest unemployment rates occur in the Central Demographic Region, with the highest rates occurring in the four cities in the region (Colonial Heights, Hopewell, Petersburg, and Richmond). It is typical for unemployment rates to be higher in urban areas as compared to suburban or more rural areas due to the larger population density. The Eastern Region has the second highest unemployment rate, and Northumberland County has the highest unemployment rate within this region. This is consistent with the overall population findings for the Eastern Region.

Overall, the Study Area includes a diverse working-age population in terms of educational attainment. The majority (90.5%) of the population are high school or equivalent graduates and have at least some college. Additionally, 68.2% of the working-age population has achieved at least one college degree (associate's, bachelor's, graduate or professional). Based on the educational diversity of the workforce, in comparison with the types of employment in the area and the unemployment rates, workers should be available with the background to fulfill many various job roles. Future OCS-related projects in the area would likely need to look more closely at each of these workforce characteristics on a local level when considering site-selection and when project needs are more fully understood.

The Central, Hampton Roads, and Northern Regions have similar percentages of minority populations, with approximately 40% of their populations considered to be minority. The Eastern Demographic Region has the overall lowest minority population of approximately 20%. The Eastern Demographic Region also has the highest percentage of low-income population at approximately 35%. The Central and Hampton Roads Regions have low-income populations, approximately 25%, and the Northern Region has the lowest percentage of low-income populations at approximately 15% (USCB 2017f, USCB 2017o).

The average unemployment rate in the Study Area is 5.6%, similar to the State (5.5%) but less than the Nation (6.6%). Northumberland, located in the Eastern Region, has a somewhat higher unemployment rate, which is consistent with its elevated housing vacancy rate. A population decline of almost 7% is projected in this county through 2040. This demonstrates the links between population, housing vacancy rates, and unemployment. These are all factors that can influence the availability of the workforce for potential future projects (USCB 2017h).

Minority and low-income status are two of several factors that the CDC and NOAA use to calculate potentially vulnerable populations. Based on the CDC social vulnerability index, there are a variety of locations throughout the Study Area that are considered potentially vulnerable. Accomack, Northampton, Richmond, and Westmoreland Counties, all located within the Eastern Demographic Region, have the highest CDC rankings for social vulnerability within the Study Area. This is consistent with the population and land use statistics previously discussed for the Eastern Region (CDC 2016).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. In the Study Area, these groups include fishing communities, tribes, limited-English populations, subsistence populations, and religious communities. There are 16 fishing communities located in the Eastern and Hampton Roads Demographic Regions. These fishing communities depend on the Chesapeake Bay, river systems, and the Atlantic Ocean for their jobs and at least a portion of their food consumption (NOAA Fisheries 2019g). These communities are particularly susceptible to projected sea level rise and storm surge changes. These communities also correlate closely with the CDC vulnerability rankings and minority and low-income populations.

Fishing communities may constitute a subsistence population; however, subsistence populations can be difficult to identify. Other than the fishing communities, no subsistence populations were identified during this analysis of the Study Area.

American Indian tribes have a unique relationship with Federal and State governments. They have very close ties to tribal lands and cultural sites, they may have a separate language, they are classified as a minority population, and they may also be classified as a low-income population. These are considered vulnerable populations. The majority of the tribal lands within the Study Area are in Charles City, Chesapeake, King and Queen, King William, New Kent, Stafford, and Suffolk Counties. None of the tribes that reside in Virginia reside on Federal reservations, although two tribes, the Mattaponi and the Pamunkey, reside on State-recognized reservations. These tribes could be considered socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics. Under the CDC social vulnerability index, large portions, if not all of Chesapeake, Charles City, and King and Queen Counties are classified as socially vulnerable. There is some degree of social vulnerability in King William, Stafford, and Suffolk Counties. New Kent is the only county that does not include a population indicated as socially vulnerable. All of these counties are subject to sea level rise increases, in particular Chesapeake County. Proposed development in or near these tribal areas or that would affect the tribes would require coordination and consultation with the tribal governments.

Limited-English populations are present throughout the Study Area. These populations are considered vulnerable due to challenges they may face understanding laws and regulations, emergency procedures

and notifications, or during interactions with governments, emergency personnel, or the general public (USCB 2017e).

Another unique subset of the population includes religious subpopulations. Amish and Mennonite populations have a "self-sufficiency" philosophy that includes a dependence on agriculture and hunting. Although not considered a subsistence population, the unique characteristics of this community, including their religions and cultural practices, sometimes language, and their agriculturally-focused lifestyle can result in a vulnerability classification. Amish and Mennonite communities are located in Fairfax County, Hampton city, James City County, Lancaster County, Newport News city, Prince George County, and Virginia Beach city. Several of these counties also have a CDC ranking of vulnerable, have minority and low-income groups, and are at risk of sea level rise and changes in storm surge. This contributes the risk for these communities.

13.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development in the Study Area.

13.5.1 Regional Observations

The Eastern Demographic Region is somewhat unique in comparison to the other regions in land cover, land use, population distribution and demographics, employment, and social vulnerability. This region tends to have fewer industrial areas, a more diffuse transportation network, lacks large urban centers, and has a higher proportion of natural/agricultural areas compared with the other regions. It is likely there would be less resources and infrastructure available in this region to support large OCS-related projects, and there may be greater challenges associated with approval of projects in this area.

Counties in the Hampton Roads Demographic Region may have greater resources and more developed infrastructure and transportation networks, in addition to existing and future land use plans and zoning that would be consistent with OCS-related projects. These counties host major metropolitan areas and therefore would likely have the workforce to support such projects. However, several of these counties are also the most susceptible to projected sea level change and storm surge effects. The Great Dismal Swamp NWR is also located in this region. This is a protected area and local communities likely would not support adverse impacts to this resource.

13.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- The Chesapeake Bay, Great Dismal Swamp, and Potomac River are valuable natural, economic, and recreation resource for the Study Area. Future development will need to consider all relevant regulations and restrictions to ensure project suitability and best understand potential impacts to these resources.
- Sea level rise is increasing along the Virginia coast. This is a particular issue in the Hampton Roads area which is already heavily developed and has a large population of individuals who may be impacted. Subsidence can increase the effects of sea level rise. Projects will need to examine the most current information available for sea level rise predictions as well as consider geotechnical evaluations to consider subsidence issues when considering site selection and initiating project planning.

- It is likely that future industrial development activities will be concentrated in the counties and independent cities that have higher proportions of urban development such as: Alexandria, Arlington, Colonial Heights (city), Fairfax (city), Falls Church (city), Hampton (city), Hopewell (city), Manassas (city), Manassas Park (city), Newport News (city), Norfolk (city), Portsmouth (city), Richmond (city). These more developed areas will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. The Eastern Shore and area immediately adjacent to the Great Dismal Swamp are likely less suitable for major development.
- Projects will need to consult and likely need to comply with existing and future land use plans and zoning ordinances that are unique to respective communities. Project developers would benefit from early coordination with economic development organizations and local and State governments during the early planning and site selection process.
- Early in the site selection process, projects would benefit from consulting with development organizations in the Study Area including the VEDP, Maritime Association, VEDA, Go Virginia, in addition to looking at opportunities with the Port of Virginia and the Opportunity Zones. These organizations or development incentive programs can help projects find sites that are most suitable for the specific project purpose and may be more ready for new development than other sites.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Projects will need to take Virginia's unique cultural, historical, and recreation sites, landmarks, destinations, recreational opportunities, and events into account during project planning. Many Virginia cultural sites have significance on a national as well as State and local level, therefore, potential impacts to such sites could have national implications. As site selection progresses, projects will want to examine these cultural and recreational aspects on a local scale building on the baseline analysis presented in this study.
- Projects should consider the need for transportation resources and examine the Study Area's existing resources as well as potential future development that may be planned in the area. Searching the Virginia Department of Transportation or local municipality development websites should generate information about planned future development projects that may provide useful information.
- Projects should consider the locations of socially vulnerable communities during the site selection and project planning process. For some communities, future project development could be a beneficial change while for others it could be detrimental. Many factors contribute to social vulnerability. Projects should examine the resources discussed above to gain the most current information about these communities as project planning begins. Working with community planners and municipalities can help projects find suitable locations that benefit both the project and the community.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 14

NORTH CAROLINA

14 North Carolina

14.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of North Carolina to support development of future BOEM environmental impact assessments related to prospective OCS development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

North Carolina is located near the South Atlantic Planning Area. A total of 23 counties are located within the North Carolina Study Area (Study Area) along the North Carolina coastline. Counties range in population size from around 4,090 in Tyrell County to 219,866 in New Hanover County. There is only one city in the Study Area with a population over 100,000; it is Wilmington (New Hanover County) with a population of 145,862. The next most populous city in the Study Area is Greenville (Pitt County) with a population of 32,872 (ESRI 2019a). North Carolina counties include diverse populations regarding demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. North Carolina's location in the South has geographical commonalities with many of the other Atlantic States with open coastlines protected by barrier islands. The North Carolina coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes 23 counties located within the State of North Carolina. The Study Area is shown in Figure 4-1 and Figure 4-2 and includes the following counties:

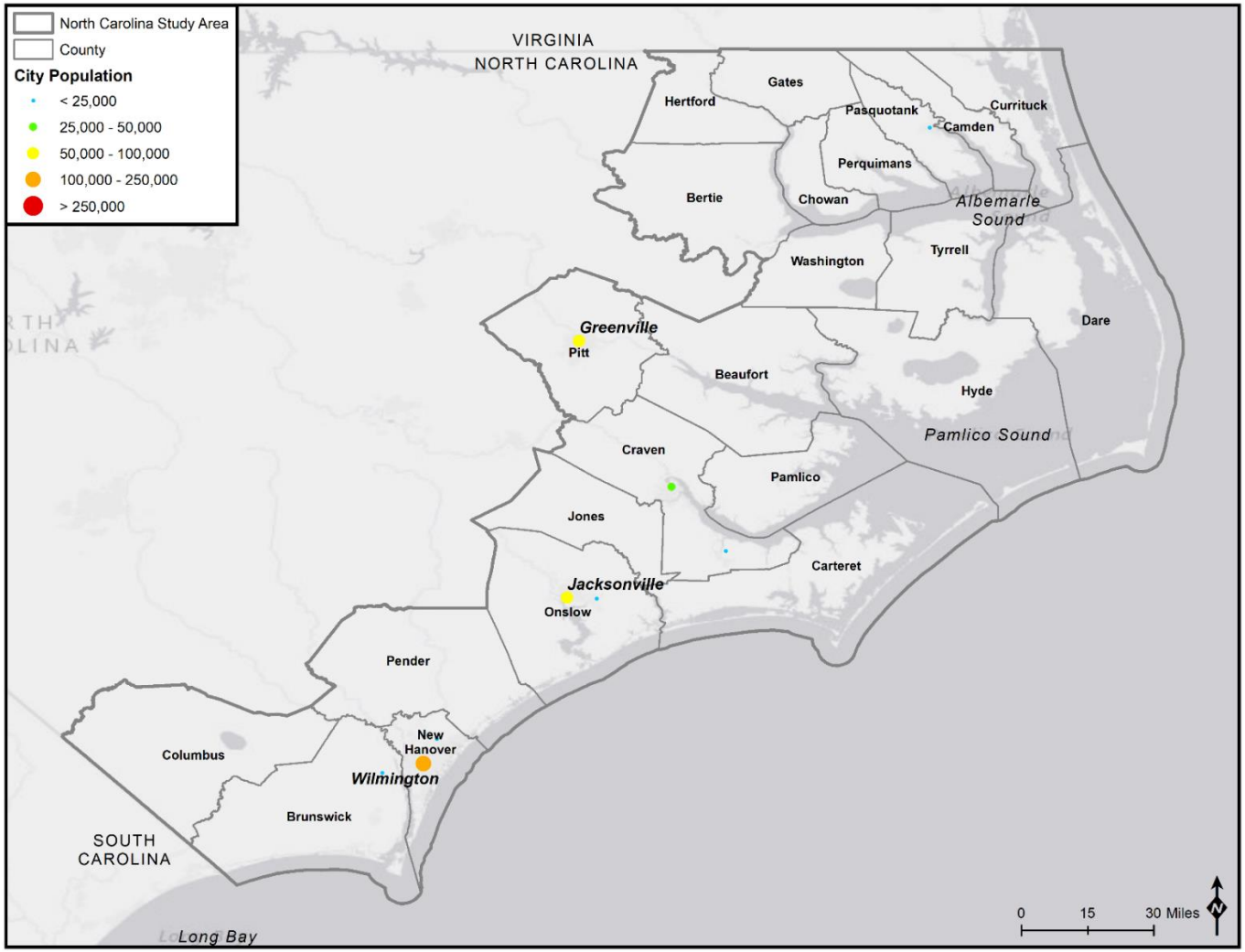
- Beaufort
- Bertie
- Brunswick
- Camden
- Carteret
- Chowan
- Columbus
- Craven
- Currituck
- Dare
- Gates
- Hertford
- Hyde
- Jones
- New Hanover
- Onslow
- Pamlico
- Pasquotank
- Pender
- Perquimans
- Pitt
- Tyrrell
- Washington

14.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of North Carolina are described below.

Source: ESRI 2019a

Figure 14-1. State of North Carolina Study Area



Source: ESRI 2019a

Figure 14-2. Cities in the North Carolina Study Area

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- North Carolina Department of Administration
- North Carolina Department of Environmental and Natural Resources
- North Carolina Department of Transportation
- North Carolina Office of State Budget and Management
- Economic Development Partnership of North Carolina

The metadata database for North Carolina specific State, county, and local data sources is included in Appendix A.

14.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

14.2.1 Water Resources

North Carolina's water resources include sounds and bays, rivers and lakes, floodplains, and wetlands. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

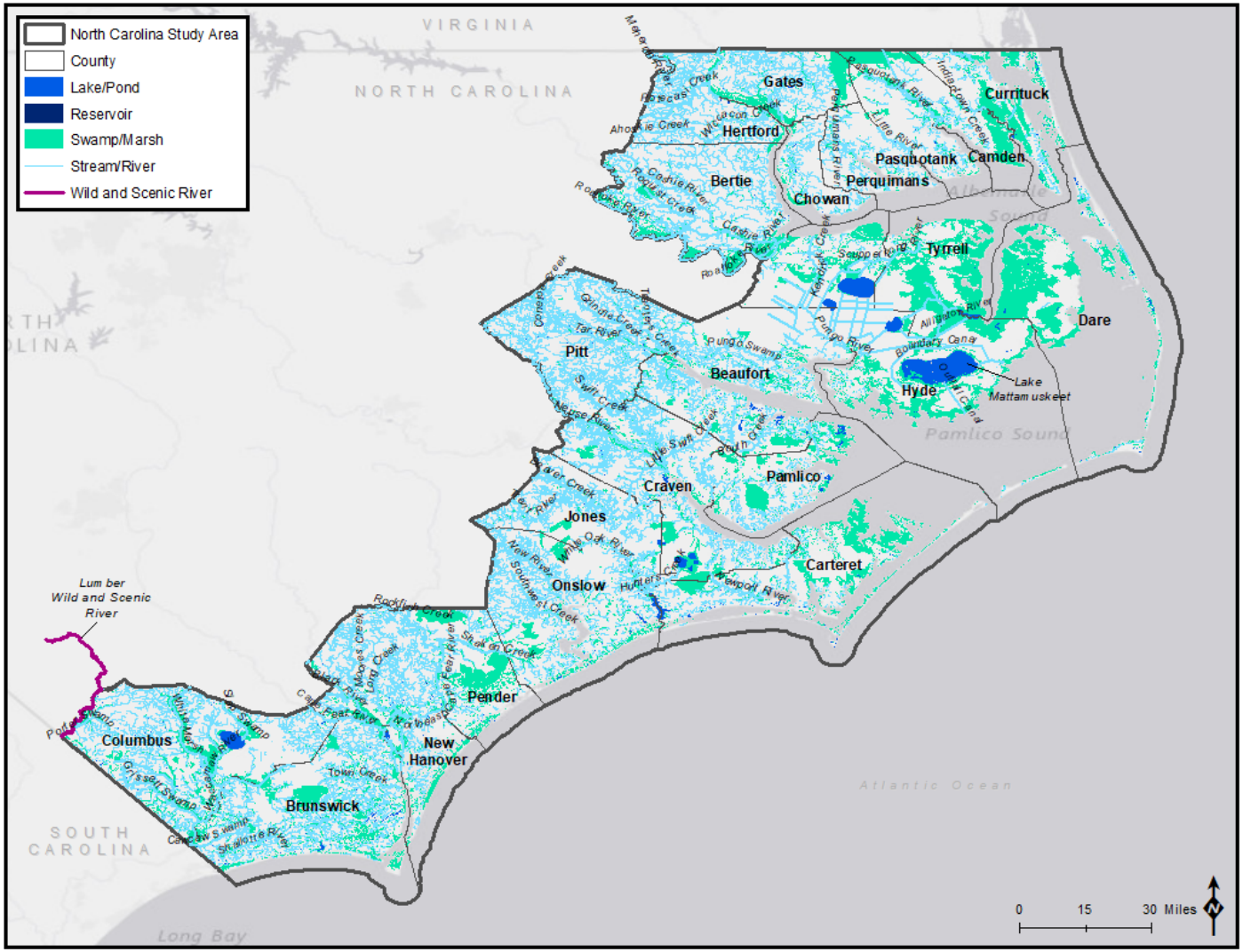
14.2.1.1 Sounds and Bays

The North Carolina coast, shown in Figure 14-3, is a low coastal region with long barrier islands and sounds to the north and with bays to the south. North Carolina's estuarine system, a body of water where fresh and salt water mix, includes 2.2 million acres of shallow sounds, rivers, and creeks. The Outer Banks are the long low barrier islands on the northern Atlantic Coast of North Carolina separated from the mainland with narrow, shallow estuaries called sounds. From north to south, these sounds along the North Carolina coast include Currituck Sound, Albemarle Sound, Croatan Sound, Pamlico Sound, Core Sound, and Bogue Sound. North Carolina bays include Onslow Bay and Long Bay (Chesapeake Bay Foundation 2019, USGS 1985).

Stretching up to Virginia Beach, Currituck Sound is a narrow estuary between the Great Dismal Swamp and the northern most Outer Banks with shallows and relatively small islands. Currituck Sound is often considered an arm of the Albemarle Sound (USGS 1985, NCEE 2000, Carolina Designs 2016).

The Albemarle Sound is a recessed arm of the Atlantic formed by the confluence of the Chowan and Roanoke Rivers stretching 55 miles to the Outer Banks and including Currituck Sound to the north and Croatan Sound to the south. Protected by the Outer Banks and with fewer shoaling hazards, Albemarle Sound is not directly connected to the Atlantic Ocean, instead connecting through the Croatan Sound. Albemarle Sound is part of the Intercoastal Waterway. Other major rivers entering Albemarle Sound include the Pasquotank and the Alligator. While tides off Cape Hatteras average about 3.5 feet, tides in the Albemarle estuarine system average 0.5 feet, being characterized by wind driven water levels with little influence from the diurnal Atlantic tides (USGS 1985, NCEE 2013, Carolina Designs 2016).

On the southern end of the Albemarle Sound, the Croatan Sound separates Roanoke Island from the mainland. Flushed by the flow from the Albemarle Sound, Croatan Sound naturally maintains a depth between 15 to 20-feet (USGS 1985, NCEE 2013, Carolina Designs 2016).



Source: USGS 2019e

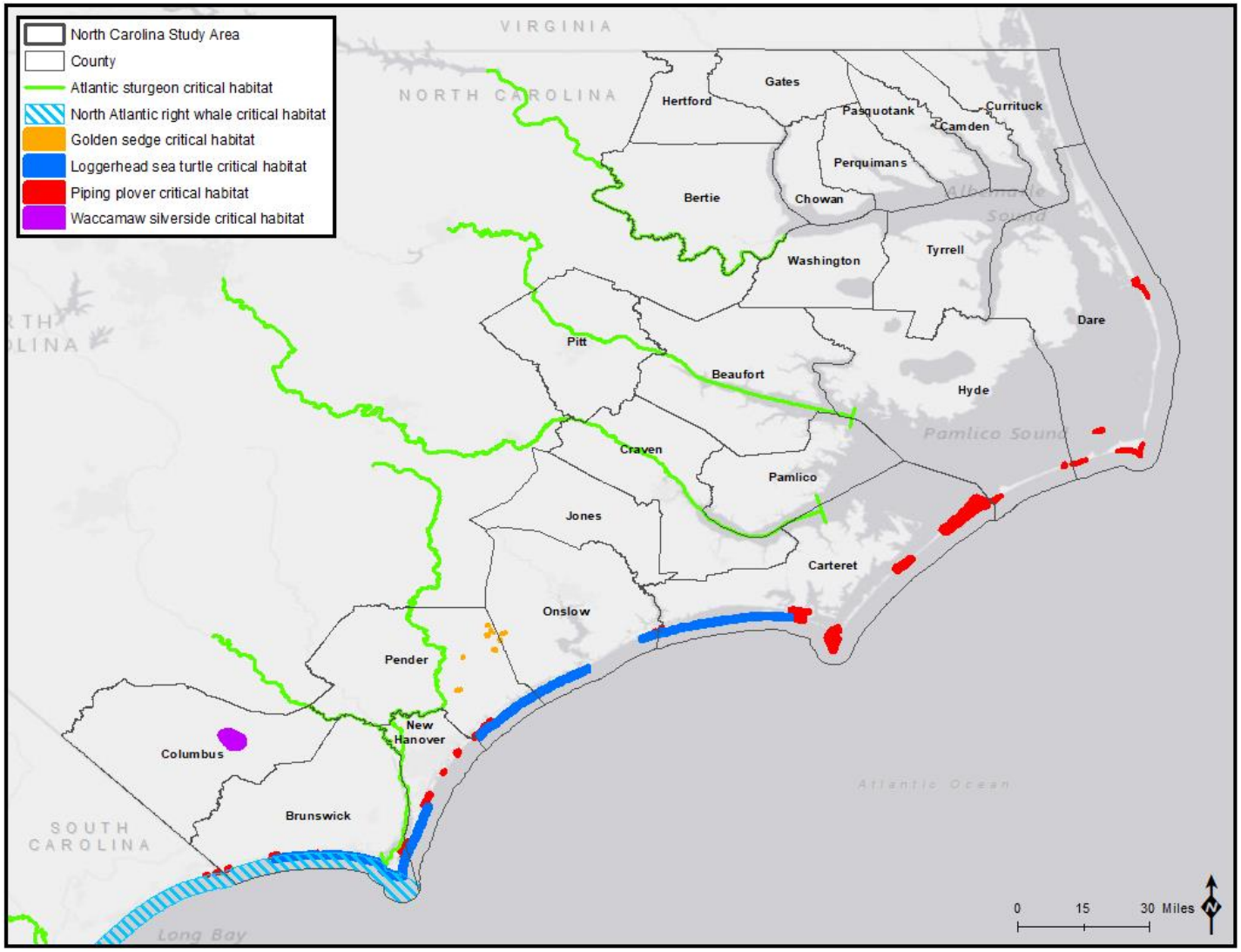
Figure 14-3. Hydrography in the North Carolina Study Area

South of the Albemarle estuarine system, the Pamlico Sound is a wide, shallow recessed arm of the Atlantic fed by the Tar-Pamlico River and the Neuse River. Although Pamlico Sound covers more than 2,000 square miles and is up to 30-miles wide, it averages only 16-feet deep, extending from the southern tip of Ocracoke Island to the end of Hatteras Island; joining with Core Sound to the south. Pamlico Sound is also part of the Intercoastal Waterway. While tides off Cape Hatteras average about 3.5-feet, tides in the Pamlico estuarine system average 0.5-feet, being characterized by wind driven water levels with little influence from diurnal Atlantic tides. Protected from full-force Atlantic tides and feed by nutrient rich rivers, the combined Albemarle-Pamlico estuary provides a nursery for more than 90% of the commercial seafood species harvested in North Carolina (USGS 1985, NCEE 2013, Carolina Designs 2016, NCEE 2019a). South of Pamlico Sound, Onslow Bay and Long Bay join the Coastal Plain with the Atlantic Ocean (USGS 1985, NCEE 2013, Carolina Designs 2016).

Long Bay is a broad, crescent-shaped embayment that stretches from Cape Fear, North Carolina to Cape Romain, South Carolina. The Long Bay is a continuous 60-mile stretch of beach with Myrtle Beach at its center. Waves, more than tides, move sediment along the beaches of Long Bay. The beaches receive little sediment from local rivers (USGS 2009). This bay has a mixture of nutrients from freshwater rivers and the ocean. Low oxygen events in the bay last only a few hours to several days and tend to occur from May through October. This typically occurs when summer winds combine with tides and longshore currents to limit mixing of waters, creating a relatively short-term, stratified low oxygen zone that is most pronounced in the tight convex curve of the upper bay. Bay salinity, temperature, turbidity, and oxygen levels are monitored to track and predict these low oxygen occurrences (SCE 2020)

The protected nature of sounds makes them susceptible to accumulating sediments and pollutants including nutrients. Nutrient pollution can lead to the growth of harmful algae blooms and dead zones which are areas of hypoxic (low-oxygen) waters. Dead zones may result from a confluence of tides and currents along with nutrient-rich fertilizer runoff and wastewater. Excess nutrients fuel an overgrowth of algae, which dies and decomposes, consuming oxygen and depleting the available supply for marine life. The dead zones and harmful algal blooms are most pronounced during warm summer months. Efforts to minimize harmful nutrient loading to the sounds include planted shoreline buffers, wastewater treatment plant upgrades, reduced power plant emissions, and overland runoff reduction practices (Chesapeake Bay Foundation 2019, USGS 1985).

As shown in Figure 14-4, the North Carolina coastal region in the Study Area includes designated critical habitat for several endangered and threatened species, including the Atlantic sturgeon, North Atlantic right whale, loggerhead sea turtle, golden sedge, piping plover, Cape Fear shiner, and Waccamaw silverside. Designated critical habitat for the Carolina distinct population segment of the Atlantic sturgeon occurs in six rivers in North Carolina. The southeastern calving area of the North Atlantic right whale is off the southern tip of North Carolina coast. The North Carolina coast provides nesting beaches that are designated as critical habitat for the loggerhead sea turtle. The golden sedge is a perennial found only in North Carolina on sandy soils overlying coquina limestone. The North Carolina coast provides the piping plover with critical habitat for both breeding and wintering. The Waccamaw silverside is found only in Lake Waccamaw (USFWS 2017a, USFWS 2017b, USFWS 2019u, USFWS 2019v, USFWS 2019w, NOAA Fisheries 2019l, NOAA Fisheries 2019m).



Sources: USFWS 2019i, USFWS 2019j)

Figure 14-4. Critical Habitat within the North Carolina Study Area

14.2.1.2 Rivers and Lakes

Within the Study Area, the major drainage basins include the Pasquotank, Tar-Pamlico, Neuse, White Oak, Cape Fear, and Lumber; these basins all flow into the Atlantic Ocean. Figure 14-3 shows the major surface water bodies within the Study Area (NCEE 2013). In addition, North Carolina rivers providing critical habitat for the Carolina distinct population segment of the Atlantic sturgeon within the Study Area, include the Roanoke, Tar-Pamlico, Neuse, Cape Fear, Northeast Cape Fear, Waccamaw, Peedee, and Black Rivers (NOAA Fisheries 2019l).

Drawing from the southeast corner of Virginia and flowing south from the Great Dismal Swamp, the Pasquotank River flows into Albemarle Sound. Characterized by low-lands, the Pasquotank River Basin includes the Outer Banks and contains more than 40% water including the Alligator River, the Great Dismal Swamp, and Lake Phelps. The basin also contains Jockey's Ridge, a natural sand dune system between 80 and 120 feet high. The Alligator River passes through the largest extent of peat communities in North Carolina. Opened in 1805, the 22-mile canal through the Dismal Swamp provided a safer passage between Albemarle Sound and Chesapeake Bay; forming the foundation for the Intracoastal Waterway (NCEE 2000, NCEE 2019b).

South of the Pasquotank River, the Tar River starts as a freshwater stream in the Piedmont, changing nature to become the wide, brackish Pamlico River after entering Beaufort County, where it's joined by the 30-mile Pungo River from Washington County before flowing into Pamlico Sound. The Tar-Pamlico River Basin contains many wetlands including Mattamuskeet Lake in Hyde County. This 18-mile long, 6-mile wide, 40,000-acre shallow lake is a major winter stop for waterfowl and provides major nesting habitat for osprey (NCEE 2019a).

South of the Tar-Pamlico River, the Neuse River stretches from the Falls Lake Reservoir above Raleigh in the Piedmont to Pamlico Sound where it is 6-miles across. Near Goldsboro in Lenoir County, the Neuse River carved a 100-foot canyon from layered sedimentary rock on its journey to the Atlantic. The Neuse River changes from a swift, freshwater river near New Bern, North Carolina where it widens, forming a 40-mile long, brackish estuary entering Pamlico Sound (NCEE 2019c).

South of the Neuse River, the White Oak River empties into northern Onslow Bay at Bogue Sound, behind a narrow stretch of barrier islands west of Cape Lookout. The White Oak River Basin is tucked on the coast between the Neuse River Basin and the Cape Fear River Basin, stretching from coastal Carteret County down to the swampy marshes of New Hanover County. The White Oak River Basin includes the highly productive Core Sound, between the Carteret County mainland and the Outer Banks, and Bogue Sound, between the mainland and the southern-most barrier islands (Bear and Emerald). The White Oak River Basin also includes the Onslow Bight, a region of peat bogs, marshes, and barrier islands stretching from Pamlico River to the lower Northeast Cape Fear River (NCEE 2019d).

South of the Neuse River, the Cape Fear River is formed from the convergence of two Piedmont rivers, the Haw and Deep Rivers, in Moncure, North Carolina. The Cape Fear River flows southeasterly through the coastal plain, joined by the Black River in Pender County and then by the Northeast Cape Fear River above Wilmington. Cape Fear then widens into a 35-mile-long estuary before emptying into the Atlantic at Southport, North Carolina, where dangerous shoals stretch out for miles into the Atlantic Ocean. Opening directly onto the ocean, the Cape Fear River, along with Northeast Cape Fear River, are major transportation routes regularly maintained and dredged by the USACE (NCEE 2019e, USGS 1985).

South of the Cape Fear River, the Lumber River flows south into South Carolina before entering the Atlantic Ocean. The Lumber River Basin Flows into South Carolina and includes the Lumber River, Waccamaw Lake, and Waccamaw River. At the head of Waccamaw River lies Waccamaw Lake, North Carolina's largest permanently water-filled Carolina Bay. Scattered along the Atlantic Coast and

concentrated in North and South Carolina, the origins of these shallow elliptical depressions may be due to strong Ice Age winds reshaping existing pools into oval ponds. In North Carolina, these depressions range from 45 feet to 7 miles in length and are important breeding grounds for frogs and salamanders. Although most Carolina Bays are highly acidic, outcroppings of limestone along the shore of Lake Waccamaw help neutralize the pH making Waccamaw Lake a diverse ecosystem complete with several endemic fish and the Waccamaw Spike Mussel. Threats to the Lumber River Basin include pressures from increasing population density along with nutrient, mercury, and fecal coliform contamination (USFWS 2019u, NC Parks 2019, NCEE 2019f).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. The State of North Carolina has approximately 37,853 miles of river with 144.5 miles designated as wild and scenic rivers. In the North Carolina Coastal Region, a total of 81 miles of the Lumber River are recognized as National Wild and Scenic River, drawing visitors and paddling enthusiasts to this "outstandingly remarkable" wildlife and recreation resource (USFWS 2019a).

14.2.1.3 Floodplains

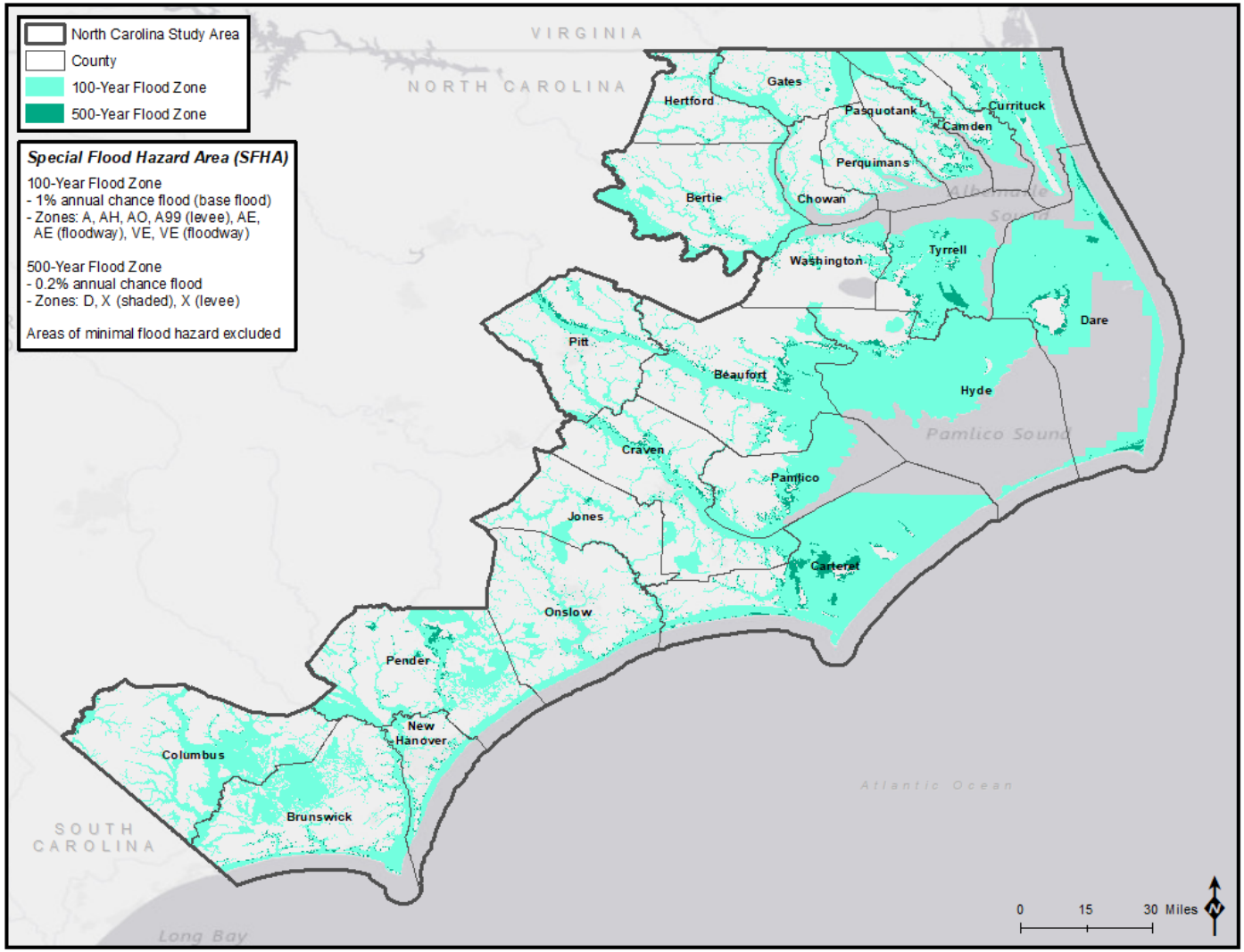
Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 Floodplain Management and Federal agencies responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988. Therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and will likely shape site selection for proposed future projects in the area.

As seen in Figure 14-5, floodplains are a large part of the land area of many counties in the Study Area. Table 14-1 details the flood zone acreage within the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

14.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C § 1344), EO 11990 (Protection of Wetlands), and Federal agencies responsibilities related to wetlands under these regulations. As seen in Figure 14-6, wetlands are a large part of the land area in many of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland specific species), and soil (hydric soils being most common in wetlands). Table 14-2 details the wetland acreage in the Study Area along with other water resources. (FGDC 2013, USFWS 2019c).



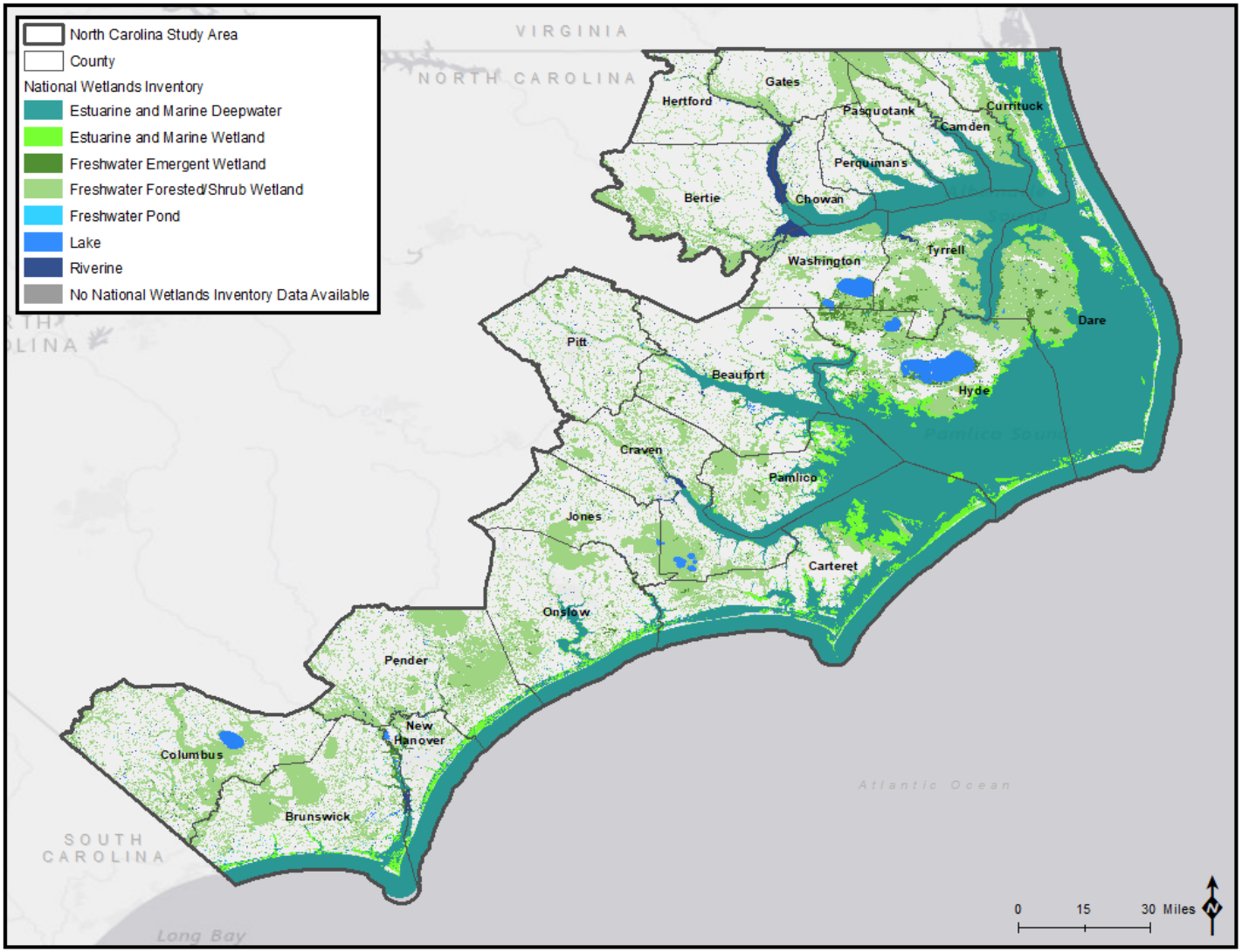
Source: FEMA 2019b

Figure 14-5. Floodplains of the North Carolina Study Area

Table 14-1. Floodplains in the North Carolina Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Beaufort	214,098	40.2	19,152	3.6
Bertie	141,577	31.6	4,872	1.1
Brunswick	221,782	40.8	9,113	1.7
Camden	92,915	60.4	5,398	3.5
Carteret	442,740	136.3	34,058	10.5
Chowan	27,762	25.1	1,040	0.9
Columbus	192,854	32.1	2,306	0.4
Craven	135,392	29.9	11,284	2.5
Currituck	167,146	99.7	6,877	4.1
Dare	396,893	161.8	20,903	8.5
Gates	71,392	32.7	1,311	0.6
Hertford	45,776	20.3	1,374	0.6
Hyde	410,948	104.9	5,318	1.4
Jones	47,020	15.6	925	0.3
New Hanover	52,805	42.9	4,696	3.8
Onslow	111,628	22.9	4,893	1.0
Pamlico	147,362	68.4	9,765	4.5
Pasquotank	46,342	31.9	7,153	4.9
Pender	196,753	35.3	12,354	2.2
Perquimans	37,126	23.5	1,560	1.0
Pitt	81,741	19.6	9,550	2.3
Tyrrell	214,253	85.7	19,453	7.8
Washington	43,373	19.6	6,646	3.0
Study Area Total	**3,539,678**	**48.5**	**200,002**	**2.7**

Sources: NOAA Fisheries 2019j, USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the state or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: USFWS 2018a

Figure 14-6. Wetlands in the North Carolina Study Area

Table 14-2. Wetlands in North Carolina Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine	Other
Beaufort	192,470	8,111	2,241	94,131	80,227	1,527	1,033	5,199	0
Bertie	146,595	0	1,477	117,013	6,830	34	659	20,582	0
Brunswick	326,463	18,282	7,712	176,105	115,262	1,812	2,867	4,423	0
Camden	127,257	1,622	1,494	77,350	44,985	68	447	1,291	0
Carteret	671,007	80,105	2,546	82,345	503,725	705	772	809	0
Chowan	59,614	26	183	19,787	28,345	85	216	10,972	0
Columbus	204,368	0	2,579	186,685	0	9,336	2,122	3,646	0
Craven	207,919	1,948	2,169	158,596	30,569	6,480	614	7,543	0
Currituck	252,826	25,968	1,154	55,049	169,262	44	561	788	0
Dare	946,787	41,042	10,786	153,310	739,284	1,608	401	356	0
Gates	64,799	0	443	60,334	0	0	136	3,886	0
Hertford	37,078	0	259	30,966	0	129	421	5,303	0
Hyde	791,071	51,890	24,243	175,838	490,724	45,295	879	2,202	0
Jones	96,037	0	423	92,816	0	644	314	1,839	0
New Hanover	120,279	10,725	4,286	20,234	78,799	1,636	909	3,690	0
Onslow	231,841	15,800	3,691	121,665	88,225	126	1,091	1,242	0
Pamlico	243,022	21,639	2,627	73,122	143,371	1,245	304	714	0
Pasquotank	76,717	39	314	34,577	40,093	70	306	1,318	0
Pender	281,281	9,002	2,680	226,192	37,445	229	955	4,778	0
Perquimans	80,789	50	523	26,162	51,850	150	268	1,787	0
Pitt	80,308	0	705	73,793	0	119	1,110	4,582	0
Tyrrell	293,180	1,331	11,419	145,417	130,818	225	415	3,555	0
Washington	120,446	17	5,788	64,630	25,913	17,692	446	5,960	0
Study Area Total	**5,652,154**	**287,596**	**89,741**	**2,266,119**	**2,805,727**	**89,259**	**17,245**	**96,466**	**0**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

The Great Dismal Swamp NWR occupies approximately 112,000 acres straddling the State line between North Carolina and Virginia (USFWS 2019b). It occupies a significant portion of Chesapeake City and part of Suffolk County in Virginia, totaling about 82,000 acres, and parts of Camden, Gates, and Pasquotank Counties in North Carolina, totaling about 38,000 acres. The Great Dismal Swamp is the largest remaining intact remnant of a formerly vast habitat that once covered over one million acres. Protection of this resource began in 1973 prior to the formation of the Great Dismal Swamp NWR in 1974 (USFWS 2019b). The Dismal Swamp Act of 1974 directs the USFWS to "Manage the area for the primary purpose of protecting and preserving a unique and outstanding ecosystem, as well as protecting and perpetuating the diversity of animal and plant life therein. Management of the refuge will be directed to stabilize conditions in as wild a character as possible, consistent with achieving the refuge's State objective" (USFWS 2019b). As such, this is an important natural and cultural resource within the Study Area. Chapter 14.3.2.5 Protected Areas provides additional discussion about the Great Dismal Swamp.

14.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making.

Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods, because higher seas raise the launch pad for storm surge (Strauss et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in North Carolina coastal areas reflects the national trend for increasing population growth in the coastal areas. The socioeconomic impacts of this relationship are discussed in Chapter 14.4. Further, land subsidence increases the rate of relative sea level rise in areas with certain geological characteristics (Eggleston and Pope 2013).

14.2.2.1 Sea Level Rise

Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches (0.125 inch/year) but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019). According to NOAA measurements of relative sea level trends using tide gauges throughout the US, the average linear relative mean sea level rate for the North Carolina Study Area is 0.14 inches/year (NOAA 2019b).

The rate of local sea level rise across the coast of North Carolina varies, depending on spatial location. Two main factors affect the spatial variation of rates of sea level rise along the North Carolina coast: 1) vertical land movement of the Earth's surface, and 2) ocean currents, specifically the Gulf Stream (NCDEQ 2015). Land subsidence is more pronounced north of Cape Lookout than south of Cape Lookout, which contributes to higher measured rates of sea level rise along the northeastern Study Area. Farther north, the relative speed and position of the Gulf Stream has been observed to increase sea level primarily north of Cape Hatteras (NCDEQ 2015).

Figure 14-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in North Carolina primarily along the immediate coastline and its river and bay inlets, and also along farther inland at Albemarle and Pamlico Sounds (NOAA 2018a). Most of the areas predicted to experience sea level rise will do so with a rise of less than 5 feet. This projected rise does not

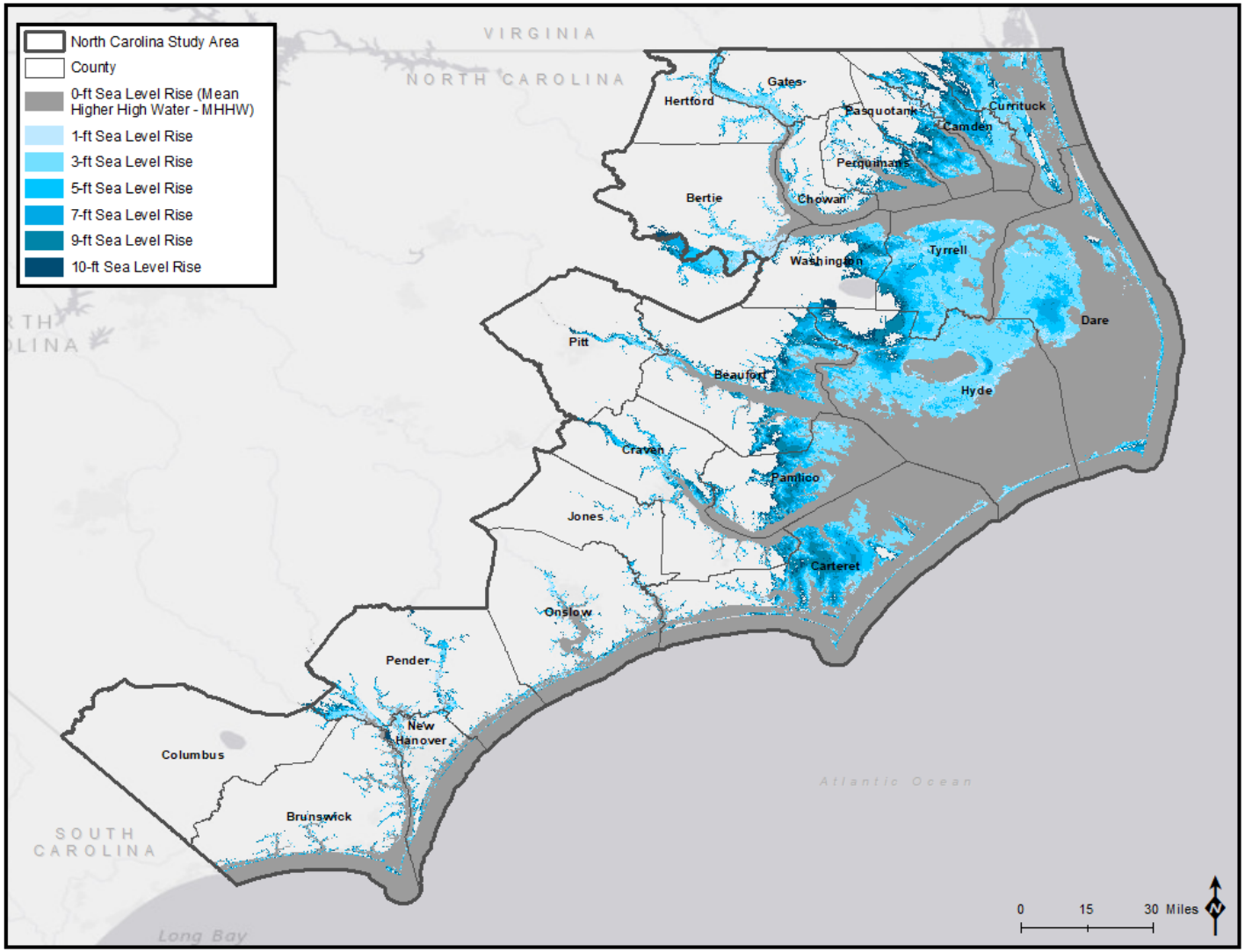
take into account other potential factors that can influence sea level such as subsidence and hydrography changes.

According to Sealevelrise.org, the current rate of sea level rise is over 0.5 inches a year, as compared to global rates of 0.125 inches a year, and rising (SeaLevelRise.org, 2019). Recent research by the Intergovernmental Panel on Climate Change into the frequency of coastal flooding has shown that, regardless of the rate of rise, as the mean sea level increases, North Carolinians should expect more frequent flooding of low-lying areas (nuisance flooding). Table 14-3 show predictions for sea level rise in 30 years given current rates of sea level rise, and with rates increasing at a best-case scenario and considering subsidence. Based on comparisons of NOAA global sea level rise rates to existing gauge rates from North Carolina, sea level rise across North Carolina by 2045 would vary from a low estimate of 2.4 inches to the south end of the North Carolina coast (Southport gauge) to a high estimate of 5.4 inches to the north (Duck gauge), with the highest sea levels expected north of Cape Hatteras. Factoring in relatively high potential impacts from greenhouse gases combined with subsidence, sea level rise would vary from a low estimate of 6.8 inches at Wilmington to a high estimate at Duck of 8.1 inches (NCDEQ, 2015). The range of sea level values (from 1.9 to 10.6 inches) reported in Table 14-3 reflects both the uncertainty in the predictions and the spatially varying nature of sea level in North Carolina.

Table 14-3. Predictions in Sea Level Rise in North Carolina Study Area

	Current Rates of Sea Level Rise		Best-Case Scenario + Subsidence		Worst-Case Scenario + Subsidence	
	Relative Sea Level Rise in 30 Years		Relative Sea Level Rise in 30 Years		Relative Sea Level Rise in 30 Years	
Tidal Gauge Station	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**
Duck	5.4	4.4-6.4	7.1	4.8-9.4	8.1	5.5-10.6
Oregon Inlet	4.3	2.7-5.9	6.3	3.9-8.7	7.3	4.7-9.9
Beaufort	3.2	2.8-3.6	6.5	4.2-8.7	7.5	5.0-10.0
Wilmington	2.4	2.0-2.8	5.8	3.5-8.0	6.8	4.3-9.3
Southport	2.4	1.9-2.8	5.9	3.7-8.2	6.9	4.4-9.4

Source: NCDEQ 2015
Note: Projections were rounded to the nearest tenth of an inch.



Source: NOAA 2018a

Figure 14-7. Projected Sea Level Rise throughout the North Carolina Study Area

14.2.2.2 Storm Surge

Storm surges from coastal storms increase the impacts of sea level rise. The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b).

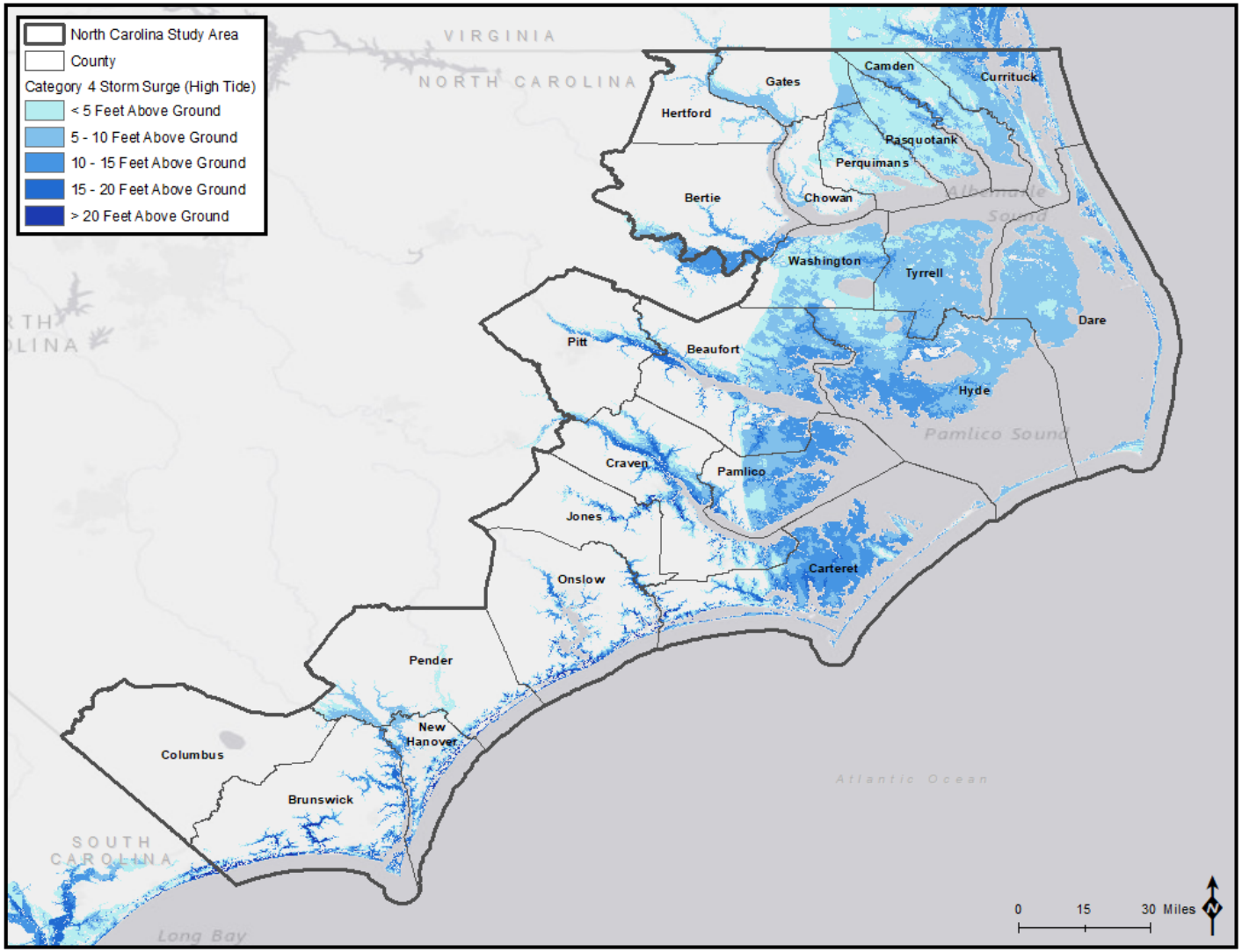
North Carolina's geography and topography leave it highly susceptible to severe coastal flooding, and the USEPA reports that it has the third highest land area vulnerable to changing sea levels within the Nation. North Carolina's coastal location makes it a prime target for hurricane landfalls, and changing climate and weather conditions may increase the number and frequency of future hurricane events (NCDPS 2018).

Recent storms in North Carolina have increased the awareness of the threats of storm surge. In October 2016, Hurricane Matthew caused widespread destruction in the State of North Carolina. Maximum storm surge values reached over 6 feet in North Carolina (NOAA 2019n). More than 800,000 households lost power and 635 roads were closed, including the major east-west and north-south corridors (NCDPS 2018). By some accounts Hurricane Matthew caused some $4.8 billion in damage, affecting 98,000 homes and nearly 20,000 businesses (Bidgood 2017). During Hurricane Matthew, water levels exceeded historical maximum water levels. At the USCG Station in Hatteras, NC, water levels peaked at 5.76 feet, as compared to the previous record of 4.15 feet during Hurricane Sandy in 2012. At Wilmington, NC, water levels peaked at 3.53 feet, as compared to the previous record of 3.47 feet during Hurricane Hazel in 1954 (NOAA 2019n).

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (NOAA 2020a). Figure 14-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the North Carolina coastline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario. Storm surge is projected to impact areas in North Carolina similar to those affected by sea level rise.

14.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area clearly have historically and will continue to help shape existing and future land use, can be a factor in zoning decisions, can contribute to identification of protected areas, may be a component of cultural and historic and recreational resource use and preservation. Additionally, the physical characteristics of the area can influence transportation routes and facilities, population distribution and density, and, therefore, housing and business distribution. Transportation routes, population distribution and density, and, therefore, housing and business distribution all also influence employment trends, which may, in turn, influence vulnerable populations. Coastal development has centered on rivers capable of sustaining shipping ports. The coastal landscape is shallow and easily flooded, which inhibits dense development. Albemarle and Pamlico Sounds separate North Carolina's Outer Banks (barrier islands) from the mainland. With limited influence from ocean waves, tides, and storms, the topography of these sounds continues to influence transportation and, as a result, also influence land use and population characteristics. The presence of the sounds and the myriad beaches along the North Carolina coastline also influences the maritime industry and maritime jobs in the region.



Source: NOAA 2020a

Figure 14-8. Projected Storm Surge throughout the North Carolina Study Area for a Category 4 Hurricane

In addition to the sounds, other natural resources in the Study Area which are protected by certain regulations and laws include other water resources, including the Great Dismal Swamp and other wetlands, floodplains, and critical habitat for the Atlantic sturgeon, loggerhead sea turtle, golden sedge, piping plover, and Waccamaw silverside. These natural resources within the Study Area are factors that should be considered during evaluation of potential future projects near the Atlantic OCS planning area.

North Carolina's coastal location makes it highly susceptible to sea level rise, storm surges, and direct hurricane landfalls. Both subsidence and ocean currents contribute to sea level rise along the North Carolina coast, especially to the north towards the mid-Atlantic where subsidence is more pronounced. Several coastal counties in North Carolina will continue to have increasing physical vulnerability as sea level rise progresses. In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

14.3 Land Cover and Land Use

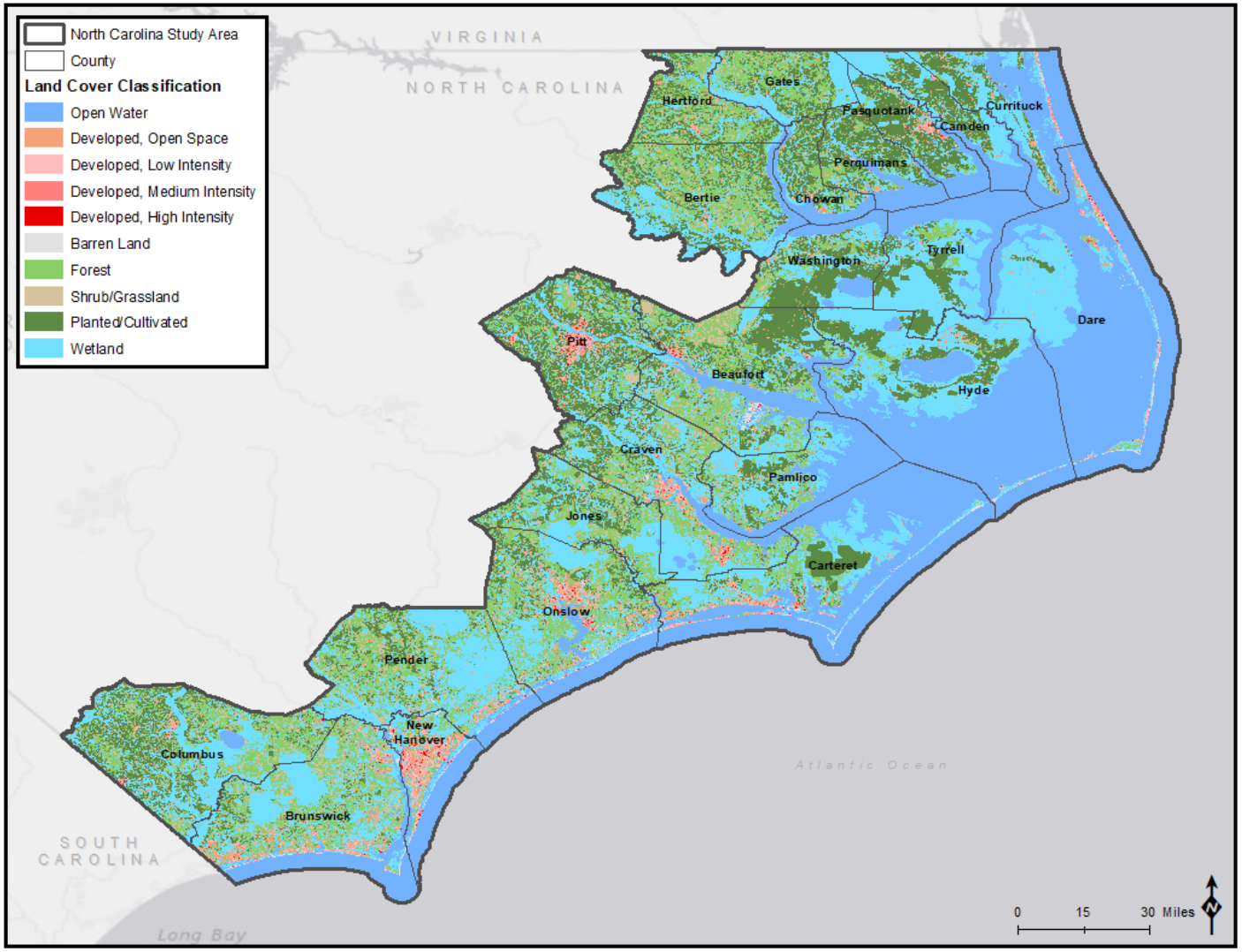
This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

14.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a).

Figure 14-9 displays the NLCD data for the Study Area. Table 14-4 presents the NLCD data for each county within the Study Area by acreage. With the exception of open water land cover (e.g., rivers, lakes, ponds, ocean), Table 14-5 presents the same NLCD data by percentage and overall land cover for each county (NLCD 2016a). Open water land cover was excluded from Table 14-5 because this land cover would not be considered for future industrial development. The following section discusses the key findings of this analysis.

As shown in Table 14-4, the primary land cover in the Study Area is open water, accounting for 29% of the area. When open water is discounted as shown in Table 14-5, the primary land cover in the Study Area is wetlands (41.4%), followed by forest (23.1%), and agriculture (22.7%). The percentage of wetlands in each county ranges from 21.2% in Hertford County to 83.6% in Dare County.



Source: NLCD 2016a

Figure 14-9. National Land Cover in North Carolina Study Area

Table 14-4. Acres of Land Cover by NLCD Classifications in North Carolina Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Beaufort	616,223	21,037	5,984	1,657	578	8,219	5,451	157,451	45,452	146,442	144,293	87,878
Bertie	474,429	12,069	2,619	543	89	3,251	193	150,757	28,897	102,863	148,643	27,756
Brunswick	671,698	34,454	20,158	5,459	1,106	26,723	4,307	163,035	49,815	35,429	230,551	127,385
Camden	198,564	3,889	602	176	58	836	37	6,939	526	54,422	85,765	46,149
Carteret	851,446	15,709	11,034	3,398	758	15,191	8,019	59,213	8,406	55,064	169,627	520,217
Chowan	149,535	5,673	1,523	456	83	2,061	125	22,764	2,890	49,266	27,508	39,248
Columbus	611,199	21,513	7,637	1,306	448	9,391	213	156,732	35,960	153,399	222,151	11,840
Craven	494,901	23,740	11,862	3,794	1,357	17,014	1,041	123,023	28,713	70,990	185,346	45,034
Currituck	335,279	7,764	3,111	1,613	144	4,869	2,131	9,178	1,441	48,996	89,684	171,216
Dare	986,678	8,122	7,577	3,786	565	11,928	7,734	5,023	1,618	5,363	202,770	744,121
Gates	221,276	6,456	837	132	10	979	20	72,949	11,801	49,873	75,834	3,365
Hertford	230,655	8,339	2,510	859	230	3,600	126	90,275	15,183	60,072	47,838	5,222
Hyde	933,776	5,255	1,912	205	55	2,173	2,190	21,680	3,196	101,434	252,982	544,866
Jones	303,166	7,714	1,627	175	21	1,823	275	95,787	21,547	61,879	112,833	1,308
New Hanover	210,459	18,681	22,218	9,346	2,995	34,559	3,411	18,844	6,391	3,208	38,627	86,739
Onslow	579,317	27,644	18,800	7,017	1,751	27,569	5,306	159,755	32,782	62,040	171,083	93,137
Pamlico	359,441	8,035	1,320	189	32	1,541	366	47,511	7,017	37,387	112,158	145,427
Pasquotank	185,171	9,467	3,497	1,300	288	5,085	96	9,454	845	81,409	37,726	41,088
Pender	597,858	15,901	7,110	1,344	209	8,664	1,804	156,682	37,796	62,011	270,386	44,615
Perquimans	210,516	7,164	1,273	252	44	1,568	13	25,342	3,723	81,262	38,564	52,880
Pitt	419,552	25,764	12,886	5,784	1,764	20,434	370	81,316	18,005	164,841	104,156	4,668
Tyrrell	382,193	3,091	645	66	11	722	317	14,293	1,071	67,275	161,751	133,672
Washington	270,022	6,581	1,571	314	40	1,925	109	30,673	5,892	96,721	78,891	49,230
Study Area Total	**10,293,354**	**304,064**	**148,313**	**49,173**	**12,639**	**514,189**	**43,650**	**1,678,677**	**368,966**	**1,651,646**	**3,009,166**	**3,027,059**

Source: NLCD 2016a

Table 14-5. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the North Carolina Study Area (Excluding Open Waters)

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Types
Beaufort	4.0	1.1	0.3	0.1	5.5	1.0	29.8	8.6	27.7	27.3	Forest/Agriculture/Wetland
Bertie	2.7	0.6	0.1	<0.1	3.4	<0.1	33.8	6.5	23.0	33.3	Forest/Agriculture/Wetland
Brunswick	6.3	3.7	1.0	0.2	11.2	0.8	30.0	9.2	6.5	42.4	Wetland/Forest
Camden	2.6	0.4	0.1	<0.1	3.1	<0.1	4.6	0.3	35.7	56.3	Wetland/Agriculture
Carteret	4.7	3.3	1.0	0.2	9.3	2.4	17.9	2.5	16.6	51.2	Wetland
Chowan	5.1	1.4	0.4	0.1	7.0	0.1	20.6	2.6	44.7	24.9	Agriculture/Wetland/Forest
Columbus	3.6	1.3	0.2	0.1	5.2	<0.1	26.1	6.0	25.6	37.1	Wetland/Forest/Agriculture
Craven	5.3	2.6	0.8	0.3	9.1	0.2	27.3	6.4	15.8	41.2	Wetland
Currituck	4.7	1.9	1.0	0.1	7.7	1.3	5.6	0.9	29.9	54.7	Wetland
Dare	3.3	3.1	1.6	0.2	8.3	3.2	2.1	0.7	2.2	83.6	Wetland
Gates	3.0	0.4	0.1	<0.1	3.4	<0.1	33.5	5.4	22.9	34.8	Forest/Agriculture/Wetland
Hertford	3.7	1.1	0.4	0.1	5.3	0.1	40.0	6.7	26.6	21.2	Forest/Agriculture/Wetland
Hyde	1.4	0.5	0.1	<0.1	1.9	0.6	5.6	0.8	26.1	65.0	Wetland
Jones	2.6	0.5	0.1	<0.1	3.2	0.1	31.7	7.1	20.5	37.4	Forest/Agriculture/Wetland
New Hanover	15.1	18.0	7.6	2.4	43.0	2.8	15.2	5.2	2.6	31.2	Developed/Wetlands
Onslow	5.7	3.9	1.4	0.4	11.4	1.1	32.9	6.7	12.8	35.2	Wetland/Forest
Pamlico	3.8	0.6	0.1	<0.1	4.5	0.2	22.2	3.3	17.5	52.4	Wetland
Pasquotank	6.6	2.4	0.9	0.2	10.1	0.1	6.6	0.6	56.5	26.2	Agriculture
Pender	2.9	1.3	0.2	<0.1	4.4	0.3	28.3	6.8	11.2	48.9	Wetland
Perquimans	4.5	0.8	0.2	<0.1	5.5	<0.1	16.1	2.4	51.6	24.5	Agriculture
Pitt	6.2	3.1	1.4	0.4	11.1	0.1	19.6	4.3	39.7	25.1	Agriculture/Wetland
Tyrrell	1.2	0.3	<0.1	<0.1	1.5	0.1	5.8	0.4	27.1	65.1	Wetland
Washington	3.0	0.7	0.1	<0.1	3.9	<0.1	13.9	2.7	43.8	35.7	Agriculture/Wetland
Study Area Total	4.2	2.0	0.7	0.2	7.1	0.6	23.1	5.1	22.7	41.4	Wetland/Forest/Agriculture

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 216a

The total developed land cover in the Study Area is 7.1%, of which 6.2% is open space and low intensity development, indicating potential for future growth. For individual counties, total developed land cover ranges from 1.9% in Hyde County to 11.4% in Onslow County. The only exception is New Hanover County which has 43% total developed land cover, of which 33.1% is open space and low intensity development. This developed area in New Hanover County corresponds to the city of Wilmington. The next most developed counties are Onslow County (11.4%) because of the city of Jacksonville, followed by Brunswick County (11.2%) partially due to urban sprawl from Wilmington (New Hanover County) and Myrtle Beach, South Carolina, and Pitt County (11.1%) because of the city of Greenville.

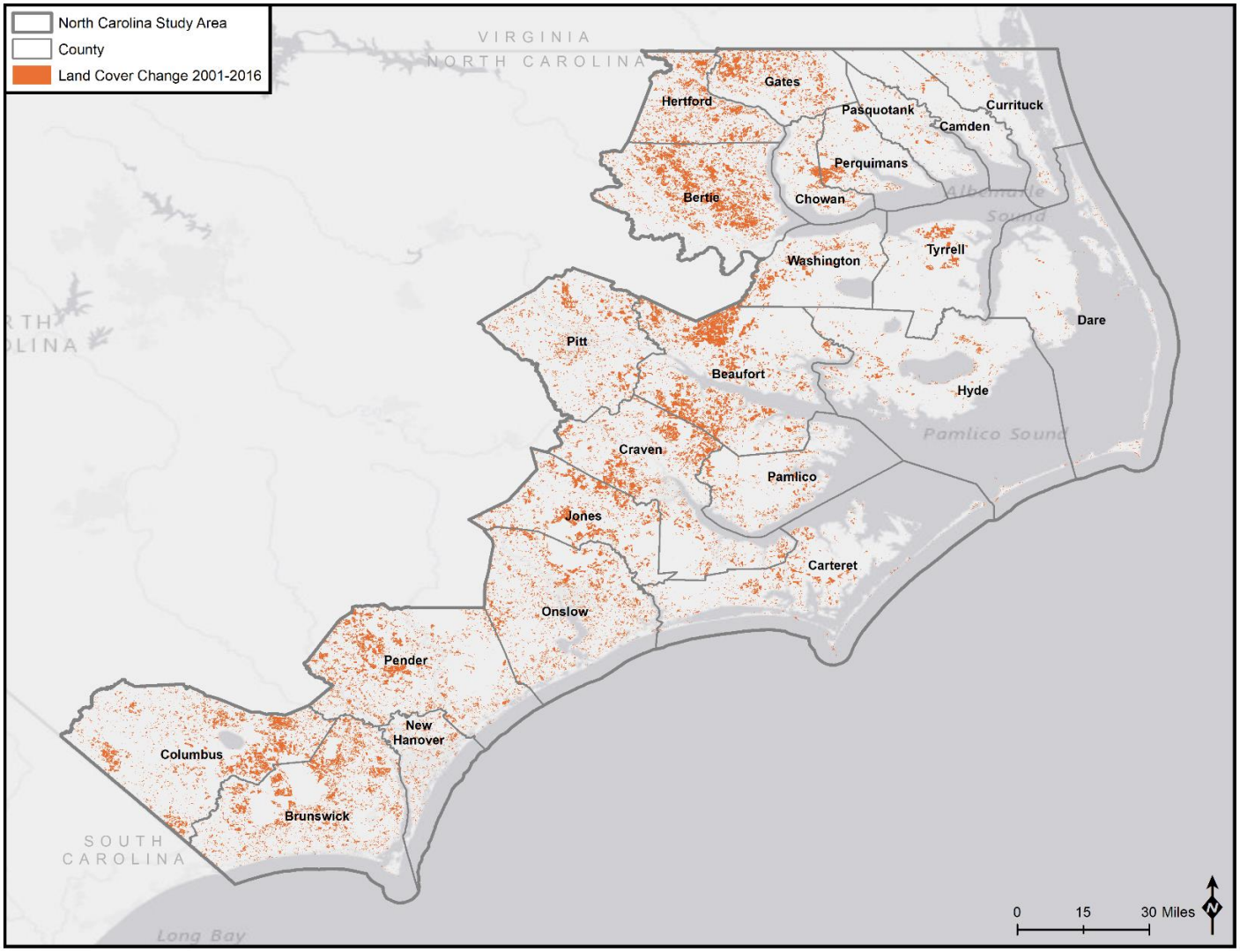
It is important to note, however, that although the percentage of developed land cover in New Hanover County is much greater than Onslow County (43% versus 11.4%), the total acreage of developed land is not much different. New Hanover County has approximately 34,559 acres of developed land while Onslow County has approximately 27,569 acres of developed land. The differences in developed land cover percentages is due to the overall size of the county.

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In North Carolina, 8.1% of the land cover in the Study Area changed at least once. Figure 14-10 and Table 14-6 show the land cover change within the Study Area from 2001 to 2016. Hertford County experienced the most significant land cover change at 19.3% followed closely by Bertie County at 19.1%. These were largely changes from or to any one of the forested land cover types. As these counties are not located near a major city, it can be presumed the land cover change was not driven by urban or suburban changes. From 2012 to 2017 the total acreage farmed in the Study Area increased by 4,601 (USDA 2019c). Therefore, it is possible the land cover changes in Hertford and Bertie Counties were associated with some forest clearing in favor of agriculture. Dare County experienced the least land cover change at only 0.4%.

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potential reducing project costs and facilitating shorter timelines for development.

14.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.



Source: NLCD 2001-2016

Figure 14-10. Land Cover Change in the North Carolina Study Area

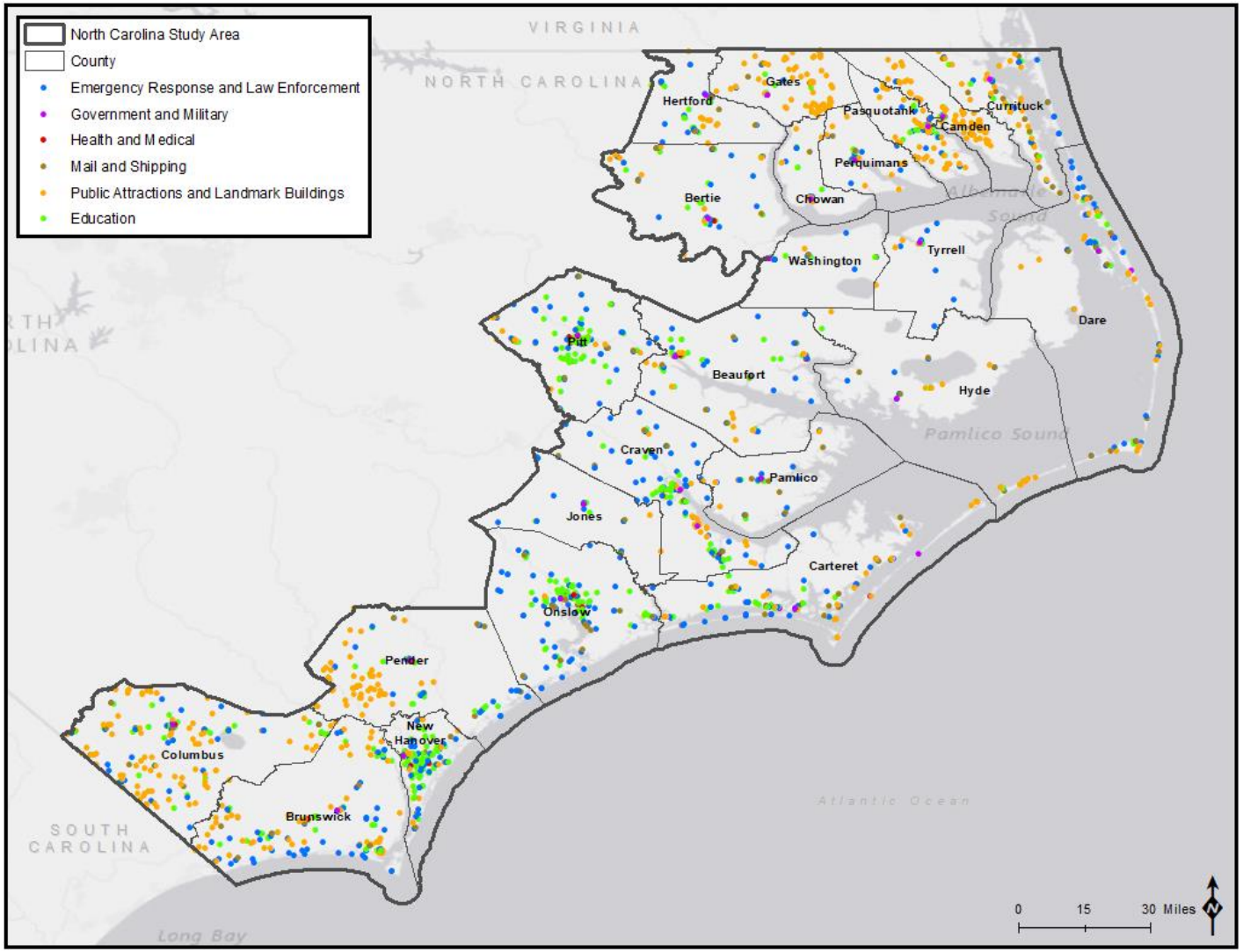
Table 14-6. Land Cover Change for the North Carolina Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Beaufort	616,223	104,981	17.0
Bertie	474,429	90,471	19.1
Brunswick	671,707	80,970	12.1
Camden	198,565	2,871	1.4
Carteret	851,465	20,517	2.4
Chowan	149,535	11,114	7.4
Columbus	611,199	72,440	11.9
Craven	494,901	61,650	12.5
Currituck	336,911	4,070	1.2
Dare	986,705	4,043	0.4
Gates	221,276	36,567	16.5
Hertford	230,655	44,499	19.3
Hyde	933,785	13,563	1.5
Jones	303,166	44,919	14.8
New Hanover	210,471	10,741	5.1
Onslow	579,324	57,270	9.9
Pamlico	359,442	16,313	4.5
Pasquotank	185,171	4,522	2.4
Pender	597,867	67,943	11.4
Perquimans	210,516	14,382	6.8
Pitt	419,552	38,909	9.3
Tyrrell	382,193	10,911	2.9
Washington	270,022	18,680	6.9
Study Area Total	**10,295,078**	**832,344**	**8.1**

Source: NLCD 2001-2016

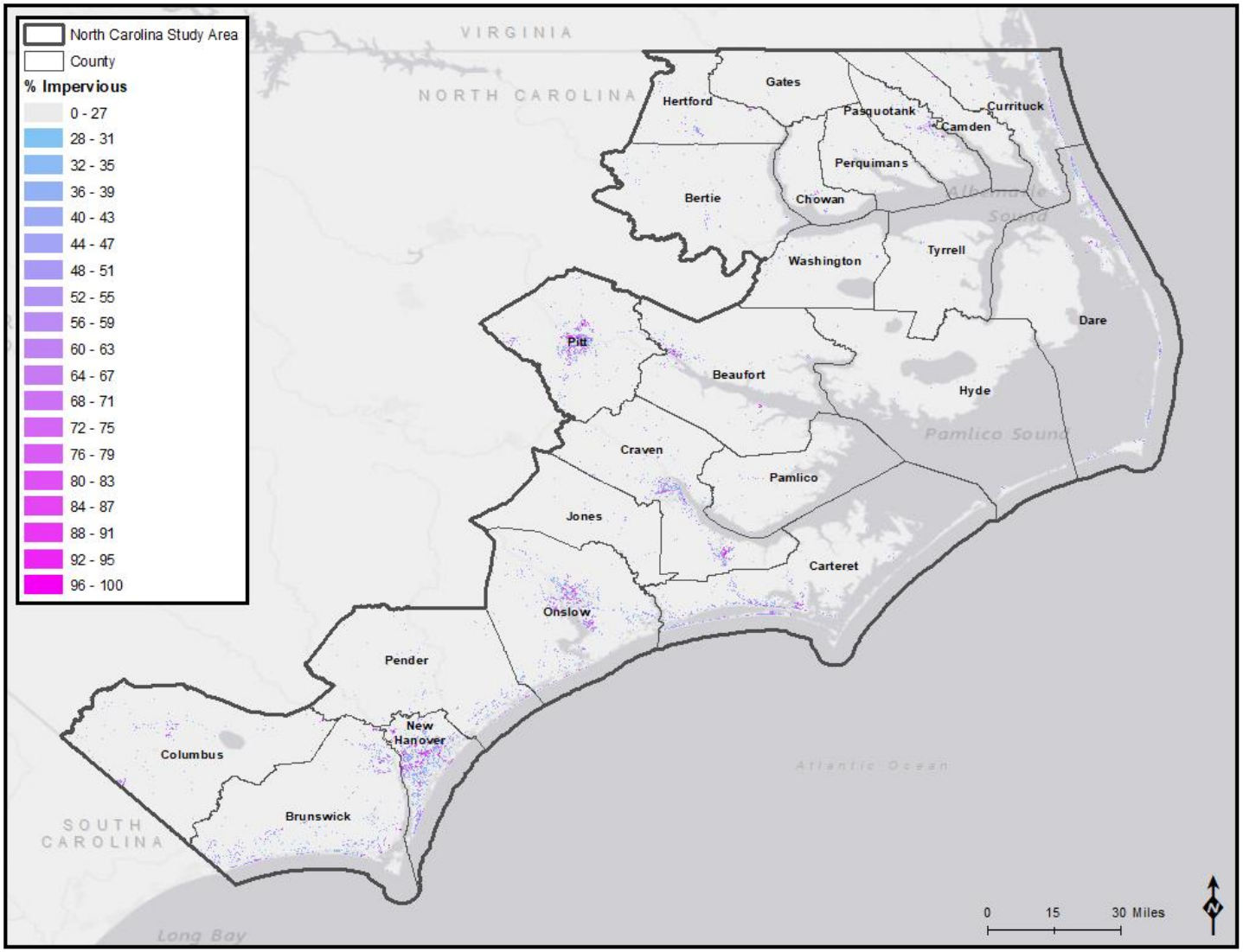
14.3.2.1 Existing and Future Land Use

The land cover data provides an initial assessment of potential land uses within a project area. As determined in the land cover analysis in Chapter 14.3.1, much of the land cover in the Study Area is wetlands (41.4%). However, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. In this section, land cover data is enhanced by the application of more detailed ground-based information. Figure 14-11 presents existing land uses at the broad scale of the Study Area (USGS 2017). Figure 14-12 shows impervious areas across the Study Area (NLCD 2016b). These figures show the relationship between land cover analysis which identified developed areas in Chapter 14.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 14-11. Select Existing Land Uses within the North Carolina Study Area



Source: NLCD 2016b

Figure 14-12. Impervious Surfaces within the North Carolina Study Area

Overall, the existing land use maps for the Study Area indicate that (1) public attractions and landmark buildings are abundant in the northern counties of Gates, Pasquotank, Camden, and Currituck, and southern counties of Pender, Columbus and Brunswick, (2) public attractions and landmark buildings are not highly correlated with urban development or impervious surfaces, (3) education resources are notably abundant in the counties of New Hanover, Onslow, Pitt, and Craven, and (4) impervious surfaces are correlated with urban development (Figure 14-9) and education-related land uses (Figure 14-11).

For future land use planning, the Coastal Area Management Act of 1974 (CAMA) was enacted to provide a program for the protection, preservation, orderly development, and management of North Carolina's coastal resources in the 20 coastal counties (NCDEQ 2019a). It is the responsibility of Division of Coastal Management in North Carolina's Department of Environmental Quality to oversee the CAMA land-use planning, as well as permitting, enforcement, and other tasks (NCDEQ 2019b). The CAMA and CAMA Handbook for Development can be obtained from the North Carolina Department of Environmental Quality's website. The CAMA Handbook for Development can be used to understand the types of projects that require CAMA development permits, the regulations that must be followed, and how the guidelines and regulations help protect the State's coastal natural resources (NCDEQ 2019c). The 20 counties subject to the CAMA are all part of the Study Area and are required to have a local land use plan consistent with the guidelines established by the Coastal Resources Commission. These land use plans include local policies that address the protection of natural resources and productive resources (i.e., farmland, forest resources, fisheries), desired types of economic development, and the reduction of storm hazards. The land use plans also provide guidance for projects and policy issues such as the development of regulatory ordinances (NCDEQ 2019d).

The three counties in the Study Area that are not considered coastal counties under CAMA (Pitt, Jones, and Columbus Counties) have developed Comprehensive Land Use Plans. Comprehensive Land Use Plans set goals and objectives for the county regarding topics such as appearance, community services, growth and development, housing, land use, natural environment, and transportation. Appendix B includes links to relevant planning documents.

North Carolina is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. There are 252 Qualified Opportunity Zones designated in the State. Maps of opportunity zones in North Carolina are located online https://public.nccommerce.com/oz/.

Analysis of potential future OCS-related projects will need to consider the CAMA Land Use Plan and/or Comprehensive Plan (or equivalent) of the particular county or municipality within which the new project would be situated. Statewide comprehensive plans and associated State laws and regulations that may be applicable to the proposed activities should also be considered. Municipalities and regulating State agencies may be more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

14.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the

municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other kinds of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

Zoning within the Study Area tends to address similar concerns as in other coastal counties along the Atlantic. Given its geographical position, North Carolina coastal county codes are primarily concerned with being prepared for hurricanes. Building codes are designed to withstand hurricane force winds (Sheridan 2019). Otherwise building in flood prone areas is generally discouraged by regulatory protections for floodplains, coastal zones, wetlands, and other sensitive areas.

14.3.2.3 Industrial Incentives

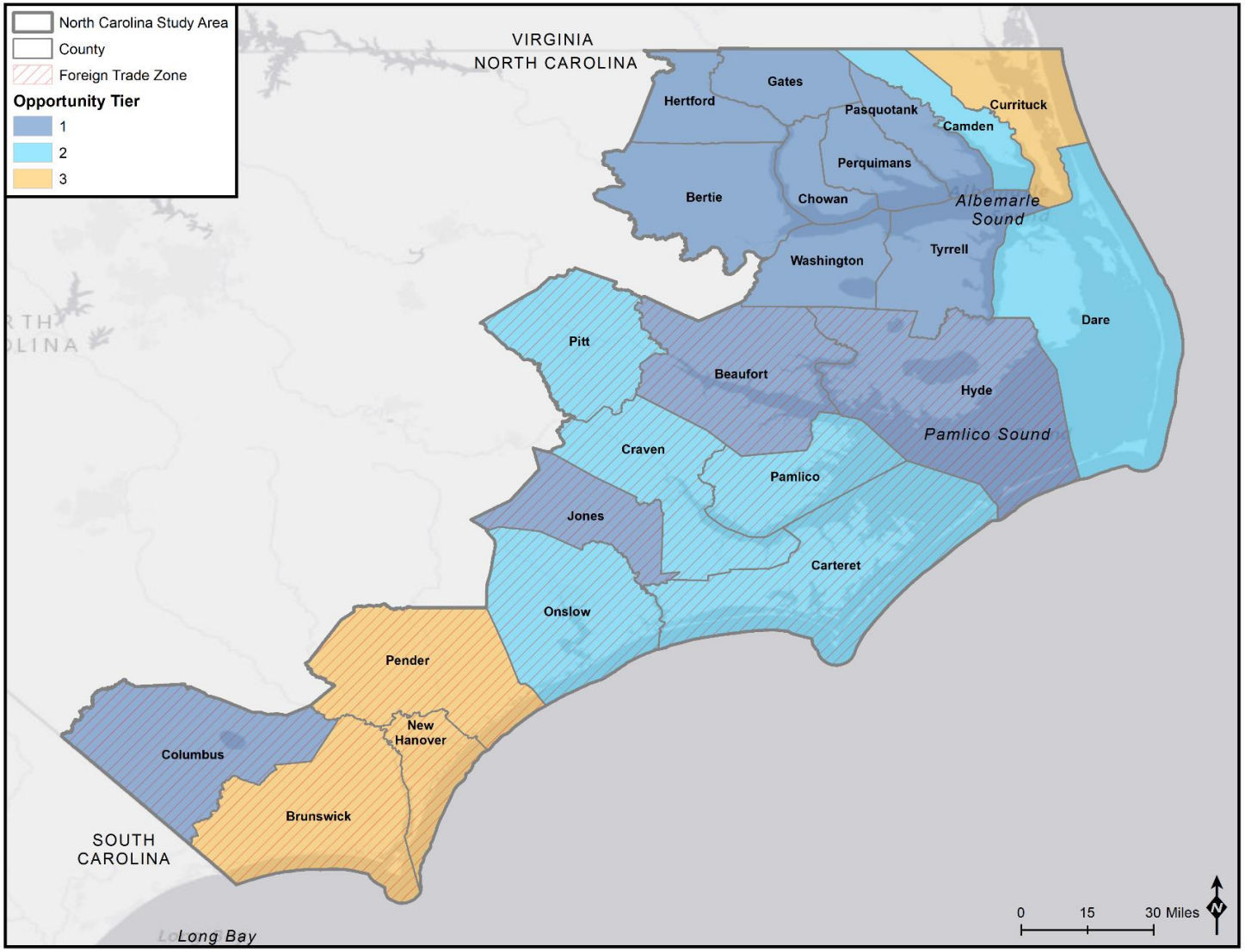
According to the Economic Development Partnership of North Carolina, the State of North Carolina takes pride in offering a pro-business environment. Businesses in North Carolina benefit in four key ways. First, North Carolina offers the lowest corporate income tax rate in the country at 2.5%. Second, business costs, utilities, and cost of living are well below the national average. Third, recent tort reform, streamlined legal practices, and improved business courts mean less red tape and litigation for businesses. Lastly, North Carolina has a highly skilled workforce (EDPNC 2019a).

The North Carolina Department of Commerce annually ranks the State's 100 counties based on economic well-being and assigns each a County Distress Rankings tier designation. Tier 1 are the most distressed counties, Tier 2 are moderately distressed, and Tier 3 are the least distressed. This tier system is incorporated into various State programs to encourage economic activity in the less prosperous areas of the State (EDPNC 2019b). County Tiers are calculated using four factors: average unemployment rate, median household income, percentage growth in population, and adjusted property tax base per capita (NCDC 2019).Tier ranking for counties within the Study Area are shown in Table 14-7 and in Figure 14-13 (EDPNC 2019b).

Table 14-7. North Carolina County Distress Ranking Tiers within the North Carolina Study Area

Tier 1 Counties	Tier 2 Counties	Tier 3 Counties
Beaufort, Bertie, Chowan, Columbus, Gates, Hertford, Hyde, Jones, Pasquotank, Perquimans, Tyrrell, Washington	Camden, Carteret, Craven, Dare, Onslow, Pamlico, Pitt	Brunswick, Currituck, New Hanover, Pender

Source: EDPNC 2019b



Sources: EDPNC 2019b, EDPNC 2019c

Figure 14-13. County Distress Rankings and Foreign Trade Zones in the North Carolina Study Area

A variety of incentives for new industry are available in North Carolina, especially when the industry involves job creation. The Job Development Investment Grant provides cash grants directly to new and expanding companies to help offset the cost of locating or expanding a facility in the State. The amount of the grant is based on a percentage of the personal income tax withholdings associated with the new jobs (EDPNC 2019d). The One North Carolina Fund awards local governments grants based on the number of jobs created, level of investment, location of the project, economic impact of the project and the importance of the project to the State and region. The local government must provide an incentive to match the One North Carolina Fund funding at one third, one half, or equal match based on the tier designation of the county, encouraging growth in Tier 1 Counties at a lesser match (EDPNC 2019e).

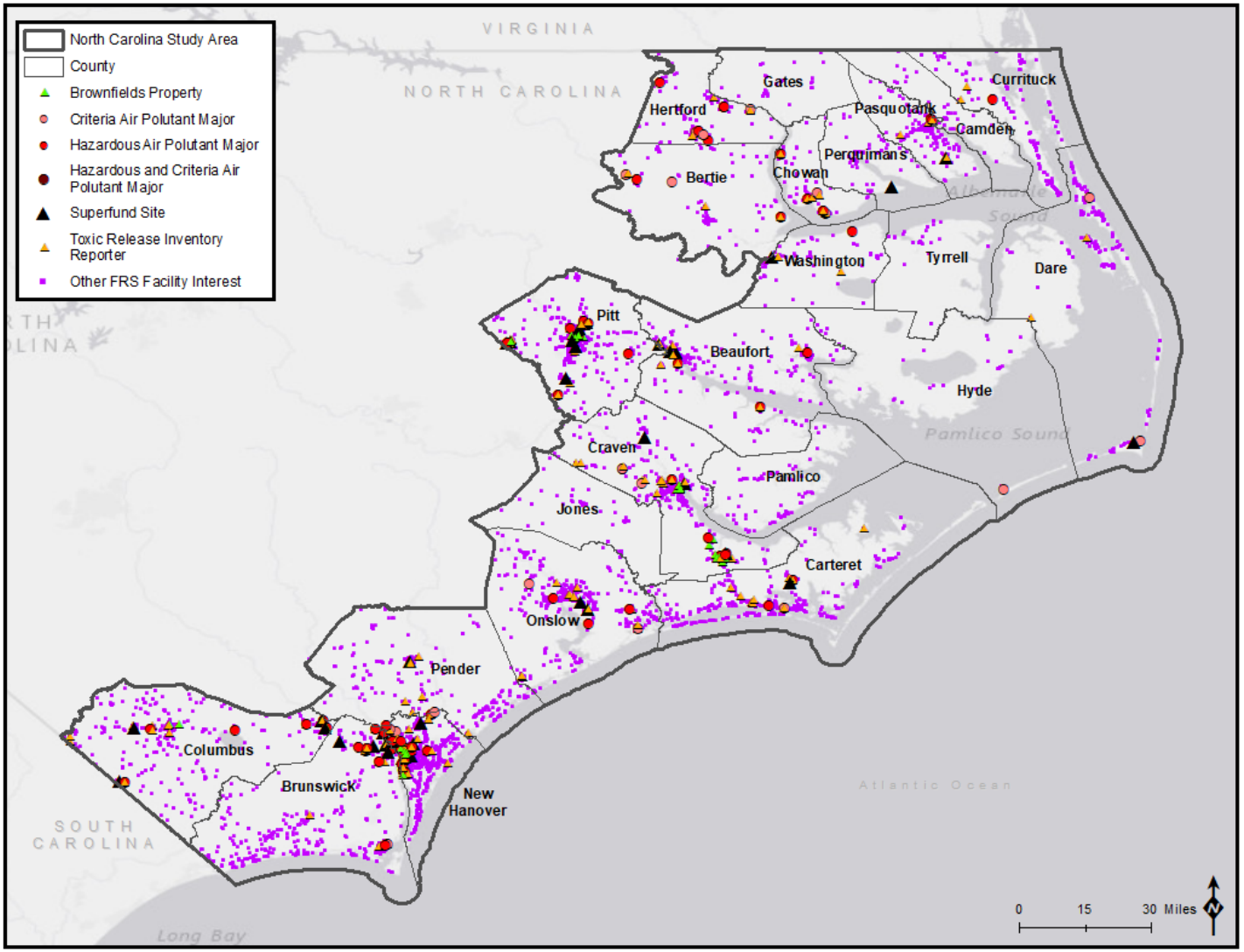
One of North Carolina's four foreign trade zones (FTZ) is located in the Study Area. FTZ #214 Southeastern North Carolina includes the Port of Wilmington, Port of Morehead City and the NC Global TransPark, as shown in Figure 14-13. FTZs offer several economic advantages for companies involved in international trade. Foreign or domestic merchandise may enter an FTZ without a formal customs entry document or payment of customs duties or government excise taxes (EDPNC 2019c). Specific advantages of FTZ #214 Southeastern North Carolina include its midpoint position, between Maine and Florida, proximity to two major interstate highways with international trucking facilities, adjacent to rail and aviation facilities at Wilmington International Airport and Kinston Regional Jetport, as well as two sea ports in Wilmington and Morehead City, North Carolina (NCDOT 2019a).

14.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 14-14 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties:* A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major:* Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major:* Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major:* Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter:* Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site:* Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

Based on the USEPA facilities in Figure 14-14, industrial facilities are concentrated in the Study Area's major urban centers of Wilmington (New Hanover County), Jacksonville (Onslow), and Greenville (Pitt). Few facilities are located in Gates, Tyrrell, Dare, Hyde, and Jones Counties. Chapter 14.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 14-14. USEPA Facility Register Service Record for the North Carolina Study Area

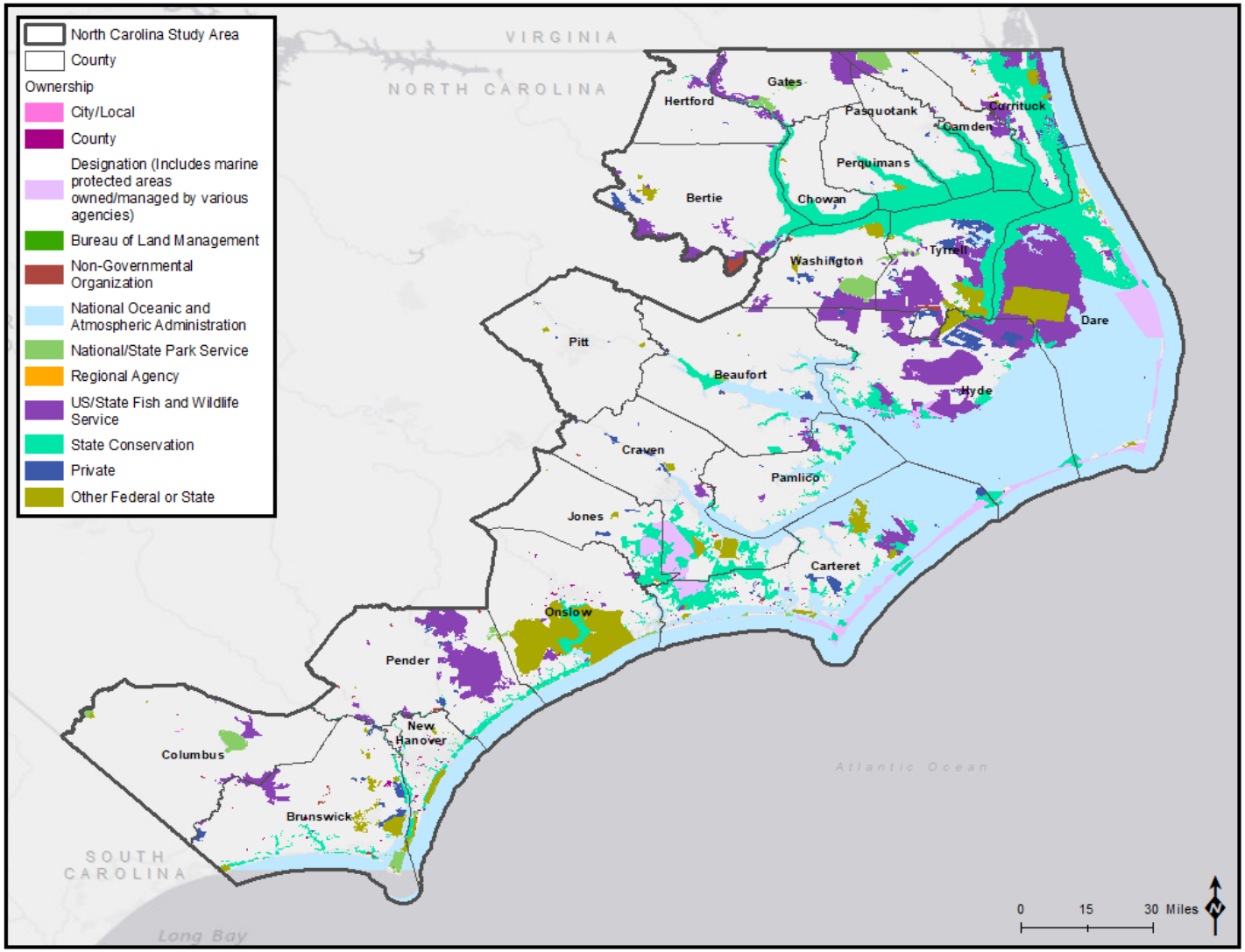
As described previously, industrial sites are frequently concentrated in industrial zones or near other industrial properties. When purchasing property, particularly existing industrial property, developers will frequently conduct a Phase I Environmental Site Assessment to research the current and historical uses of a property and determine if the current or historic uses of the property may have impacted or pose a threat to the environment and/or human health. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties which may be similar in nature, or which may provide services relevant to the new site. Therefore, a Phase I site survey may be a useful assessment during the site selection and planning process. Chapter 14.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

14.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 14-15 presents the protected areas within the Study Area. The “designation” category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

Protected lands in the Study Area include those owned and/or managed by the Federal, State or local government, non-government agencies, or private entities. These protected lands include military training facilities, national forests and seashores, NWRs, wildlife management areas, preserves, sanctuaries, State parks, game lands, coastal reserves, coastal waters areas, nursery areas, wilderness areas, conservation easements, State and local conservation areas, and State historic or cultural areas.

In the northern region of the Study Area, there are several protected areas, including Cape Hatteras National Shore and Albemarle Sound. Cape Hatteras National Seashore is the Nation’s first national seashore, established to preserve segments of the barrier islands off the coast of North Carolina (NPS 2016). It stretches across 70 miles of shoreline and is approximately 24,470 acres (Outerbanks.com 2019a). Albemarle Sound is separated from the Atlantic Ocean by the barrier islands of the Outer Banks and extends for about 50 miles from east to west varying in width from five to 14 miles (McKenna, 2019). It is a shallow, low salinity, high-turbidity estuary that supports several important commercial and recreational fisheries. In 2016r, many species populations were measured well below historic levels which caused concerns about contaminants in the water, sediment, and biota (USGS 2016b). Therefore, Albemarle Sound was chosen as one of the sites for the pilot study of a water quality monitoring network (National Monitoring Network For US Coastal Waters and their Tributaries) being developed to provide data for examining these types of water quality management issues (USGS 2016b). Further, the Nature Conservancy and State and Federal partners protect over 850,000 acres across the Albemarle Sound’s watersheds including the surrounding NWRs (Outerbanks.com 2019b). The health of sound and these species continues to be monitored.



Source: USGS 2019

Figure 14-15. Protected Areas within the North Carolina Study Area

There are also several wildlife refuges, game lands, and State parks in the northern region of the Study Area. NWRs include Mackay Island NWR, Currituck NWR, Roanoke River NWR, Pea Island NWR, Mattamusket NWR, Alligator River NWR, Pocosin Lakes NWR, and Swanquarter NWR. State reserve sites include Emily and Richardson Preyer Buckridge Coastal Reserve and Kitty Hawk Wood Coastal Reserve. Information for NWRs and State reserves can be obtained using an interactive map on the USFWS's website (USFWS 2019x) or on North Carolina's Department of Environmental Quality website (NCDEQ 2019e). Game lands in North Carolina are managed by the State for hunters, trappers, and fishermen. Some of the larger game lands in the northern region of the Study Area include Northwest River Marsh Game Land (2,900 acres), North River GL (19,046 acres), Gull Rock Game Land (28,600 acres), Alligator River Game Land (24,439 acres), Dare Game Land (46,055 acres), New Lake Game Land (1,438 acres), Chowan Swamp Game Land (32,570 acres), and Bertie County Game Land (3,884 acres) (NCWRC 2019a). The North Carolina Wildlife Resources Commission website has an interactive State map to locate game lands geographically and a list of game lands by name in each region (i.e., Coastal, Piedmont, and Mountain Regions) (NCWRC 2019b).

In the central region of the Study Area, primarily in Jones, Craven, and Carteret Counties, protected areas identified in Figure 14-15 include Cape Lookout National Seashore, Croatan National Forest, Cedar Island NWR, and several game lands. Cape Lookout National Seashore, a 56-mile-long section of barrier islands running from Ocracoke Inlet to Beaufort Inlet (Outerbanks.com 2019c). Croatan National Forest is managed by the USDA and consist of over 160,000 acres of pine forests, saltwater estuaries, bogs, and swamps ((USDA 2019g). Cedar Island NWR is at the northern tip of Carteret County and consists of 3,494 acres of pocosin and woodland habitat and approximately 11,000 acres of irregularly-flooded, brackish marsh (USFWS 2019y). Select large game lands in this region of the Study Area include the Croatan Game Land (162,217 acres total), Goose Creek Game Land (9,953 acres), White Oak River Game Land (2,600 acres), Stones Creek Game Land (4,124 acres), Carteret County Game Land (7,120 acres), Dove Bay Game Land (2,900 acres), and Neuse River Game Land (4,900 acres) (NCWRC 2019a). There is also the U.S. Marine Corp military training facility at Cherry Point in northern Craven County.

In the southern region of the Study Area (Onslow, Pender, New Hanover, Brunswick, and Columbus Counties), the large area of protected land in Onslow County is primarily used by the U.S. Marine Corp as a military training facility. It includes the Camp LeJeune, New River Air Station, Camp Johnson, Camp Geiger Marine Corp Outlying Field Camp Davis. The two large, protected areas in Pender County are Angola Bay Game Land (34,063 acres) and Holly Shelter Game Land (63,556 acres). Other game lands in the area include Cape Fear River wetlands (7,191 acres) and Roanoke Island Marshes Game Land (1,874 acres) (NCWRC 2019a). National and State reserve sites in this region if the Study Area include Masonboro Island National Reserve (5,653 acres), Zeke's Island National Reserve (1,635 acres), Bald Head Woods State Reserve (191 acres), Bird Island Coastal Reserve (2,800 acres), and Permuda Island Reserve (63 acres) (NCDEQ 2019e). State parks in the region include Lumber River State Park, Lake Waccamaw State Park, and Lumber River State Park in Columbus County; and Fort Fisher State Park and Carolina Beach State Park in New Hanover County (NC Parks 2019).

Overall, the northern region of the Study Area has the largest area of protected lands primarily because of Albemarle Sound and the many NWRs and Game Lands in the surrounding area. There are also two protected national seashores (Cape Hatteras and Cape Lookout) that span over 125 miles across Dare, Hyde, and Carteret Counties. The most developed area in the Study Area is New Hanover County, which also has notable areas of protected lands along the coastline, primarily because of national and State reserves and State parks. Therefore, future potential projects will need to consider these protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

14.3.2.6 Cultural and Historic Resources

"The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as North Carolina, resided in the area long before the era of European exploration. They were believed to be nomads living mostly on the Piedmont and low-lying Coastal Plain, but they left no permanent dwellings. Over time, they began to hunt big game and small game, fish, and collect plants Their camps and villages occur as archaeological sites throughout North Carolina, on high mountain ridges, along river banks, and across the Piedmont hills. Later inhabitants of the area settled in permanent locations, usually beside streams (NC Museum of History 2020a). During this same time, tribes with stronger leadership and unity settled in North Carolina, resulting in larger and longer lasting towns near streams. Today, several modern American Indian groups are found in North Carolina (see Chapter 14.4.5.4, Tribes).

The first Europeans to explore and map the coastline of North Carolina was Giovanni da Verrazano from Spain in 1524. The very first settlement in North Carolina (Fort San Juan at Joara) was founded in western North Carolina by Juan Pardo, a Spanish explorer. However, the settlers were killed by the Mississippian tribes within a year and the site was abandoned. The first British settlement in North Carolina, and in the Study Area, was the Roanoke Colony on Roanoke Island (Dare County), established in 1584. While the Roanoke Colony was the first European colony in North America, it ultimately failed by 1590 after two separate attempts to settle there, later to be known as the Lost Colony. Throughout the late 1600s and early 1700s, more settlers moved into North Carolina, primarily into the Albemarle Region (western North Carolina) and the region around Pamlico Sound (Pamlico County). The first permanent town was established in Bath (Beaufort County) in 1705, followed by Beaufort (1709; Carteret County) and New Bern (1710; Craven County). But the Tuscarora people were unhappy with the English settlers pushing them off their land. This led to the Tuscarora War (1711-1715) in which the Tuscarora ultimately lost. The Tuscarora signed a treaty and settled in Bertie County while some of their allies settled in Hyde County (NC Museum of History 2020a). In 1712, North Carolina split from South Carolina and became an official English Royal Colony in 1729 (Nelson 2020g).

One of the most notorious historical figures associated with North Carolina is the pirate Edward Teach, known as Blackbeard. Blackbeard had converted a French merchantman into a 40-gun warship, *Queen Anne's Revenge*, and attacked ships along the coast of Virginia, Carolina, and in the Caribbean Sea. Blackbeard eventually lost three of his ships and established his base in Pamlico Sound in 1718, after the governor of North Carolina pardoned him in exchange for his treasures. At the request of North Carolina planters, Virginia sent Lt. Robert Maynard and the British navy to attack and kill Blackbeard, who eventually died in a battle off the coast of Ocracoke Island on November 22, 1718 (History 2019b). Several Blackbeard artifacts are in the North Carolina Maritime Museum in Bath (Beaufort County).

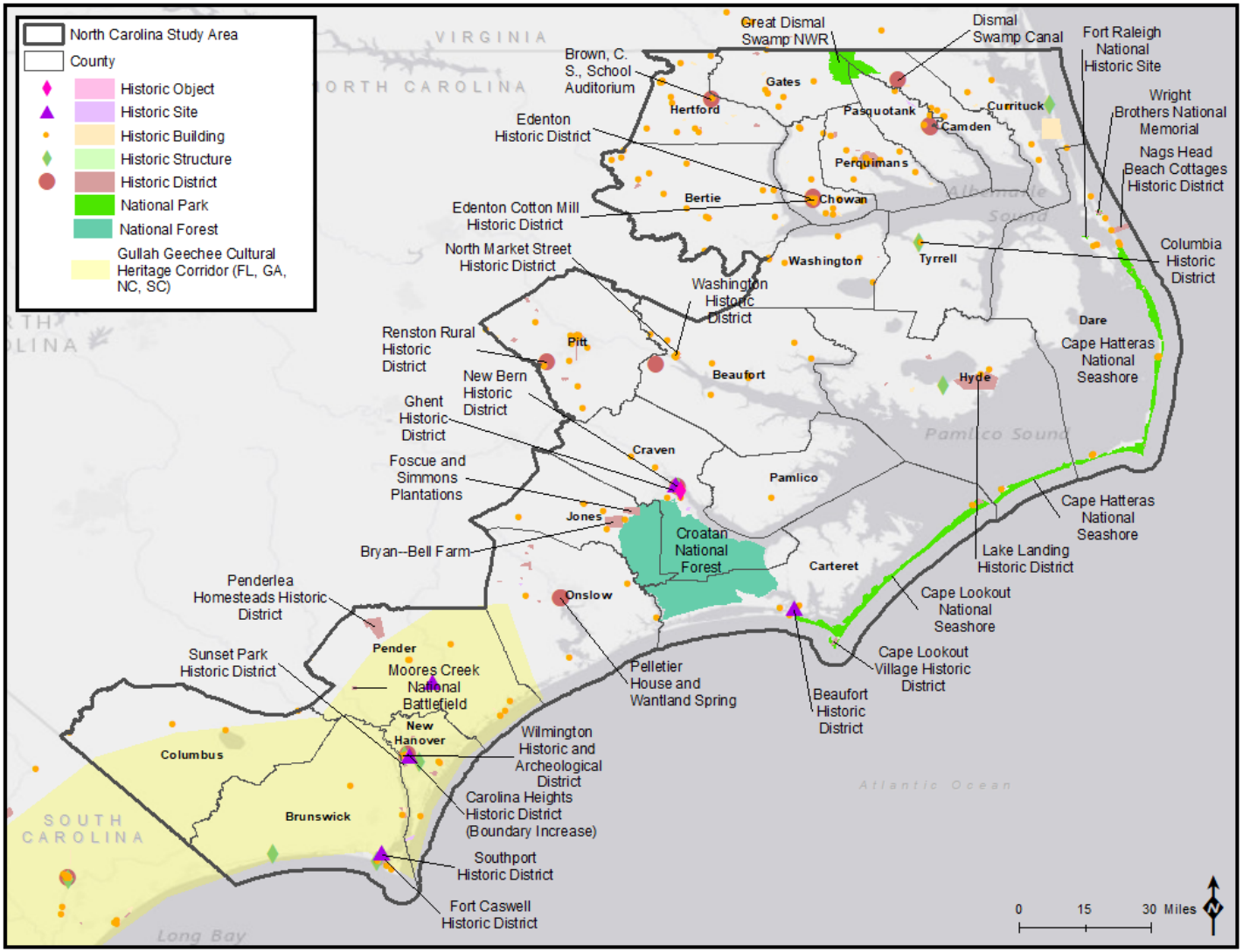
Several battles of the Revolutionary War (1775-1783) were fought in North Carolina, but only a few were fought within the Study Area. The Battle of Moores Creek Bridge, the first Revolutionary War battle to take place in North Carolina, was fought in southwestern Pender County on February 27, 1776. Two months later, the Halifax Resolves (which occurred in Halifax County just west of Bertie County) was passed on April 12, 1776. The Halifax Resolves was the first official action for independence from Britain and North Carolina became the first colony to vote in favor of independence (History 2018b).

Several Civil War battles were fought in North Carolina between 1861 and 1865, some of which were fought in the Study Area including, but not limited to, Hatteras Inlet Batteries (1861; Dare County), Roanoke Island (1862; Dare County), New Bern (1862, Craven County), Fort Fisher (1864-1865, New Hanover County) (NC Museum of History 2020b). After the Civil War, North Carolina made great strides in industrial development primarily tobacco, textiles, and furniture.

Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with Native Americans and major turning points in American history. Figure 14-16 and Figure 14-17 present a summary of many of the locations which were significant in North Carolina's history, including maritime sites and shipwrecks in Pamlico Sound, along the barrier islands, and in the Atlantic Ocean. As shown in Figure 14-16, the Gullah/Geechee Cultural Heritage Corridor is the area within which the Gullah culture in the Carolinas and the Geechee culture in Georgia and Florida primarily reside. The Corridor extends from Wilmington, North Carolina to Jacksonville, Florida. The Gullah and Geechee are cultural groups descended from enslaved peoples from West and Central Africa. The geographic isolation of the region has contributed to both cultures being able to preserve their linguistic, artistic, and societal traits while simultaneously assimilating aspects of other cultures in the area (NPS 2017a).

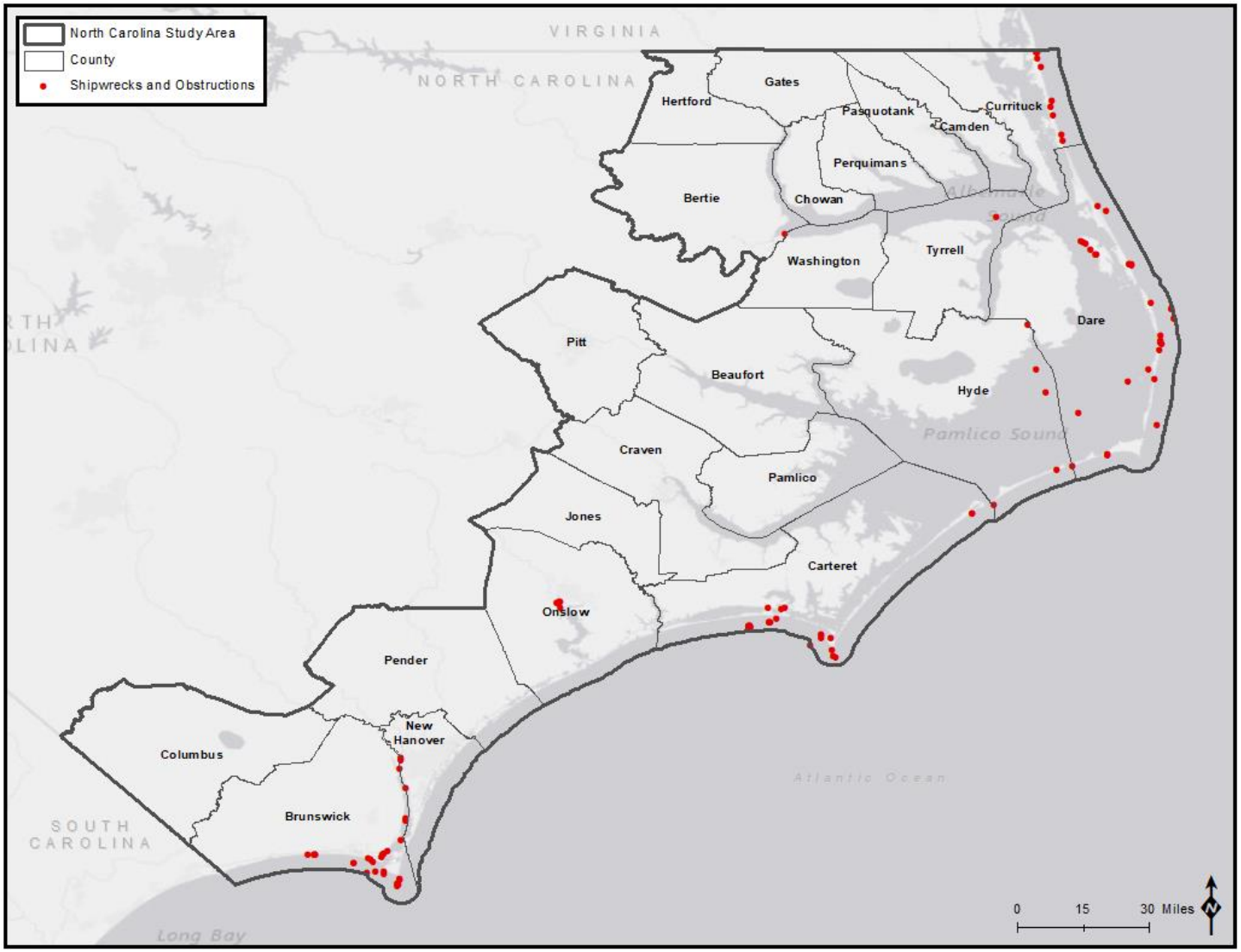
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including North Carolina) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 14-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of North Carolina's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and the immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.



Source: NPS 2014

Figure 14-16. Cultural and Historic Sites within the North Carolina Study Area



Source: NOAA 2016a

Figure 14-17. Shipwrecks and Obstructions in the North Carolina Study Area

14.3.2.7 Recreation

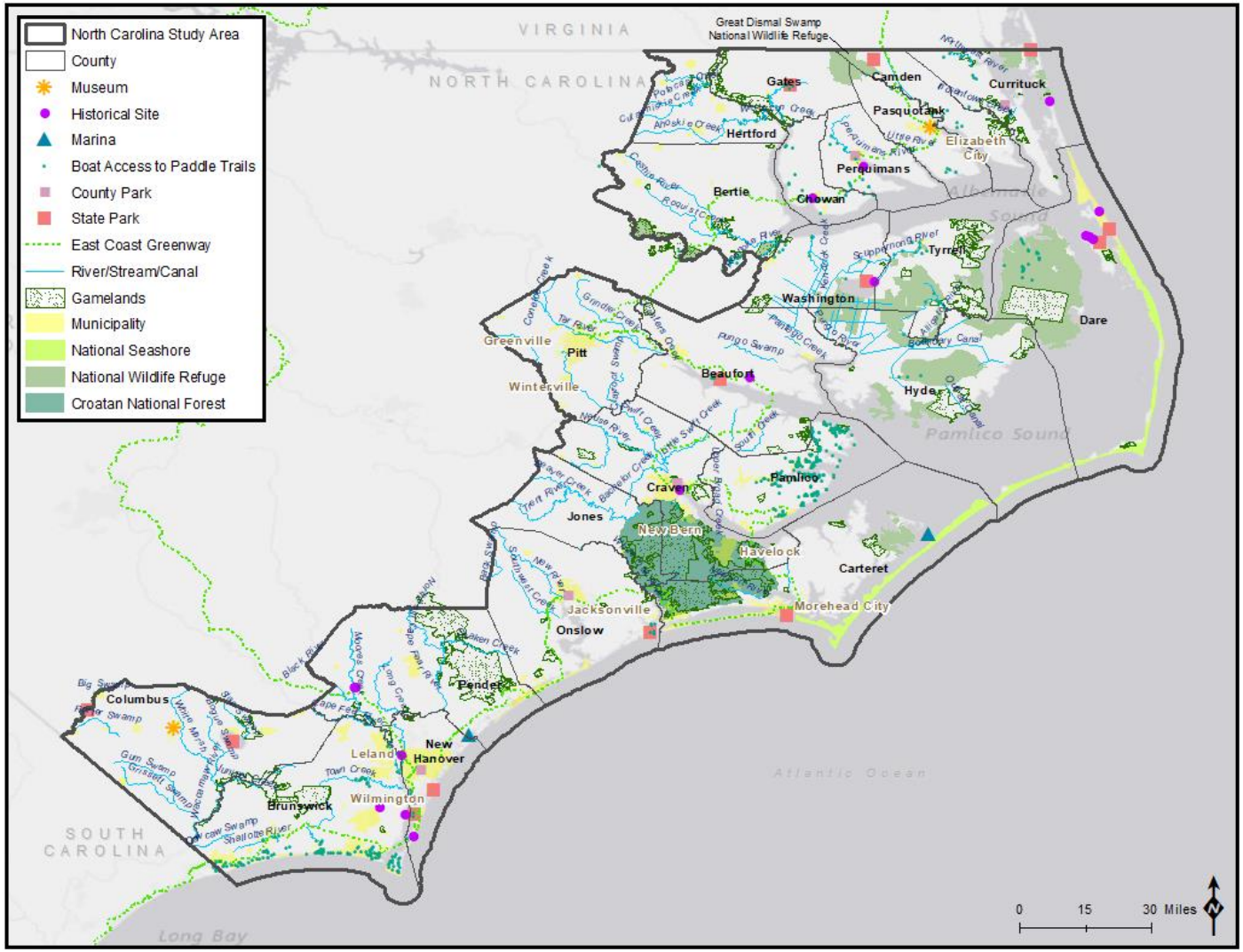
The Study Area has several recreational opportunities including two National Seashores, Croatan National Forest, the Great Dismal Swamp, numerous NWRs, game lands, and State parks, historical and cultural resources, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 14-18. The cultural and historic resources shown in Figure 14-16 can also be considered potential recreational resources as can many of the protected areas shown in Figure 14-15. The following sections present a summary of some of the recreational opportunities available in the counties most heavily visited by tourism. Future OCS-related project analysis should include an evaluation of local recreation once site-specific information has been identified. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 14.3.2.6), transportation (Chapter 14.3.2.8), tourism employment (included in Chapter 14.4.4), and rental housing (included in Chapter 14.4.3).

Currituck, Dare, and Hyde Counties (Outer Banks)

In the northern region of the Study Area, there are numerous protected areas (game lands and NWRs discussed in Chapter 14.3.2.5) that are valuable recreational resources for hunting, fishing, hiking, horseback riding, and picnicking. The barrier islands off the coast of North Carolina, the Outer Banks, is a popular tourist destination that spans Currituck, Dare, and Hyde Counties. Main tourist towns include Hatteras, Kill Devil Hill, Kitty Hawk, Nags Head, and Ocracoke. The Outer Banks is also part of the Cape Hatteras National Seashore. The NPS estimated that approximately 2.6 million people visited Cape Hatteras National Seashore in 2018 (NPS 2018a). It also was estimated that tourist spending in 2018 was $243.8 million in Currituck County, $1.9 billion in Dare County (fifth in the State), and $39.3 million in Hyde County. Dare County had the largest income from tourism in the Study Area, allowing for employment of 13,550 people in the community (Visit NC 2019). Additional tourism budgets and statistics for Dare County (meals, occupancy, visitation) can be found on the Outer Banks website (Outerbanks of NC 2019a).

In the Outer Banks, tourists can visit places like the Nature Conservancy at Nags Head Woods Preserve, Alligator River NWR, Dowdy Park, Pea Island NWR, Roanoke Island Festival Park and Maritime Museum, the North Carolina Aquarium, three lighthouses, and Jockey’s Ridge State Park (Outerbanks of NC 2019b, Outerbanks of NC 2019c). Jockey’s Ridge Sate Park (Dare County) estimated 1.56 million visitors in 2017 (NCDNCR 2018).

Annual events in the Outer Banks are very popular in the fall and early winter months. Some of these annual events include the Eastern Surfing Association Eastern Surfing Championship (September), Duck Jazz Festival (October), Wings Over Water Wildlife Festival (October), Outer Banks Seafood Festival (October), Outer Banks Brewtag (October), OBX Marathon (November), and Celebration of the Wright Brothers First Flight at the Wright Brothers National Monument (December) (Outerbanks.org, 2019d). There are also several fishing tournaments between April and November in the Outer Banks (NCBBA 2019).



Sources: NCDOA 2019c, NCDOT 2019f, NCDNR 2019, NPS 2014, USFS 2019b

Figure 14-18. Select Recreational Resources within the North Carolina Study Area

Carteret County

Carteret County offers several options for visitors to go on boat tours, marsh cruises, fishing charters, and diving (The Crystal Coast 2019a). The barrier islands on the southern coast of Carteret County, known as the Crystal Coast, have several beaches and attractions for tourists. The barrier islands on the east coast of Carteret County are known as Cape Lookout National Seashore and are considered part of the Outer Banks. Cape Lookout National Seashore has 56 miles of mostly undeveloped shoreline with no commercial facilities, homes, shops, or development. But it is an attraction for shell hunters, fishermen, hikers, and birdwatchers (Outerbanks.com 2019c). The National Parks Service estimated that, in 2018, approximately 408,000 people visited Cape Lookout National Seashore (NPS 2018a).

Onslow County

Based on an annual study commissioned by Visit North Carolina, published in 2019, Onslow County was reported to have an 8.04% increase in domestic visitors, the highest increase of any county in the State from 2017 to 2018. Visitor spending was approximately $249 million in 2018 (Only in Onslow 2019). Notable tourist destinations and activities in Jacksonville, in Onslow County, include Freedom Fountain, Vietnam Veterans Memorial, Camp LeJeune Memorial Gardens, Lynwood Park Zoo, Zing Zumm Children's Museum, and local parks (Jacksonville, 2019). Beach destinations in Onslow County include Onslow Beach, Hurst Beach, North Topsail Beach, and Hammocks Beach State Park.

Brunswick and New Hanover Counties

The two of the southernmost counties in the North Carolina Study (Brunswick and New Hanover) area are also popular destinations because of the beaches and city of Wilmington. Brunswick County has several beaches including Sunset Beach, Ocean Isle Beach, Holden Beach, Oak Island, Caswell Beach and Bald Head Island. These beaches are popular for visiting lighthouses, kayaking through salt marshes, creeks and inlets, watching sea turtles, fishing, scuba diving, surfing, boating, and golfing (Brunswick Islands 2019). Tourists visiting the Brunswick County brought in almost $600 million in 2018, allowing for employment of 5,930 people in the community (Visit NC 2019).

In New Hanover County, Wilmington is one of the leading tourists' attractions in the State with several beaches nearby including Carolina Beach, Kure Beach, Wrightsville Beach (Wilmington NC 2019a). Tourists visiting the city of Wilmington and New Hanover County brought in almost $613 million in 2018, allowing for employment of 6,470 people in the community (Visit NC 2019).

Wilmington has a historic district, a 2-mile Riverwalk lined with over 200 shops and cafes, and an ocean boardwalk and piers. There are several museums of art, history, and science in Wilmington, including the World War II Battleship North Carolina museum ship, Cape Fear Museum of History and Science, Railroad Museum, Children's Museum, and Cameron Art Museum (Wilmington NC 2019b). Additionally, Fort Fisher State Historic Site is on Kure Beach, which is the site of the remaining portions of South's largest earthen fort and the site of the largest land-sea battle of the Civil War. Other attractions include the North Carolina Aquarium at Fort Fisher and Jungle Rapids Family Fun Park.

Throughout the year, there are several popular festivals and events in Brunswick and New Hanover Counties. Festivals in Brunswick county include the North Carolina Oyster Festival (October) and North Carolina Festival by the Sea (October) (Top Events USA 2014d). One of the largest festivals in the State is the Azalea Festival which is a five-day event in Wilmington every April. It is planned and run by over 1,000 volunteers drawing in approximately 300,000 people with tourists spending approximately $51 million dollars annually (NCAF 2019). Other popular festivals in New Hanover County include the Wrightsville Beach Marathon (March), St. Patrick's Day Parade and Festival (March), Cape Fear Beer Week (March), Kure Beach Street Festival (April), Wilmington Wine and Food Festival (May),

Wilmington Greek Festival (May), Carolina Beach Music Festival (June), Cape Fear Blues Festival (June), Wilmington Riverfest (October), Cucalorus Film Festival (November), Cape Fear Kite Festival (November), and various winter holiday festivals (Carolina Beach 2019, U.S. News 2019e, Top Events USA 2014d). Fishing tournaments are also popular in Carteret, Onslow, New Hanover, and Brunswick Counties between April and November, with only a few tournaments held during the winter (Fisherman's Post 2019, The Crystal Coast 2019b).

Summary

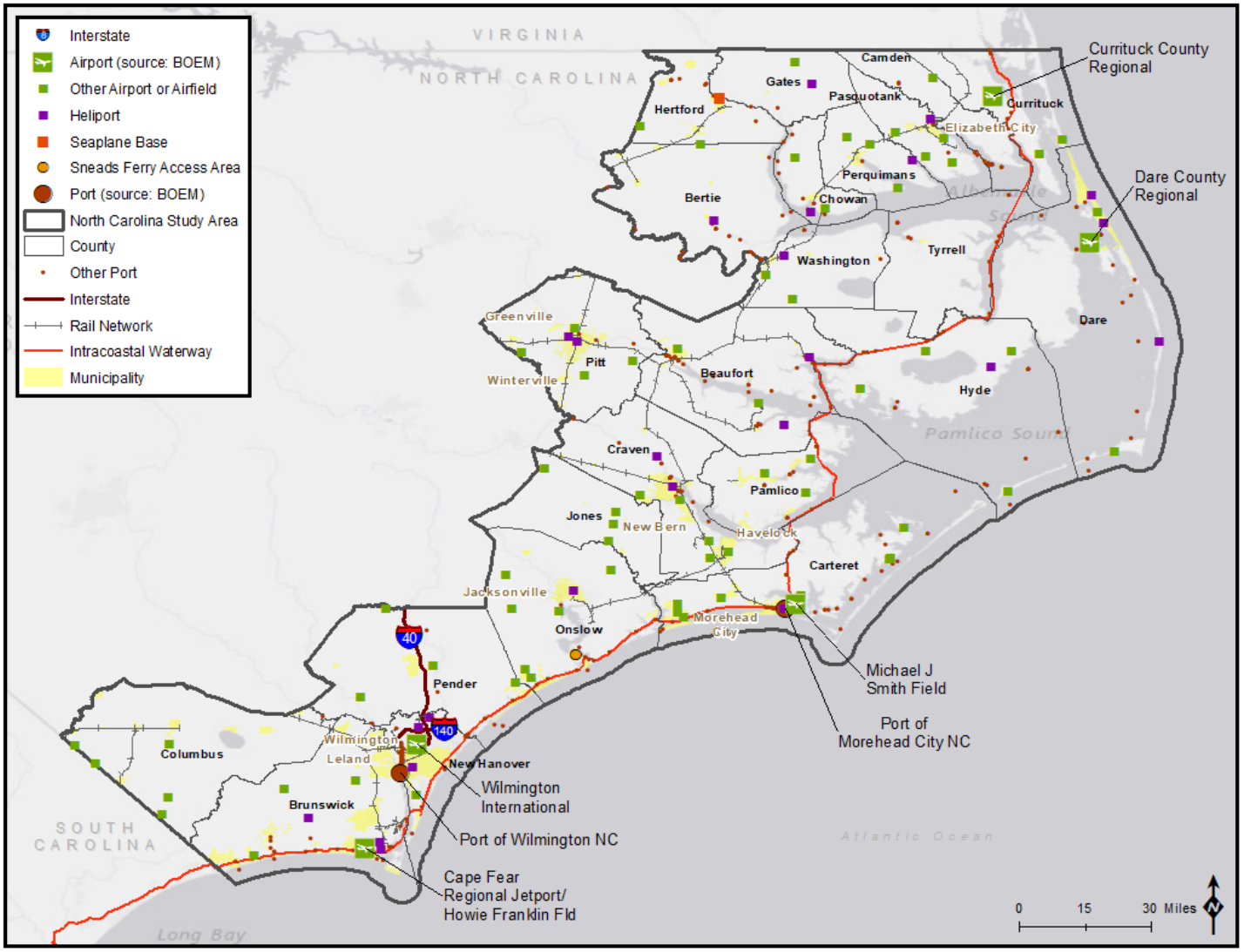
There are recreational activities year-round in the Study Area, but peak tourist season is typically from the end of May to the beginning of September because the beaches and water-related activities are the primary attractions. Thus, travel costs (e.g., hotels, airfare) will be greater during the summer months. But the spring and fall are also popular seasons for vacationing because the weather is still warm, and it is less crowded. The four most popular counties in the Study Area for recreation, based on tourism expenditures, are Dare, New Hanover, Brunswick, and Carteret Counties (Visit NC 2019). Therefore, the potential impacts on the counties, events, and attractions (e.g., festivals and fishing tournaments) should be considered during the analysis of potential projects near these areas.

14.3.2.8 Transportation Resources

The Study Area contains a variety of transportation resources including highways, railroads, airports, waterways and ports. The North Carolina Department of Transportation is responsible for all modes of transportation in North Carolina. Figure 14-19 shows the transportation resources throughout the Study Area. The roadway network connects the airports, railroads, and ports creating an integrated transportation network throughout the Study Area.

North Carolina has one of the largest State-maintained highway systems in the Nation with more than 15,000 miles of primary highways (Interstate, US, and North Carolina routes) and nearly 65,000 miles of secondary roads (NCDOT 2018). The highway system throughout the Study Area is largely driven by the region's unique geography and population. There is only one major interstate corridor within the Study Area: I-40 runs north from Wilmington and I-140 is located north and west of Wilmington. Most of the highways within the Study Area are a mix of US and State routes and secondary roads. US 17 is the primary highway from Wilmington along the coast, north through New Bern/James City, north and east to Elizabeth City and into Virginia. Other major US highways within the Study Area that primarily run east to west include US 158, US 64, US 264, US 70, and US 421.

North Carolina has approximately 3,300 miles of mainline railroad track and is served by two Class 1 railroads (CSX and Norfolk Southern) and 21 short lines and terminal railroads (Hauser et al. 2005). Passenger rail service is not available within the Study Area. Four commercial service airports are located within the Study Area: Pitt-Greenville Airport, Coastal Carolina Regional Airport (Craven County), Albert J. Ellis Airport (Onslow County), and Wilmington International Airport.



Sources: USGS 1998, NCDOA 2019c, NCDOT 2019f, BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 14-19. Transportation Resources within the North Carolina Study Area

Water transportation is a big part of the overall North Carolina transportation system especially within the Study Area because of the coastal area and other major waterways within the area (Pamlico River, Neuse River, New River, Cape Fear). Two deep water ports that handle ocean-going vessels are owned and operated by the North Carolina State Ports Authority (NC Ports 2019). The Port of Wilmington and the Port of Morehead City have facilities to handle containerized bulk, and break-bulk cargoes. The Port of Wilmington has direct access to Interstates 40 and 95, and daily train service from CSX Transportation. The Port of Morehead City is one of the deepest ports on the U.S. east coast. The port is located four miles from the ocean bar with access to I-95 and I-40 via U.S. Highways 70 and 17. Train service to the port is provided from Norfolk Southern (Hauser et al. 2005). The second largest State-owned ferry system in the Nation is located within the Study Area. In addition to passenger and vehicle transportation, ferries carry goods that are essential to water-locked communities and serve in critical community service and public safety roles. The system includes 21 ferries and seven regular routes of everyday service across the Currituck and Pamlico sounds as well as the Cape Fear, Neuse, and Pamlico Rivers (NCDOT 2019b).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways, or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. The Port of Wilmington and the Port of Morehead City are both large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

The North Carolina Department of Transportation has started a strategic transportation plan called NC Moves 2050. The plan includes a two-year, multi-phased study that involves examining all aspects of North Carolina's transportation system, collecting data and information about its performance and anticipated challenges in the future (NCDOT 2019c). In addition to the NC Moves 2050 initiative, the North Carolina Department of Transportation has various transportation projects currently under construction or in development within the Study Area (NCDOT 2019d). There are also long-range studies in progress for future transportation projects that could occur within the Study Area (NCDOT 2019e).

The primary transportation constraint within the Study Area is associated with vulnerabilities due to recurrent flooding. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in sea level and an increase in the frequency and intensity of large storm systems). Flooding in tunnels and near bridges is of concern since road closures in these areas can be a hindrance to evacuation and emergency services.

14.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area varies and equates closely with actual land use. Typically, as would be expected, the metropolitan areas are primarily comprised of developed land uses (developed open space, developed low intensity, developed medium intensity, or developed high intensity) and higher concentrations of impervious surfaces, more buildings, more development, and more transportation resources (road, rail, air, and port). The Study Area is primarily open water (29.2%) and wetlands (29.4%), especially on the coastal side and along river floodplains. Given that wet areas account for more than half of the Study Area restricts where and how much urban development has and could occur. Only 6.2% of the Study Area is classified as developed open space and low intensity development, indicating

potential for future growth. New Hanover County, which contains Wilmington, has the most total developed land cover which has 43%, of which 33.1% is open space and low intensity development and therefore potentially available for further growth. Other areas with potential for growth include areas around Jacksonville (Onslow County), Greenville (Pitt County), and in Brunswick County, which contains urban sprawl from Wilmington and Myrtle Beach, South Carolina.

The CAMA provides a program for the protection, preservation, orderly development, and management of North Carolina's coastal resources in the 20 coastal counties (NCDEQ 2019a). These 20 counties are all required to have a local land use plan consistent with the guidelines established by the Coastal Resources Commission. These land use plans include local policies that address the protection of natural resources and productive resources (i.e., farmland, forest resources, fisheries), desired types of economic development, and the reduction of storm hazards. The land use plans also provide guidance for projects and policy issues such as the development of regulatory ordinances. The three counties in the Study Area that are not considered coastal counties under CAMA (Pitt, Jones, and Columbus Counties) have developed Comprehensive Land Use Plans. These Comprehensive Land Use Plans set goals and objectives for each county, with regards to topics such as appearance, community services, growth and development, housing, land use, natural environment, and transportation.

The State of North Carolina takes pride in offering a pro-business environment by providing a low corporate income tax rate, low costs for living and operating business, streamlined legal practices for business, an available highly skilled workforce, incentives for new industry, and foreign trade zones. The North Carolina Department of Commerce annually ranks the State's counties with County Distress Rankings which are incorporated into various State programs to encourage economic activity in the less prosperous areas of the State (EDPNC 2019b). Counties within the Study Area that are encouraged for economic development are those outside of the currently developed areas and include the Tier 1 counties of Beaufort, Bertie, Chowan, Columbus, Gates, Hertford, Hyde, Jones, Pasquotank, Perquimans, Tyrrell, and Washington.

Overall, the northern region of the Study Area has the largest area of protected lands primarily because of Albemarle Sound and the many NWRs and Game Lands in the surrounding area. There are also two protected national seashores (Cape Hatteras and Cape Lookout) that span over 125 miles across Dare, Hyde, and Carteret Counties. The most developed area in the Study Area is New Hanover County, which also has notable areas of protected lands along the coastline, primarily because of national and State reserves and State parks. Therefore, analysis of future potential OCS-related projects will need to consider these protected areas during the site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

Additionally, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. Future analysis will need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

There are abundant transportation resources in Study Area. The primary transportation constraint within the Study Area is associated with vulnerabilities due to recurrent flooding. Recurrent flooding is flooding

that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in sea level and an increase in the frequency and intensity of large storm systems). Flooding in tunnels and near bridges is of concern since road closures in these areas can be a hindrance to evacuation and emergency services.

14.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

14.4.1 Population

North Carolina's population is increasing at a rate faster than the Nation. According to the USCB, the State's estimated population was 10.1 million in 2017. As shown in Table 14-8, the population of North Carolina grew 5.4% since the 2010 Census, having added approximately 517,081 people. During the same period, the population of the U.S. grew just 4.0% from 308.7 million to 321.0 million.(USCB 2017a, USCB 2017d)

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade, and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While North Carolina is affected by the nationwide trend of aging population, as indicated by the declining rate of natural increase between 2010 and 2018, natural increase continues to contribute to population growth. However, the majority of the State's growth is from net migration. According to 2018 estimates, the State gained 112,820 residents; 25,724 (22.8%) from natural increase; 66,991 (59.3%) from domestic migration, and 20,035 from international migration (USCB 2019b). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Nationally, migration remains at historic lows, as those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). However, North Carolina is not part of this national trend, as it is one of the southern States that is a popular destination for relocation. Reasons for relocation, derived from the USCB survey data for 2015 – 2017, include work related reasons (new job or transfer), a change in marital status, and desire for better housing (Governing.com 2018). USCB 2018 estimates indicate that the biggest domestic in-migration came from Florida, Virginia, South Carolina, New York, Texas and California (USCB 2019c).

Table 14-8. 2010 and 2017 Total Population and Population Projections Through 2038 in the North Carolina Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2038)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2038) (%)
Albemarle	Camden	9,980	10,336	10,499	10,669	10,697	3.6	3.5
	Chowan	14,793	14,370	13,926	12,931	12,133	-2.9	-15.6
	Currituck	23,547	25,247	28,633	35,187	40,434	7.2	60.2
	Dare	33,920	35,412	38,055	40,983	42,260	4.4	19.3
	Gates	12,197	11,601	12,125	12,171	12,172	-4.9	4.9
	Hyde	5,810	5,507	5,398	5,147	4,948	-5.2	-10.2
	Pasquotank	40,661	39,546	39,811	39,804	39,802	-2.7	0.6
	Perquimans	13,453	13,506	13,855	14,789	15,622	0.4	15.7
	Tyrrell	4,407	4,090	4,309	4,309	4,309	-7.2	5.4
	Washington	13,228	12,331	12,072	11,236	10,569	-6.8	-14.3
	Total Albemarle Region	***171,996***	***171,946***	***178,683***	***187,226***	***192,946***	***0.0***	***12.2***
Cape Fear	Brunswick	107,431	122,586	143,157	176,429	203,047	14.1	65.6
	Columbus	58,098	56,589	56,475	56,474	56,476	-2.6	-0.2
	New Hanover	202,667	219,866	241,782	282,723	315,475	8.5	43.5
	Pender	52,217	57,630	64,820	76,632	86,078	10.4	49.4
	Total Cape Fear Region	***420,413***	***456,671***	***506,234***	***592,258***	***661,076***	***8.6***	***44.8***
Eastern Carolina	Carteret	66,469	68,699	71,582	76,957	81,301	3.4	18.3
	Craven	103,505	103,374	103,588	103,616	103,621	-0.1	0.2
	Jones	10,153	9,776	10,100	10,100	10,099	-3.7	3.3
	Onslow	177,772	192,685	203,464	225,971	243,975	8.4	26.6
	Pamlico	13,144	12,803	13,311	13,495	13,647	-2.6	6.6
	Total Eastern Carolina Region	***371,043***	***387,337***	***402,045***	***430,139***	***452,643***	***4.4***	***16.9***

Table 14-8. 2010 and 2017 Total Population and Population Projections Through 2038 in the North Carolina Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2038)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2038) (%)
MidEast	**Beaufort**	47,759	47,316	47,363	46,953	46,628	-0.9	-1.5
	Bertie	21,282	19,913	19,582	19,583	19,582	-6.4	-1.7
	Hertford	24,669	24,262	24,041	24,089	24,126	-1.6	-0.6
	Pitt	168,148	176,484	182,401	197,470	209,525	5.0	18.7
	Total MidEast Region	***261,858***	***267,975***	***273,387***	***288,095***	***299,861***	***2.3***	***11.9***
	Study Area Total	**1,225,310**	**1,283,929**	**1,360,349**	**1,497,718**	**1,606,526**	**4.8**	**25.1**
	North Carolina	**9,535,483**	**10,052,564**	**10,647,005**	**11,847,719**	**12,803,172**	**5.4**	**27.4**
	United States	**308,745,538**	**321,004,407**	**332,639,000**[4]	**355,101,000**[4]	**373,528,000**[4,5]	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - OSBM 2019; 4 - USCB 2018b
5 - U.S. projections is for 2040.

14.4.1.1 Study Area Trends

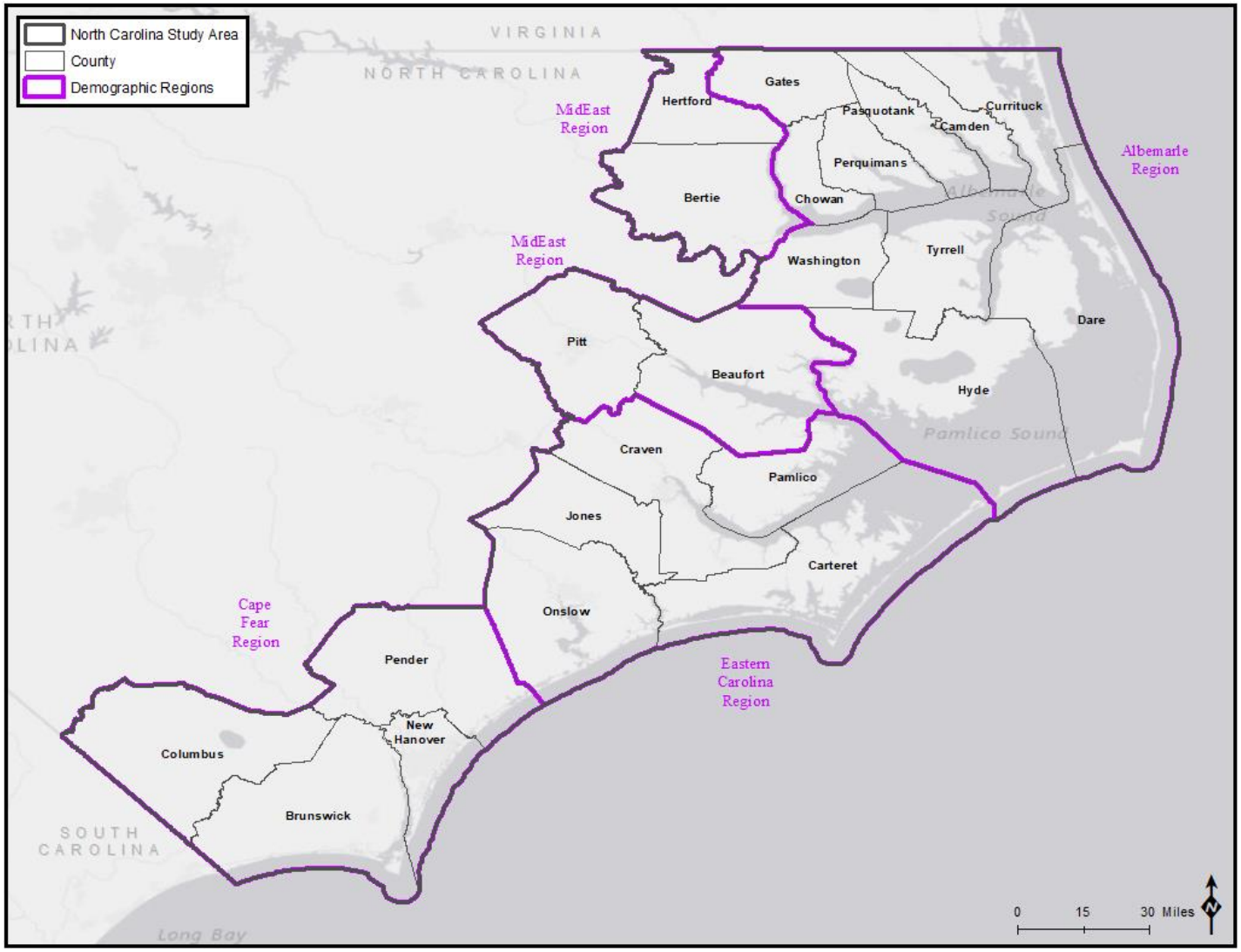
Figure 14-20 shows the four demographic regions comprising the Study Area. These regions are different from the various regions described in Chapter 14.2 because they are derived from official demographic regions used by the North Carolina Office of State Budget and Management (OSBM 2017). The counties within the Study Area are located within four demographic regions defined as MidEast, Albemarle, Eastern Carolina, and Cape Fear. According to 2017 population estimates, the Study Area represented 12.8% (1.3 million residents) of the overall State population of 10.1 million. The population of the Study Area is small compared to major centers of population that lie outside the Study Area in the more centrally located areas of the State, near the Raleigh and Charlotte-Concord-Gastonia metropolitan areas. These fast growing areas have populations greater than 1 million. Table 14-8 shows population growth and decline in the Study Area counties, as well as their location within the demographic regions. Between 2010 and 2017, 10 out of 23 counties gained population, while 13 lost population. Eight of the 13 counties that lost population were rural (Tyrell, Washington, Bertie, Hyde, Chowan, Pasquotank, Columbus, and Beaufort). During the same period, the population of the Study Area grew 4.8%, slower than the State (5.4%) and faster than the Nation (4.0%) (USCB 2017a, USCB 2017d, OSBM 2017, USDA 2013).

Between 2010 and 2017, the Cape Fear Region grew 8.6%, led by strong growth in the retirement destination counties of Brunswick (14.1%), Pender (10.4%) and New Hanover (8.5%), located along the State's southern coast (USCB 2017a, USCB 2017d, USDA 2013). The Eastern Carolina Region grew 4.4%, led by strong growth in Onslow county (8.4%), home to Marine Corps base Camp Lejuene, located on the coast adjacent to the fast growing Cape Fear counties. The Albemarle Region had stagnant growth, with the exception of the coastal counties of Currituck (7.2%) and Dare (4.4%), located within in the Virginia Beach-Norfolk-Newport News, VA-NC metropolitan area.

Figure 14-21 shows population counts in census block groups within the 23 counties located in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to metropolitan statistical areas, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 14-22 the metropolitan statistical areas present in the Study Area are:

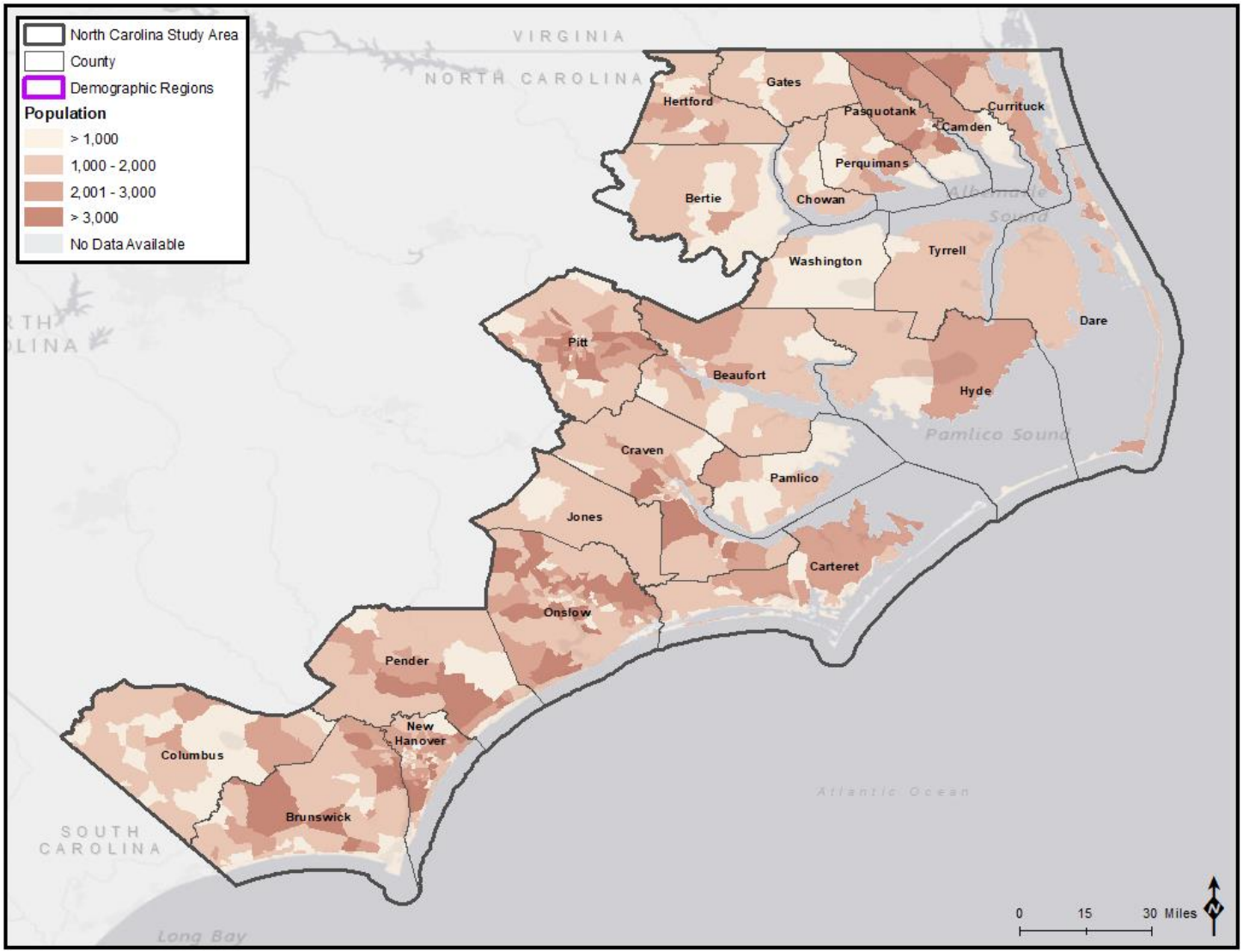
- Virginia Beach-Norfolk-Newport News, VA-NC
- Greenville, NC
- New Bern, NC
- Jacksonville, NC
- Wilmington, NC
- Myrtle Beach-Conway-North Myrtle Beach, SC-NC Metro Area (Data.gov 2017)

Figure 14-23 illustrates high density in major urban areas, surrounded by contiguous low-density areas comprising the "less than 50 persons per square mile" category. As shown in Table 14-9, the 2017 population density of the Study Area was 113 persons per square mile, less than the State (206 persons per square mile) but greater than the Nation (90 persons per square mile), signifying that the coastal counties are more densely populated than the State and the Nation. As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the North Carolina Study Area is one of two states that had less population density as compared to the State. Population densities in the Study Area ranged from 9 persons per square mile in rural Hyde County (located in the sparsely-populated Albemarle Region) to 1,144 persons per square mile in New Hanover County (located in the populous Cape Fear Region in the Wilmington metropolitan area) (USCB 2017d, USCB 2017c, USDA 2013).



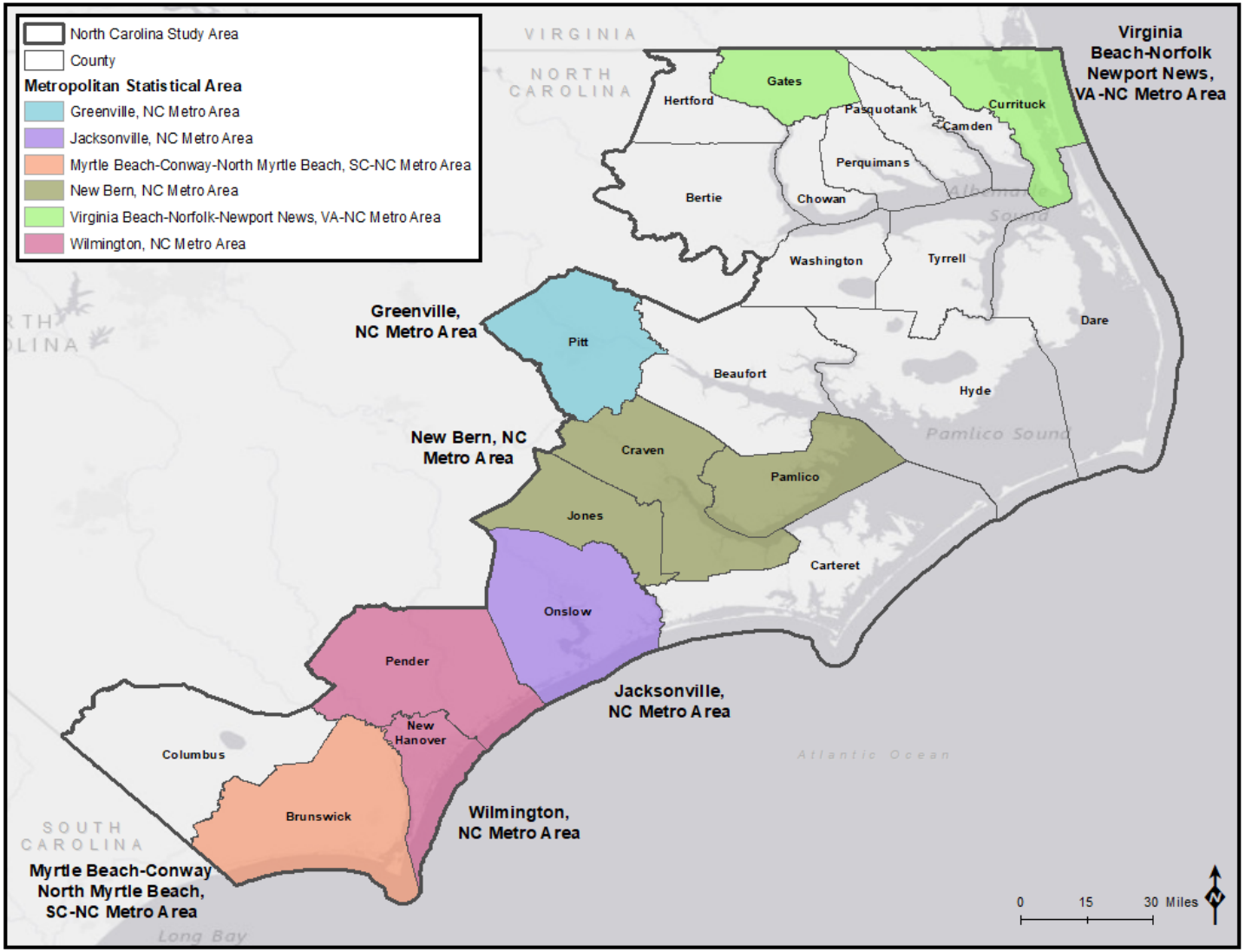
Source: OSBM 2017

Figure 14-20. Demographic Regions of the North Carolina Study Area



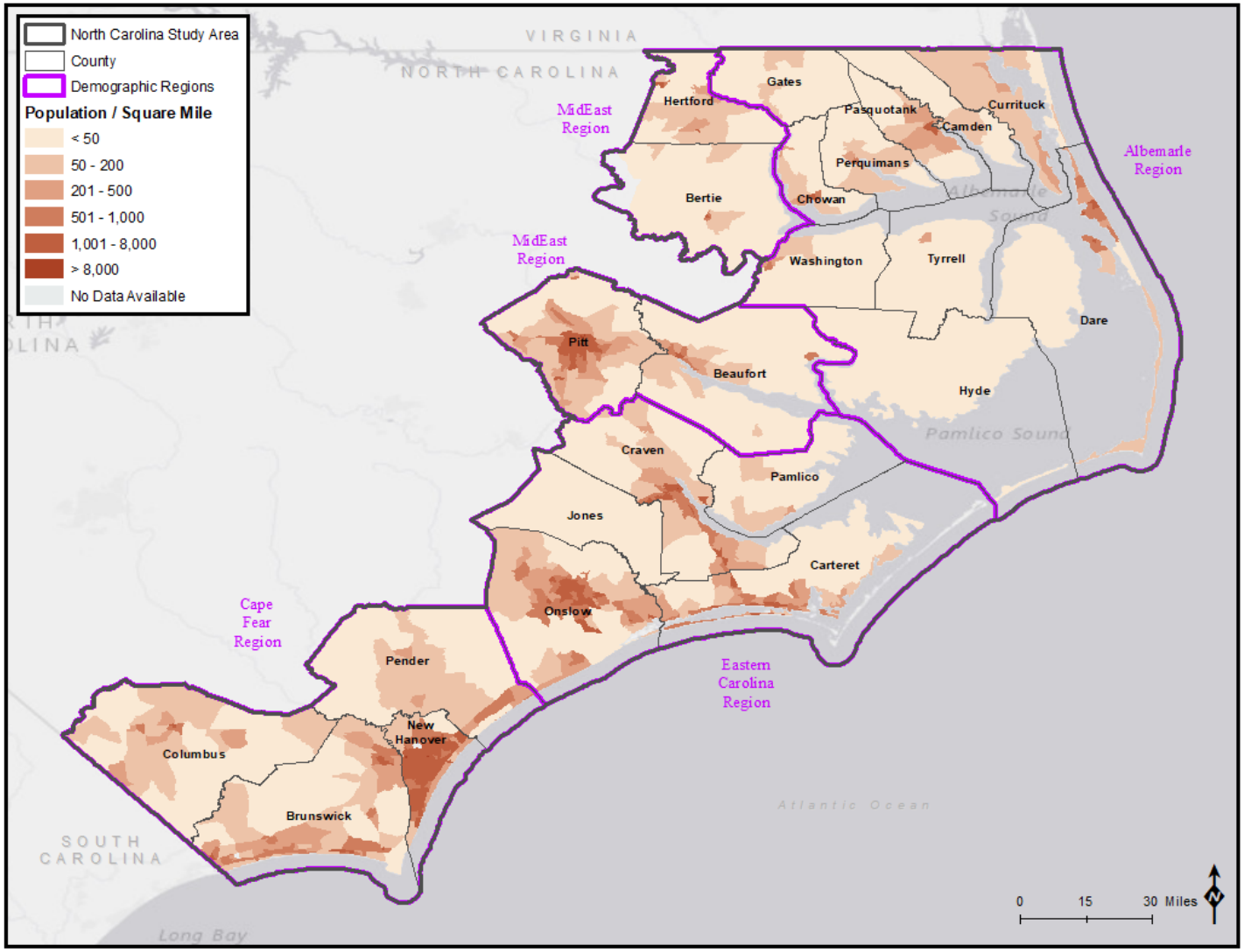
Source: USCB 2017r

Figure 14-21. Population in the North Carolina Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 14-22. Metropolitan Statistical Areas Located within the North Carolina Study Area



Source: USCB 2017r

Figure 14-23. Population Density in the North Carolina Study Area by Census Block Group

Table 14-9. 2017 and 2038 Population Density in the in the North Carolina Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2038) [1]	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2038[1] Population Density (people per square mile of land area)
Albemarle	Camden	10,336	10,697	240	43.0	44.5
	Chowan	14,370	12,133	173	83.2	70.3
	Currituck	25,247	40,434	262	96.4	154.4
	Dare	35,412	42,260	383	92.4	110.3
	Gates	11,601	12,172	341	34.1	35.7
	Hyde	5,507	4,948	612	9.0	8.1
	Pasquotank	39,546	39,802	227	174.3	175.4
	Perquimans	13,506	15,622	247	54.6	63.2
	Tyrrell	4,090	4,309	391	10.5	11.0
	Washington	12,331	10,569	347	35.6	30.5
	Total Albemarle Region	171,946	192,946	3,222	53.4	59.9
Cape Fear	Brunswick	122,586	203,047	849	144.4	239.1
	Columbus	56,589	56,476	938	60.3	60.2
	New Hanover	219,866	315,475	192	1,143.9	1,641.4
	Pender	57,630	86,078	871	66.1	98.8
	Total Cape Fear Region	456,671	661,076	2,851	160.2	231.9
Eastern Carolina	Carteret	68,699	81,301	508	135.3	160.2
	Craven	103,374	103,621	707	146.3	146.6
	Jones	9,776	10,099	471	20.7	21.4
	Onslow	192,685	243,975	762	252.9	320.2
	Pamlico	12,803	13,647	337	38.0	40.6
	Total Eastern Carolina Region	387,337	452,643	2,784	139.1	162.6
MidEast	Beaufort	47,316	46,628	832	56.9	56.0
	Bertie	19,913	19,582	699	28.5	28.0
	Hertford	24,262	24,126	353	68.7	68.3
	Pitt	176,484	209,525	652	270.5	321.2
	Total MidEast Region	267,975	299,861	2,537	105.6	118.2
	Study Area Total	**1,283,929**	**1,606,526**	**11,394**	**112.7**	**141.0**
	North Carolina	10,052,564	12,803,172	48,718	206.3	262.8
	United States	321,004,407	373,528,000	3,531,905	90.9	105.8

Sources: (USCB 2017c, USCB 2017d, USCB 2018b, OSBM 2019

[1]Note: U.S. projections are for 2020, 2030, and 2040. North Carolina projections are for 2020, 2030, and 2038.

14.4.1.2 Population Projections

According to the Office of State Budget and Management, North Carolina's population is projected to grow 27.4% (12.8 million residents) by 2038. Population in the Study Area is projected to increase 25.7% (1.6 million residents) by 2038 (note: that is the last year for which North Carolina produced projections). The Nation's population is projected to grow 16.4% (373.5 million) by 2040, less than the State and the Study Area. Table 14-8 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2038 in North Carolina, and to 2040 in the U.S., delineated by region (USCB 2017d, USCB 2017c, USCB 2018b). Figure 14-24 shows the overall projected percent change in population in each county during the same period (USCB 2018b, OSBM 2019).

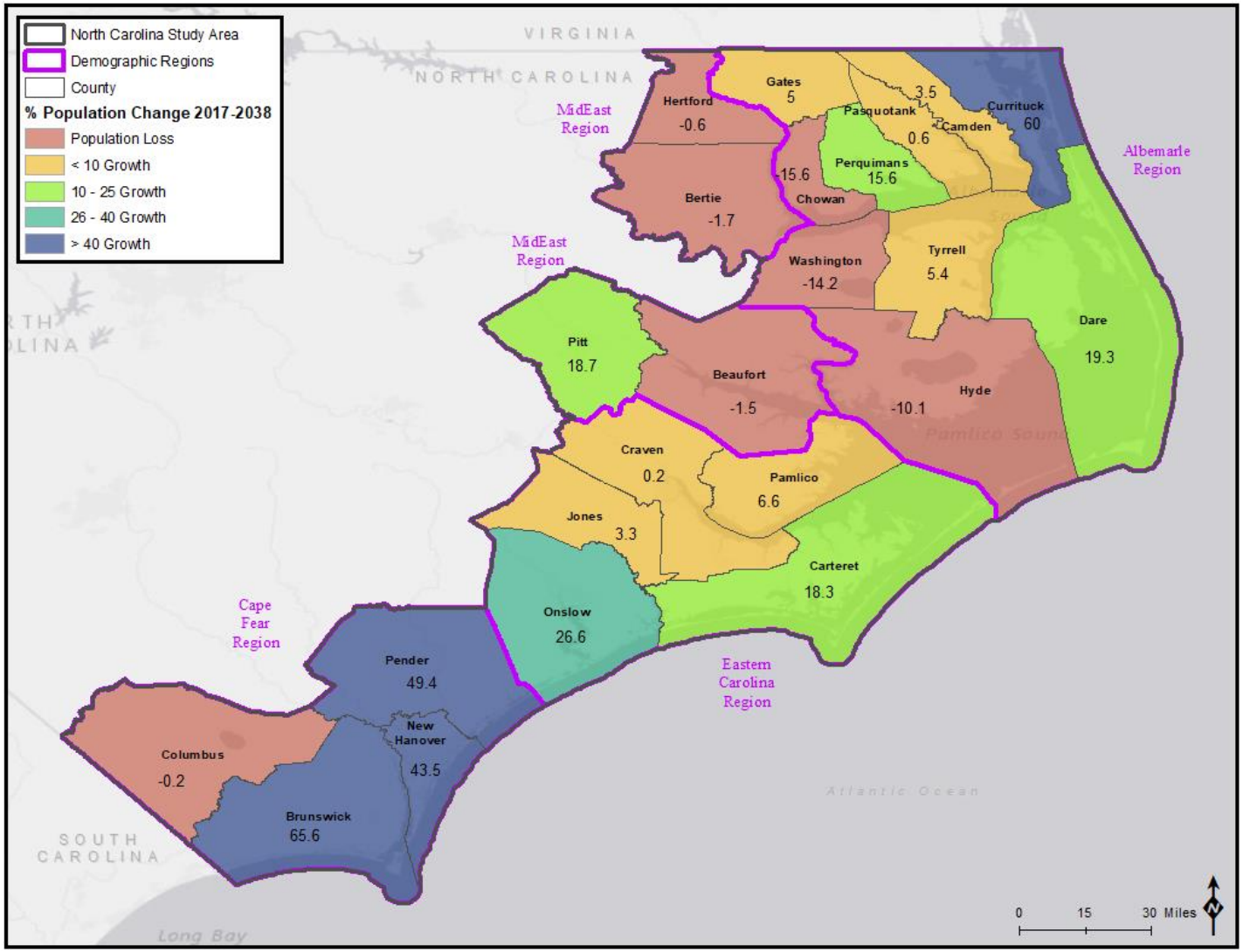
As shown in Table 14-8, 12.8% (1,283,929 people) of North Carolina's population resided in the coastal counties comprising the Study Area in 2017. Population projections show this trend continuing to 2038, when 12.5% (1,606,526 people) of the projected population will reside in the Study Area.

As shown in Table 14-8, growth will not be uniform across the Study Area. Strong growth trends are expected to continue in the Cape Fear Region, projected to be 44.8% between 2017 and 2038, and its counties (Brunswick (65.6%), Pender (49.4%) and New Hanover (43.5%) located in the Wilmington metropolitan area. Gains in these counties help offset the projected stagnation and population decline predicted in the rural mostly inland counties of the Albemarle Region (Chowan, Washington, and Hyde in the Albemarle Region) and the MidEast Region (Bertie, Beaufort and Hertford) in the Study Area. Relatively modest growth of 11.9% is predicted for the predominantly rural MidEast Region, likely due to a combination of out-migration and low birth rates. The Eastern Region, partially located within the New Bern, NC metropolitan area, is projected to decrease 1.4% in population, likely due to attraction to jobs and cultural amenities offered by the larger metropolitan areas in close proximity. Of the 23 counties in the Study Area, 16 geographies are projected to increase population by 2038 while 7 rural counties are projected to decrease population, reflecting a rural-urban divide (USCB 2017d, OSBM 2019, USDA 2013).

14.4.2 Demographics

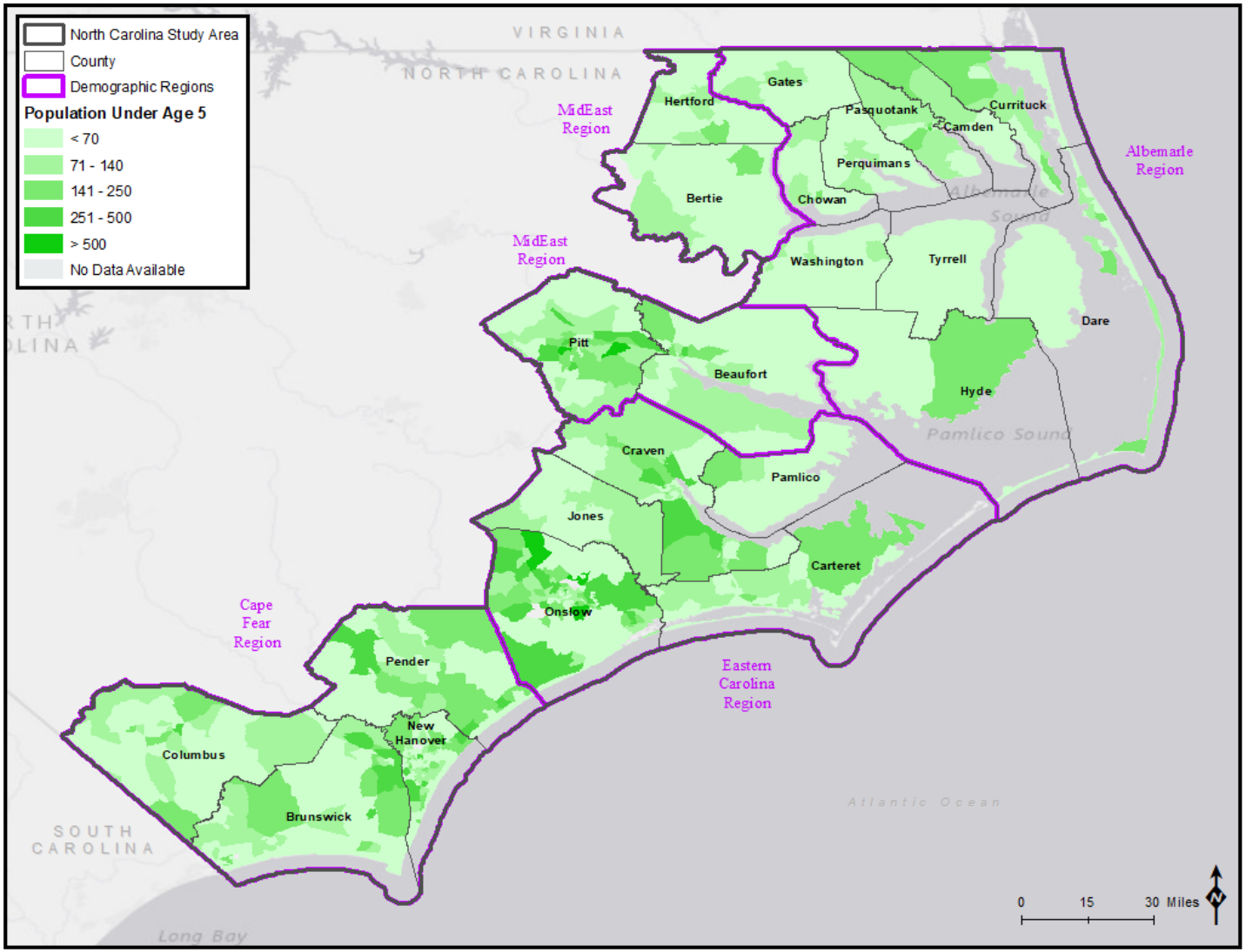
As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80 year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact North Carolina and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 14-25 and Figure 14-26 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 14-27 and Figure 14-28 show the projected change in these groups by 2038. Table 14-10 shows age distribution by region for these groups for the 2017 estimated population and 2038 projected population in North Carolina and the Study Area. U.S. population projections are to 2040 (Brookings Institute 2018, USCB 2017b, OSBM 2019).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area (USCB 2017b).



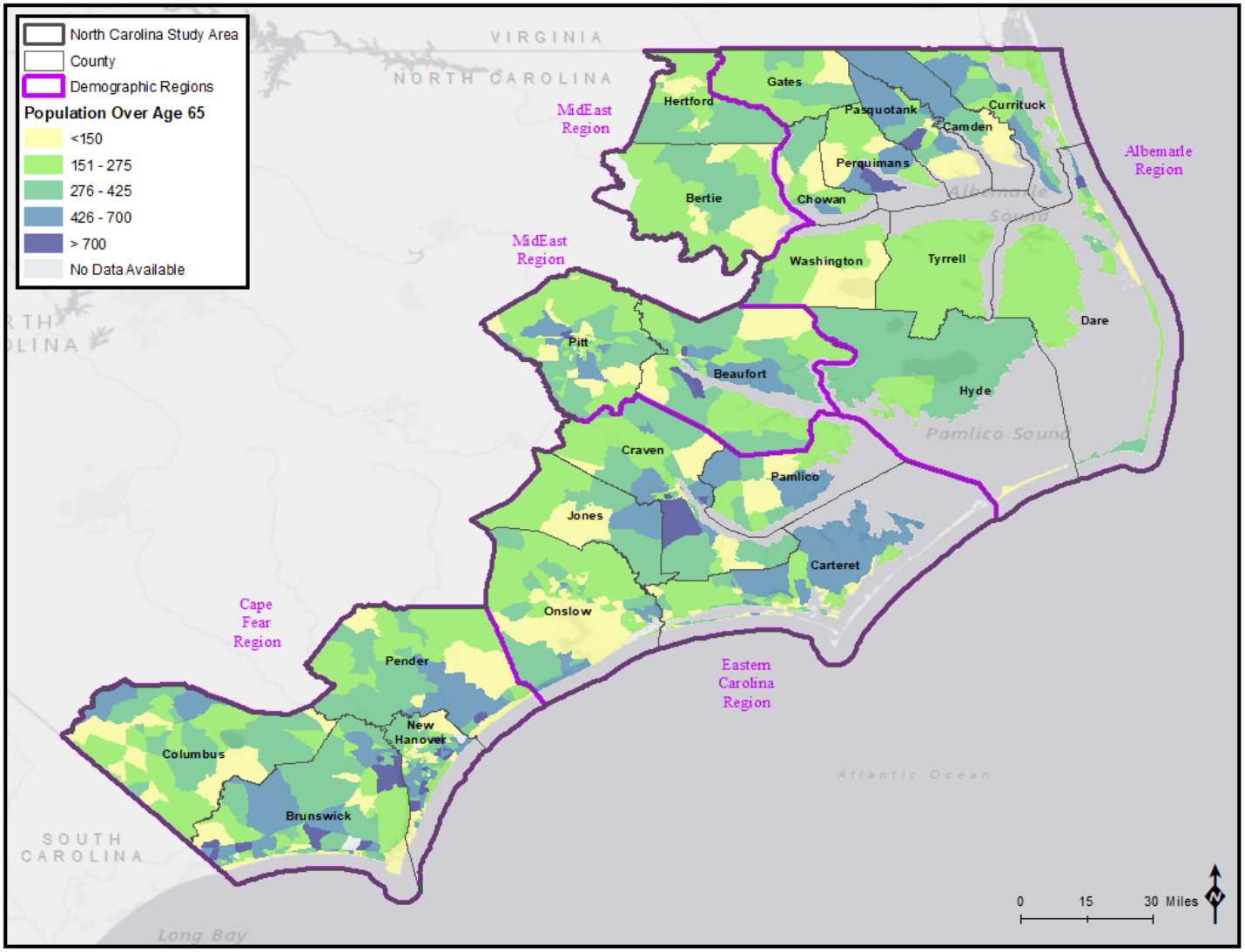
Source: OSBM 2019

Figure 14-24. Overall Projected Population Change from 2017-2038 in the North Carolina Study Area by County



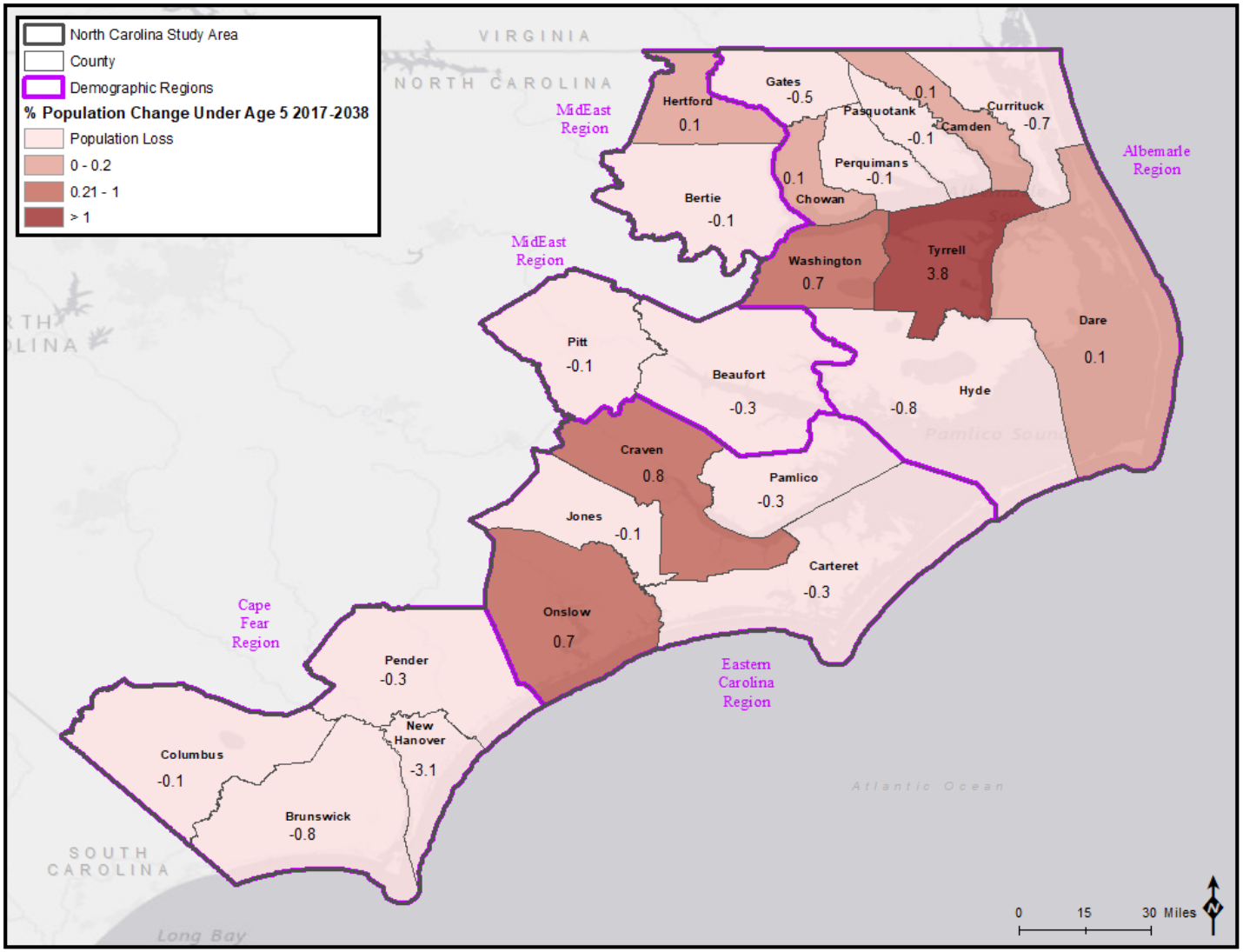
Source: USCB 2017r

Figure 14-25. Population Under Age 5 in the North Carolina Study Area by Census Block Group



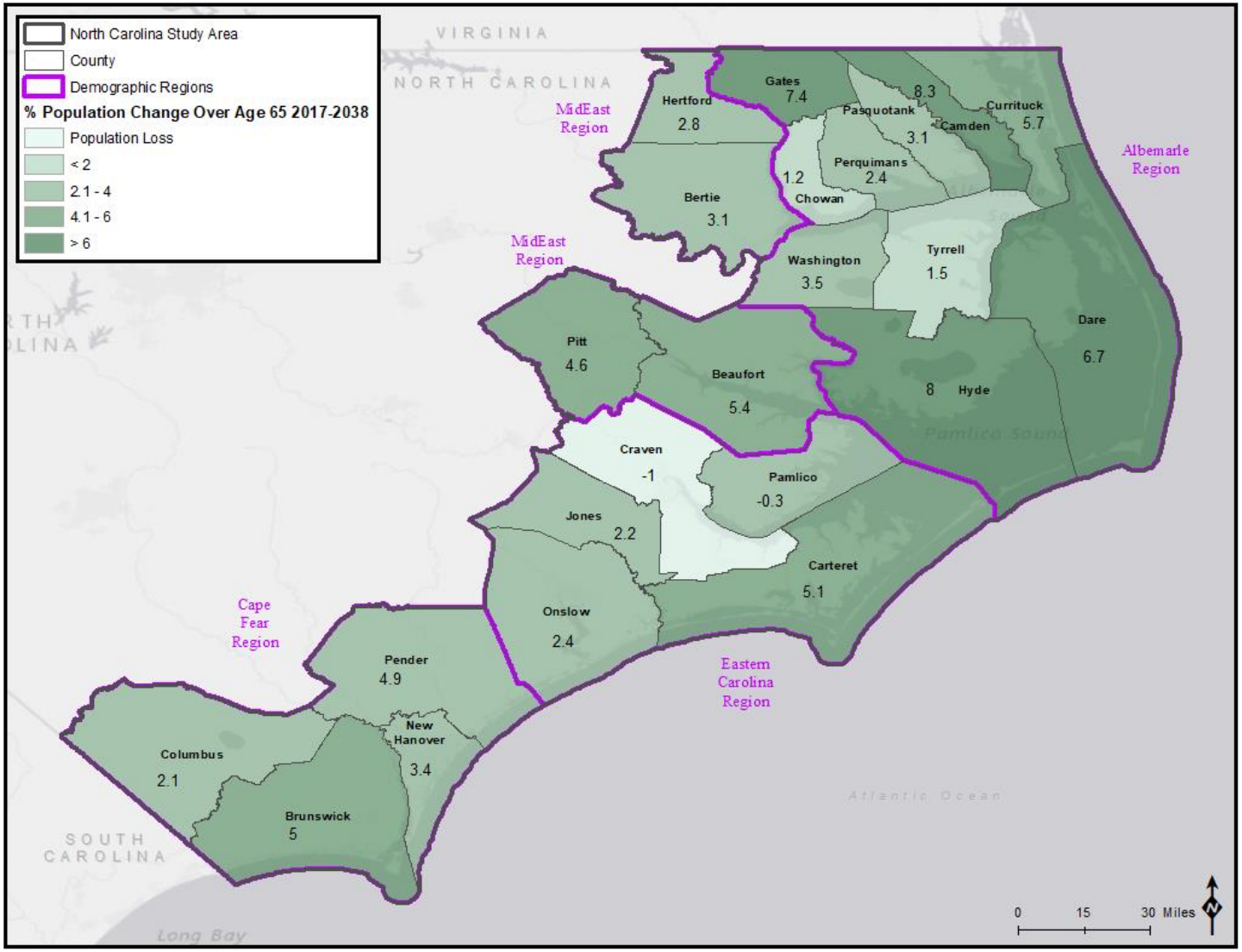
Source: USCB 2017r

Figure 14-26. Population Over Age 65 in the North Carolina Study Area by Census Block Group



Source: OSBM 2019

Figure 14-27. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the North Carolina Study Area by 2038



Source: OSBM 2019

Figure 14-28. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the North Carolina Study Area by 2038

Table 14-10. Population Under Age 5 and Over Age 65 in the North Carolina Study Area

Regions	Geographic Unit	2017 Estimates					Projected 2038				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2038)[1]	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Albemarle	Camden	10,336	459	4.4	1,657	16.0	10,697	490	4.6	2,608	24.4
	Chowan	14,370	758	5.3	3,253	22.6	12,133	643	5.3	2,892	23.8
	Currituck	25,247	1,407	5.6	3,898	15.4	40,434	1,990	4.9	8,565	21.2
	Dare	35,412	1,656	4.7	6,819	19.3	42,260	1,994	4.7	10,975	26.0
	Gates	11,601	504	4.3	2,153	18.6	12,172	471	3.9	3,161	26.0
	Hyde	5,507	291	5.3	967	17.6	4,948	224	4.5	1,258	25.4
	Pasquotank	39,546	2,518	6.4	6,172	15.6	39,802	2,476	6.2	7,448	18.7
	Perquimans	13,506	628	4.6	3,483	25.8	15,622	721	4.6	4,398	28.2
	Tyrrell	4,090	106	2.6	901	22.0	4,309	275	6.4	1,013	23.5
	Washington	12,331	616	5.0	2,710	22.0	10,569	606	5.7	2,696	25.5
	Total Albemarle Region	***171,946***	***8,943***	***5.2***	***32,013***	***18.6***	***192,946***	***9,890***	***5.1***	***45,014***	***23.3***
Cape Fear	Brunswick	122,586	5,346	4.4	34,408	28.1	203,047	7,316	3.6	67,107	33.0
	Columbus	56,589	3,138	5.5	10,484	18.5	56,476	3,099	5.5	11,638	20.6
	New Hanover	219,866	11,336	5.2	35,691	16.2	315,475	15,312	4.9	61,880	19.6
	Pender	57,630	3,263	5.7	9,973	17.3	86,078	4,605	5.3	18,295	21.3
	Total Cape Fear Region	***456,671***	***23,083***	***5.1***	***90,556***	***19.8***	***661,076***	***30,332***	***4.6***	***158,920***	***24.0***
Eastern Carolina	Carteret	68,699	3,004	4.4	15,649	22.8	81,301	3,313	4.1	22,694	27.9
	Craven	103,374	6,983	6.8	17,993	17.4	103,621	7,806	7.5	17,108	16.5
	Jones	9,776	467	4.8	1,994	20.4	10,099	469	4.6	2,284	22.6
	Onslow	192,685	17,763	9.2	16,442	8.5	243,975	24,247	9.9	26,672	10.9
	Pamlico	12,803	511	4.0	3,436	26.8	13,647	505	3.7	4,133	30.3
	Total Eastern Carolina Region	***387,337***	***28,728***	***7.4***	***55,514***	***14.3***	***452,643***	***36,340***	***8.0***	***72,891***	***16.1***

Table 14-10. Population Under Age 5 and Over Age 65 in the North Carolina Study Area

Regions	Geographic Unit	2017 Estimates					Projected 2038				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2038)[1]	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
MidEast	Beaufort	47,316	2,454	5.2	10,443	22.1	46,628	2,272	4.9	12,808	27.5
	Bertie	19,913	876	4.4	4,005	20.1	19,582	824	4.2	4,542	23.2
	Hertford	24,262	1,152	4.7	4,419	18.2	24,126	1,163	4.8	5,074	21.0
	Pitt	176,484	10,543	6.0	21,106	12.0	209,525	12,289	5.9	34,730	16.6
	Total MidEast Region	***267,975***	***15,025***	***5.6***	***39,973***	***14.9***	***299,861***	***16,548***	***5.5***	***57,154***	***19.1***
	Study Area Total	**1,283,929**	**75,779**	**5.9**	**218,056**	**17.0**	**1,606,526**	**93,110**	**5.8**	**333,979**	**20.8**
	North Carolina	10,052,564	603,983	6.0	1,514,937	15.1	12,803,172	725,754	5.7	2,691,236	21.0
	United States	321,004,407	19,853,515	6.2	47,732,389	14.9	373,528,000	21,106,000	5.7	80,827,000	21.6

Sources: OSBM 2019, USCB 2017b, USCB 2018b

[1]Note: U.S. projections are for 2040. North Carolina projections are for 2038.

According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 6.0% in North Carolina, and 5.9% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 14-10 shows the breakdown by demographic region. Projections indicate this group's decline to 5.8% in the Study Area, similar to the Nation and the State (5.7%). The Cape Fear Region, which includes counties (Brunswick, Pender and New Hanover) that are popular retirement destinations, had the smallest percentage (5.1%) of young children in 2017; a further decrease to 4.6% is projected by 2038. For the study area, this is an overall decrease of 0.1% in the proportion of the population under age 5 from 2017-2038. The net effect of retiree in-migration is a decline in the fertility rate, resulting in a decreasing population of young children over time (OSBM 2019, USDA 2013).

According to 2017 estimates shown in Table 14-10, the elderly represented 14.9% and 15.1% of the national and State population, respectively. Reflecting its popularity as a retirement destination, the Study Area had 17.0% of elderly population. The number and proportion of elderly to the overall population are projected to rise in each demographic region of the Study Area, the State and the Nation. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the percentage of elderly Americans is projected to increase in the Study Area (20.8%), the State (21.0%) and the Nation (21.6%). The Cape Fear Region had the largest percentage (19.8%) of elderly in 2017; a further increase to 24.0% is projected by 2038. For the study area, this is an overall increase of 3.8% in the proportion of the population over age 65 from 2017-2038. Figure 14-28 and Table 14-10 illustrate large concentrations of elderly populations in rural counties of the Albermarle Region; specifically Camden (24.4%), Dare (26.0%), Hyde (25.4%) and Perquimans (28.2%) Counties (USCB 2017b, USCB 2018b, OSBM 2019).

14.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area are presented in Table 14-11.

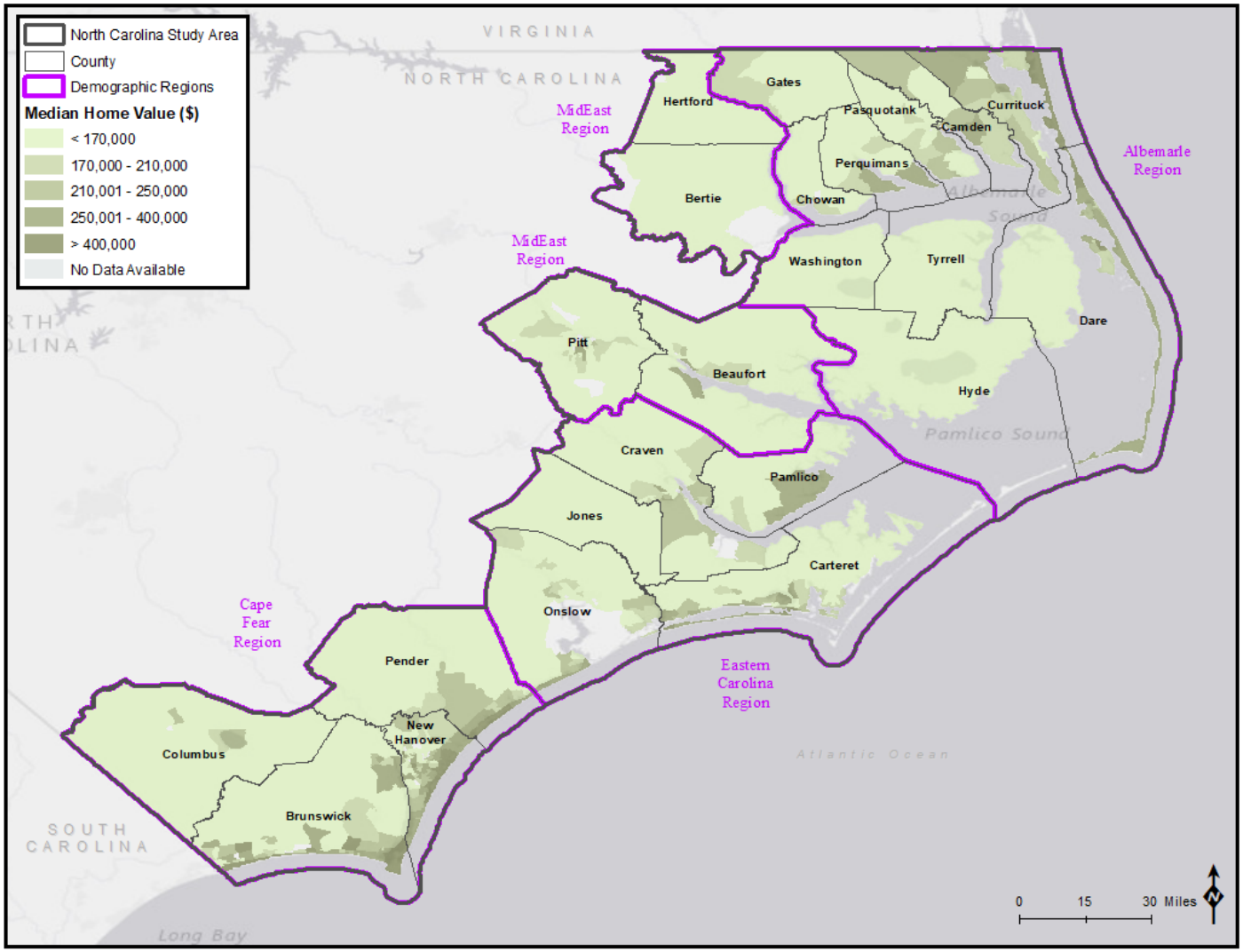
As shown in Table 14-11, in 2017 homeownership in North Carolina was 65.0%, higher than the Nation (63.8%) and the Study Area (64.1%). Renters comprised approximately 35% of the State population in 2017, less than the Study Area (35.9%) and the Nation (36.2%) (USCB 2017m). The percentage of owner-occupied housing was highest in the Albemarle region, and lowest in the MidEast Region.

As shown in Table 14-11, median home values were higher in the Nation ($193,500) and the State ($161,000) as compared to the Study Area ($152,550). Figure 14-29 illustrates median home values in the Study Area. The figure portrays higher values near the coasts and the Cape Fear Region, where many beach communities are located, and lower values in the less populous predominantly rural MidEast Region (USCB 2017l).

Table 14-11. Housing Utilization and Vacancy Rates in the North Carolina Study Area

Regions	Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Albemarle	Camden	4,197	3,796	401	9.6	3,042	80.1	754	19.9	$222,500	$1,122
	Chowan	7,294	5,903	1,391	19.1	4,310	73.0	1,593	27.0	$128,300	$737
	Currituck	15,326	9,766	5,560	36.3	8,055	82.5	1,711	17.5	$244,500	$947
	Dare	34,290	15,264	19,026	55.5	10,598	69.4	4,666	30.6	$285,000	$1,056
	Gates	5,305	4,439	866	16.3	3,569	80.4	870	19.6	$142,500	$798
	Hyde	3,311	1,835	1,476	44.6	1,400	76.3	435	23.7	$81,000	$839
	Pasquotank	17,027	14,629	2,398	14.1	8,848	60.5	5,781	39.5	$158,900	$859
	Perquimans	7,134	5,882	1,252	17.5	4,280	72.8	1,602	27.2	$165,500	$824
	Tyrrell	2,152	1,539	613	28.5	1,163	75.6	376	24.4	$113,100	$756
	Washington	6,471	5,223	1,248	19.3	3,164	60.6	2,059	39.4	$86,000	$619
	Total Albemarle Region	***102,507***	***68,276***	***34,231***	***33.4***	***48,429***	***70.9***	***19,847***	***29.1***	***NA***	***NA***
Cape Fear	Brunswick	84,702	53,104	31,598	37.3	40,983	77.2	12,121	22.8	$194,700	$883
	Columbus	26,210	22,462	3,748	14.3	15,921	70.9	6,541	29.1	$85,200	$607
	New Hanover	107,369	91,673	15,696	14.6	52,611	57.4	39,062	42.6	$225,600	$938
	Pender	28,115	21,053	7,062	25.1	16,658	79.1	4,395	20.9	$167,200	$828
	Total Cape Fear Region	***246,396***	***188,292***	***58,104***	***23.6***	***126,173***	***67.0***	***62,119***	***33.0***	***NA***	***NA***
Eastern Carolina	Carteret	49,580	30,000	19,580	39.5	21,801	72.7	8,199	27.3	$197,700	$864
	Craven	46,453	40,571	5,882	12.7	25,669	63.3	14,902	36.7	$156,500	$871
	Jones	4,948	4,148	800	16.2	3,009	72.5	1,139	27.5	$92,700	$621
	Onslow	77,453	63,093	14,360	18.5	33,135	52.5	29,958	47.5	$154,400	$987
	Pamlico	7,687	5,395	2,292	29.8	4,040	74.9	1,355	25.1	$150,600	$716
	Total Eastern Carolina Region	***186,121***	***143,207***	***42,914***	***23.1***	***87,654***	***61.2***	***55,553***	***38.8***	***NA***	***NA***
MidEast	Beaufort	25,773	18,978	6,795	26.4	13,439	70.8	5,539	29.2	$123,600	$691
	Bertie	9,853	7,988	1,865	18.9	5,882	73.6	2,106	26.4	$78,900	$644
	Hertford	10,645	8,880	1,765	16.6	5,967	67.2	2,913	32.8	$86,800	$709
	Pitt	77,843	68,805	9,038	11.6	35,957	52.3	32,848	47.7	$138,700	$761
	Total MidEast Region	***124,114***	***104,651***	***19,463***	***15.7***	***61,245***	***58.5***	***43,406***	***41.5***	***NA***	***NA***
	Study Area Total	**659,138**	**504,426**	**154,712**	**23.5**	**323,501**	**64.1**	**180,925**	**35.9**	**$152,550**	**$844**
	North Carolina	**4,521,697**	**3,874,346**	**647,351**	**14.3**	**2,517,896**	**65.0**	**1,356,450**	**35.0**	**$161,000**	**$844**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 14-29. Median Home Value in the North Carolina Study Area by Census Block Group

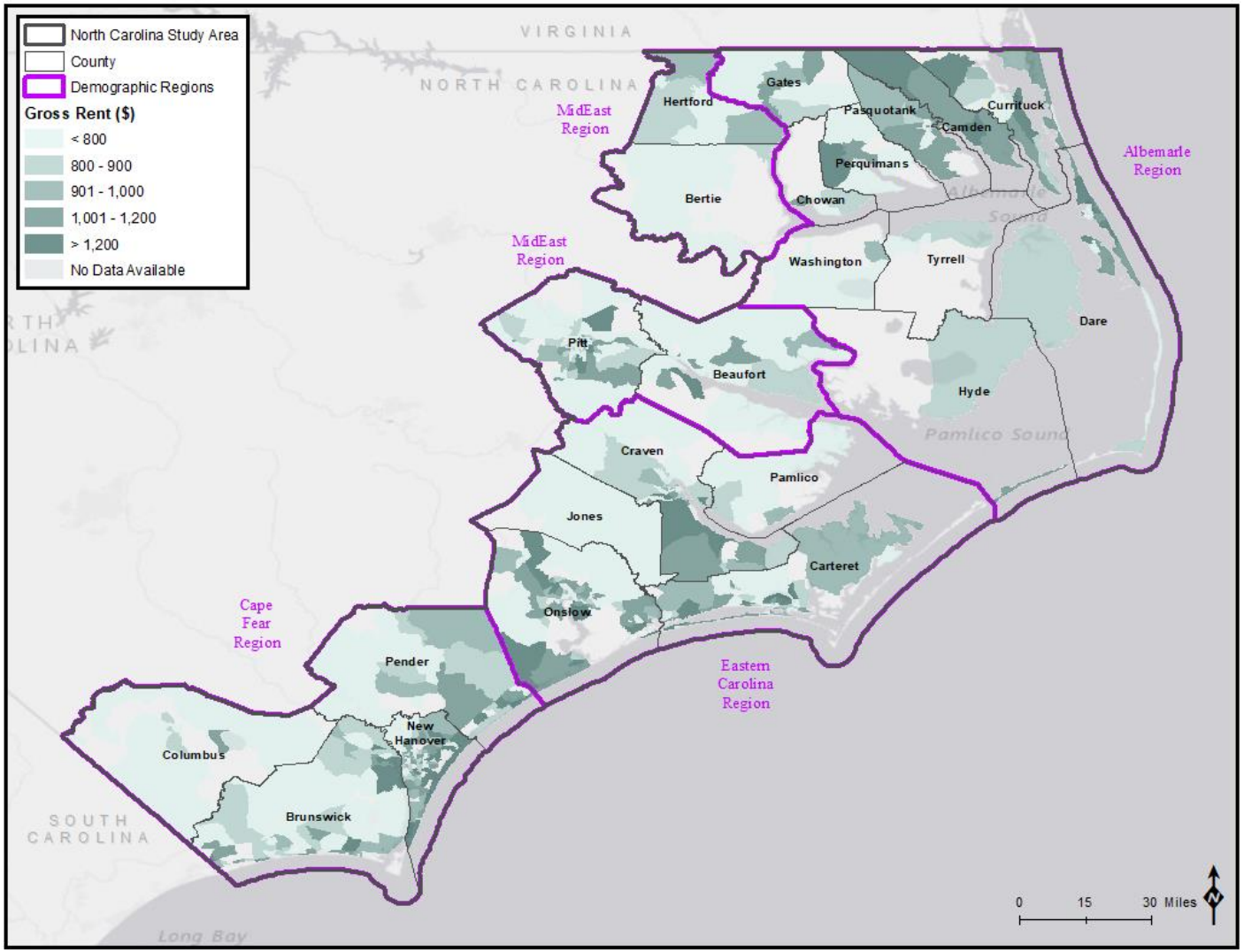
Home values in the State increased 5.4% during the 12-month period ending November 2019, according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market. The market temperature of the State, as well as in most metropolitan areas within the Study Area, is characterized as "very hot" by Zillow, which indicates market conditions favorable to sellers. In the 12-month period ending June 2020, metropolitan area home values increased at the following rates (Zillow.com 2020a):

- Virginia Beach-Norfolk-Newport News, VA-NC – 3.3%; market temperature: very hot (Zillow.com 2020b).
- Greenville, NC – 5.7%; market temperature: very hot (Zillow.com 2020c).
- New Bern, NC – 4.6%; market temperature: very hot (Zillow.com 2020d).
- Jacksonville, NC – 7.4%; market temperature: very hot (Zillow.com 2020e).
- Wilmington, NC – 7.0%; market temperature: very hot (Zillow.com 2020f).
- Myrtle Beach-Conway-North Myrtle Beach, SC-NC Metro Area – 2.3%; market temperature: hot (Zillow.com 2020g).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low -Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

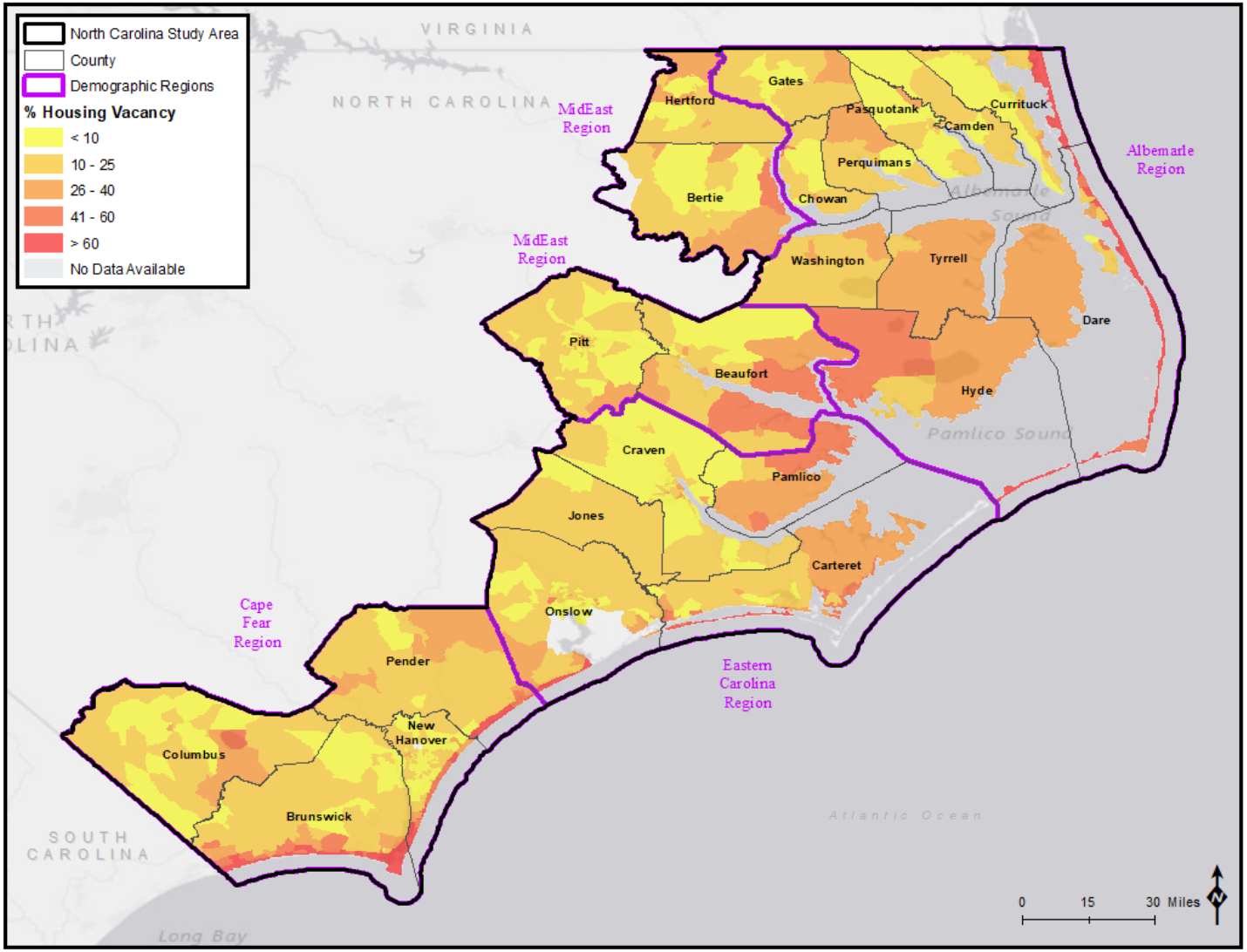
Figure 14-30 illustrates median gross rent, indicating that more expensive rents are close to the beach communities in the coastal areas. According to the National Low Income Housing Coalition, as of 2019, fair market rent for a two-bedroom rental unit in the State is $881. In these conditions, a minimum wage worker would have to work approximately 94 hours a week in order to afford a two-bedroom fair market rate home. North Carolina has a shortage of approximately 196,231 rental homes affordable and available to extremely low-income households. Approximately 347,105 (26%) of renter households in North Carolina are considered extremely low income; approximately 340,344 (71%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (42%), single caregivers (22%), and disabled (22%), a large portion of which are on a fixed income. These households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a).

As shown in Table 14-11, home vacancy rates in North Carolina (14.3%) in 2017 were higher than the Nation (12.2%) but lower than the Study Area (23.5%). The Study Area has the second highest home vacancy rate throughout the overall Project Area as discussed in Chapter 1.6.3 and shown on Table 1-9. Figure 14-31 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (33.4%) in the Albemarle Region, and the lowest in the MidEast Region (15.7%) (USCB 2017g). The Study Area encompasses coastal areas with many popular beach destinations, particularly in the Outer Banks. High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals.



Source: USCB 2017r

Figure 14-30. Median Gross Rent in the North Carolina Study Area by Census Block Group



Source: USCB 2017r

Figure 14-31. Housing Vacancy Rates in the North Carolina Study Area by Census Block Group

14.4.4 Employment

14.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 14-12. In 2017, the Study Area has a total employment of 500,000 thousand jobs, representing approximately 11.7% of the total jobs in North Carolina, and 0.4% of the total jobs in the U.S. (USCB 2017p).

North Carolina's 2018 Annual Gross Domestic Product was 575.6 billion, which represented 2.8% of the Nation's gross domestic product (BEA 2019).

Table 14-12. Census Bureau Labor and Industry Statistics Employment Sectors for the United States, North Carolina, and the North Carolina Study Area (number of jobs)

Industry	United States	Percent (%)	North Carolina	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**4,571,020**		**535,701**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	58,281	1.3	10,376	1.9
Construction	9,564,541	6.4	306,585	6.7	40,963	7.6
Manufacturing	15,477,389	10.3	569,099	12.5	46,690	8.7
Wholesale trade	4,042,867	2.7	118,640	2.6	10,103	1.9
Retail trade	17,167,000	11.4	539,821	11.8	68,761	12.8
Transportation and warehousing, and utilities	7,681,579	5.1	202,143	4.4	22,646	4.2
Information	3,173,300	2.1	81,961	1.8	8,808	1.6
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	292,158	6.4	28,219	5.3
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	480,726	10.5	48,336	9.0
Educational services, and health care and social assistance	34,781,348	23.1	1,059,123	23.2	126,994	23.7
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	439,048	9.6	62,571	11.7
Other services, except public administration	7,371,226	4.9	224,650	4.9	27,238	5.1
Public administration	7,025,870	4.7	198,785	4.3	33,996	6.3

Sources: USCB 2017p

Table 14-12 and Figure 14-32 show the number of jobs in each major industry sector for the U.S., the State and the Study Area. A variety of industry sectors is present throughout the Study Area. According to the Economic Development Partnership of North Carolina, industry in the State of North Carolina is driven by knowledge-based industries such as biotechnology, energy, finance, and information technology. Other industries of note in North Carolina are aerospace and defense, automotive manufacturing, food processing, biotechnology, pharmaceuticals, furniture manufacturing, plastics, and textiles (EDPNC 2019f). The dominant employment sectors in the Study Area are educational services, and health care and social assistance (23.7%), retail trade (12.8%), and arts, entertainment, and recreation, and accommodation and food services (11.7%). Generally, the dominant employment sectors in the Study Area are similar to those of the State. In the Study Area, 7.6% of people work in construction, more than the State (6.7%) and the Nation (6.4%). The Study Area had a lower proportion of manufacturing jobs (8.7%) than the State (12.5%) and the Nation (10.3%) (USCB 2017p).

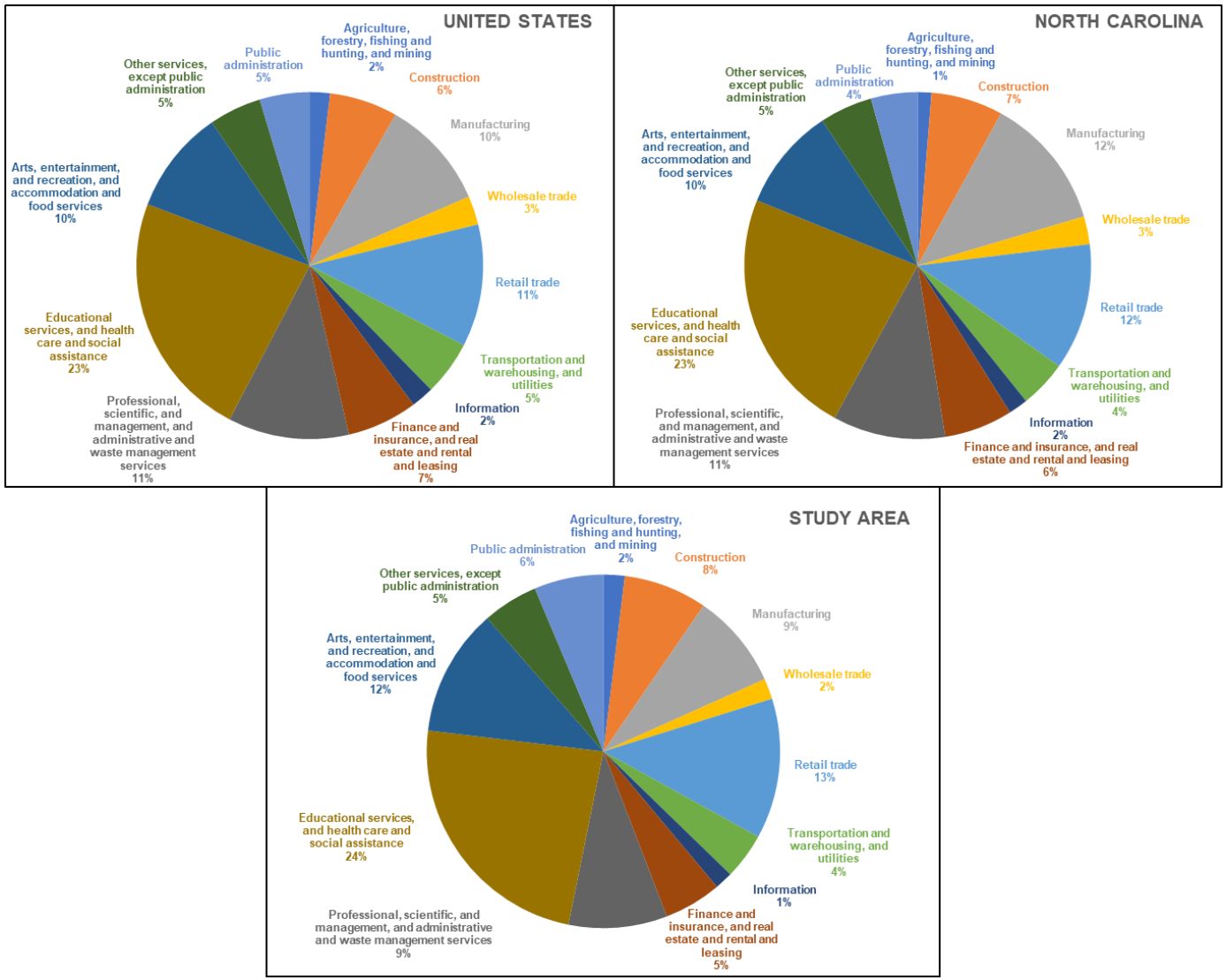
Figure 14-33 shows the location of jobs within the Study Area. The greater portion of jobs are located in the Cape Fear and MidEast Regions, located in the Wilmington and Greenville metropolitan areas. Population density increases the demand for all goods, services, space and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the Albemarle Region. Rural areas tend to have fewer locally available options and less economic development.

14.4.4.1.1 North Carolina's Ocean Economy

Overall, North Carolina's ocean economy ranked 19th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 14-13 North Carolina's ocean economy accounted for 50,980 maritime jobs in 2016, accounting for 1.2% of North Carolina's employment (NOAA 2016b, USCB 2017i). Within the State, Tourism and Recreation was the dominant sector, accounting for 87.7% (42,544) of maritime jobs. The Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

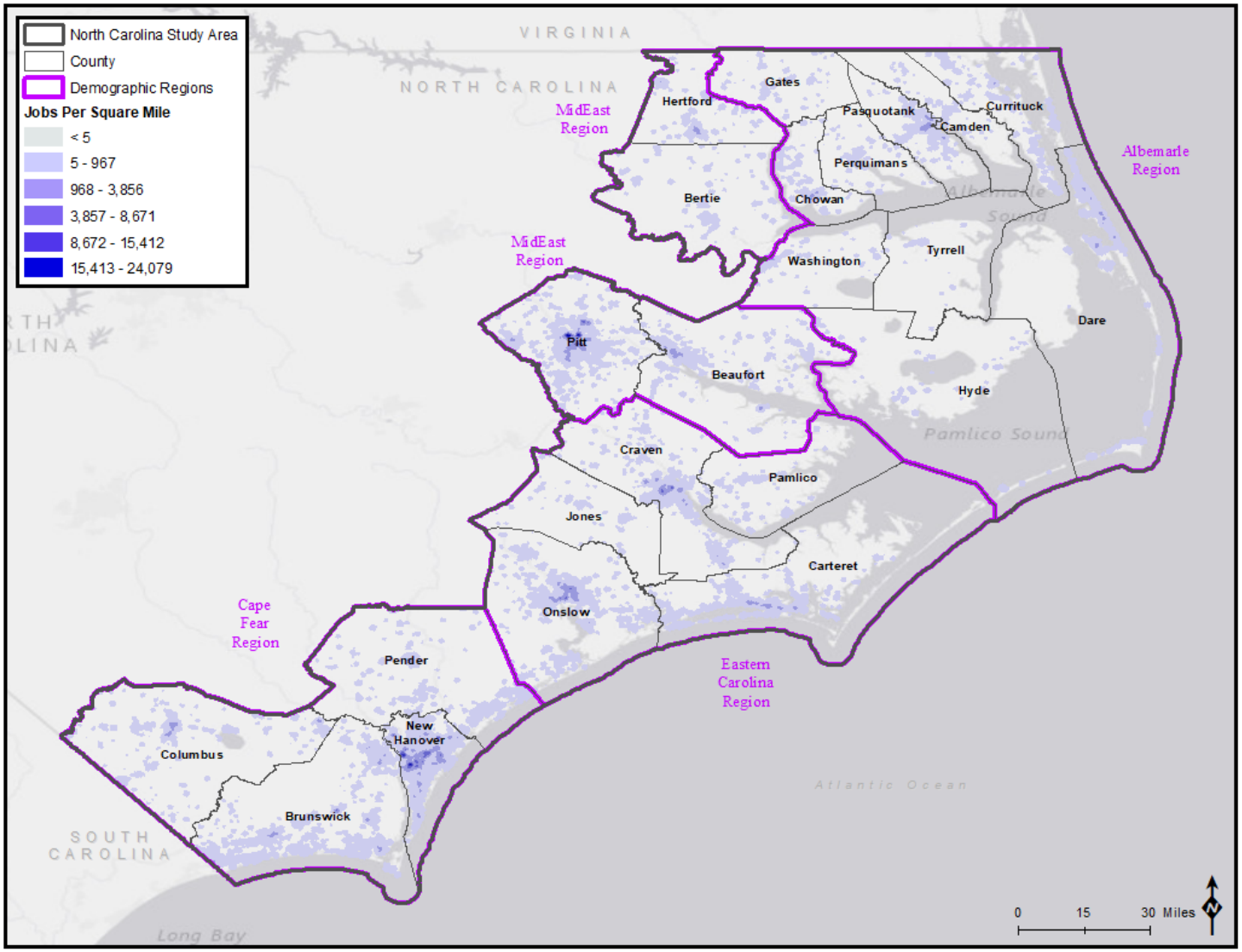
The Study Area had 47,892 maritime jobs, representing 93.9% of total maritime jobs in the State. New Hanover County had the greatest number of maritime jobs (14,076), representing 29.4% of maritime jobs in the Study Area. (NOAA 2016b, USCB 2017i). The highest percentage of maritime jobs to overall county jobs were in Dare (34.4%), Gates (33.1%, and Carteret (21.1%) counties, indicative of less economic diversity in rural areas (NOAA 2016b).

Figure 14-34 shows the percent of maritime related jobs to total jobs in each county in the Study Area. The counties in the Albemarle and Eastern Carolina Regions have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities.



Source: USCB 2017p

Figure 14-32. Number of Jobs by Industry Sector for the U.S., North Carolina, and the North Carolina Study Area



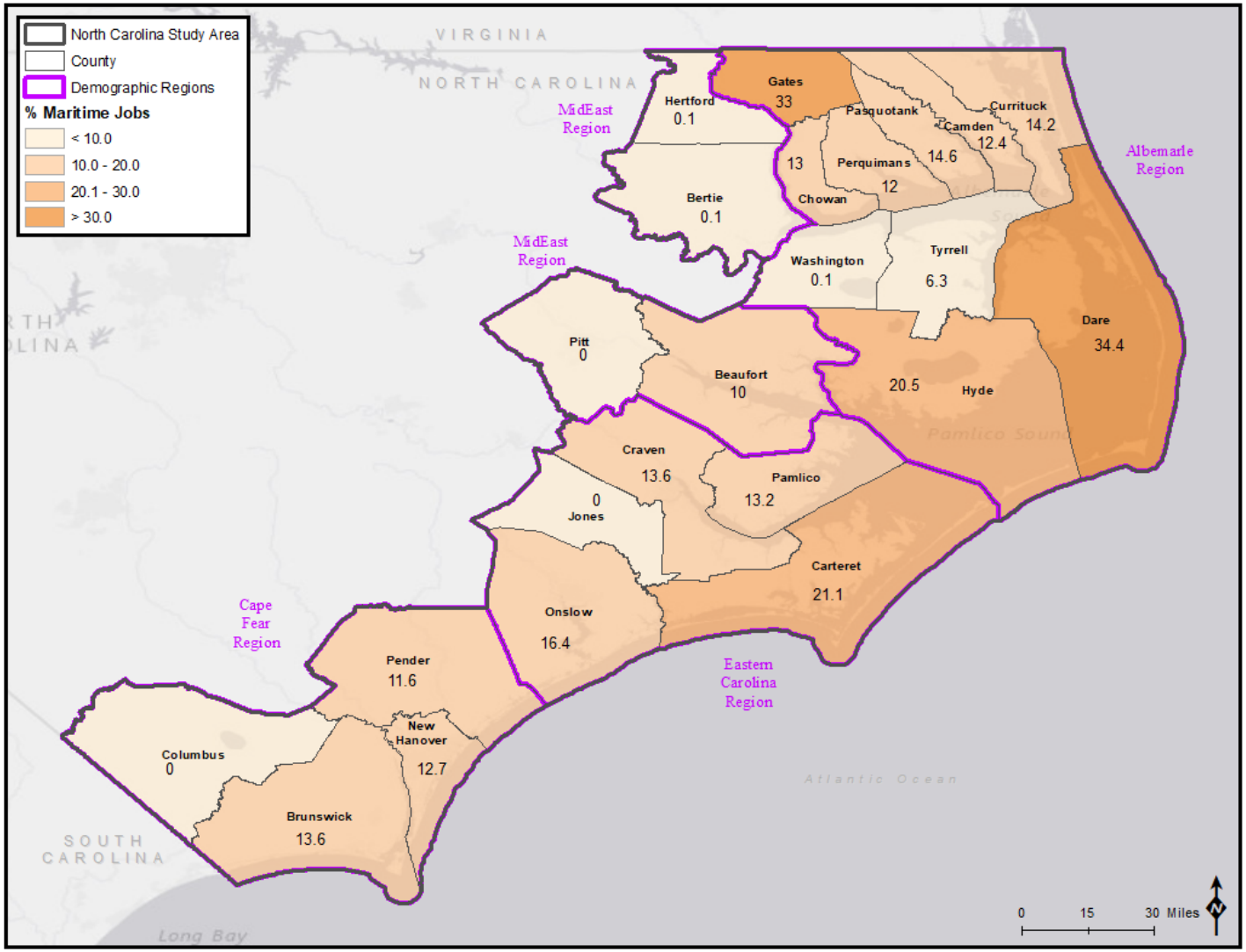
Source: USCB 2017r

Figure 14-33. Jobs Per Square Mile in the North Carolina Study Area by Census Block Group

Table 14-13. Employment Data in the North Carolina Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Albemarle	Camden	5,088	4,970	4,528	442	8.9	1,153	169	14.7	$68,327	$27,468
	Chowan	6,230	6,177	5,439	738	11.9	4,663	624	13.4	$41,979	$23,542
	Currituck	12,960	12,745	12,138	607	4.8	6,328	902	14.3	$65,758	$29,340
	Dare	19,503	19,421	18,411	1,010	5.2	16,241	5,594	34.4	$55,640	$30,898
	Gates	5,522	5,494	5,012	482	8.8	1,494	495	33.1	$52,481	$24,335
	Hyde	2,291	2,291	2,038	253	11.0	1,614	331	20.5	$40,532	$19,181
	Pasquotank	18,216	17,560	16,333	1,227	7.0	14,213	1,764	12.4	$47,264	$23,714
	Perquimans	5,761	5,684	5,209	475	8.4	2,012	248	12.3	$44,039	$25,848
	Tyrrell	1,699	1,699	1,555	144	8.5	889	56	6.3	$32,411	$17,736
	Washington	5,135	5,078	4,548	530	10.4	3,046	254	8.3	$34,557	$21,117
	Total Albemarle Region	***82,405***	***81,119***	***75,211***	***5,908***	***7.3***	***51,653***	***10,437***	***20.2***	***NA***	***NA***
Cape Fear	Brunswick	53,193	53,100	48,982	4,118	7.8	30,373	4,148	13.7	$51,164	$29,707
	Columbus	22,041	22,033	20,496	1,537	7.0	14,684	0	0.0	$36,261	$21,849
	New Hanover	115,942	115,433	107,369	8,064	7.0	110,243	14,076	12.8	$51,457	$31,708
	Pender	27,469	27,009	24,768	2,241	8.3	11,699	1,358	11.6	$49,357	$25,997
	Total Cape Fear Region	***218,645***	***217,575***	***201,615***	***15,960***	***7.3***	***166,999***	***19,582***	***11.7***	***NA***	***NA***
Eastern Carolina	Carteret	33,560	32,702	30,098	2,604	8.0	21,627	4,573	21.1	$51,584	$30,903
	Craven	51,004	43,859	40,286	3,573	8.1	32,839	4,485	13.7	$49,391	$26,830
	Jones	4,478	4,420	3,912	508	11.5	1,458	0	0.0	$37,256	$21,058
	Onslow	107,177	69,250	61,901	7,349	10.6	40,707	6,686	16.4	$48,162	$23,141
	Pamlico	5,461	5,456	5,015	441	8.1	2,708	359	13.3	$45,211	$25,461
	Total Eastern Carolina Region	***201,680***	***155,687***	***141,212***	***14,475***	***9.3***	***99,339***	***16,103***	***16.2***	***NA***	***NA***
MidEast	Beaufort	20,945	20,945	19,051	1,894	9.0	15,990	1,602	10.0	$41,101	$24,657
	Bertie	8,367	8,367	7,307	1,060	12.7	5,352	161	3.0	$31,287	$18,319
	Hertford	10,230	10,183	9,163	1,020	10.0	8,282	7	0.1	$35,806	$18,383
	Pitt	91,519	91,348	82,142	9,206	10.1	75,874	0	0.0	$43,526	$25,462
	Total MidEast Region	***131,061***	***130,843***	***117,663***	***13,180***	***10.1***	***105,498***	***1,770***	***1.7***	***NA***	***NA***
	Study Area Total	**633,791**	**585,224**	**535,701**	**49,523**	**8.5**	**423,489**	**47,892**	**11.3**	**$45,211**	**$24,637**
	North Carolina	**5,019,831**	**4,923,307**	**4,571,020**	**352,287**	**7.2**	**4,295,071**	**50,980**	**1.2**	**$50,320**	**$28,123**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 14-34. Maritime Jobs in the North Carolina Study Area by County

14.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 14-13, in 2017 North Carolina had lower median household income and per capita income than the U.S.

According to the USCB, the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, North Carolina had a median income of $50,320 (12.7% lower than the Nation's median income), and a per capita income of $28,123 (9.8% lower than the Nation's per capita income). Median and per capita income metrics in the Study Area were lower than the State at $45,211 and $24,637, respectively (USCB 2017k, USCB 2017n). Figure 14-35 and Figure 14-36 show median household and per capita income in the Study Area, respectively. The figures portray high median household and per capita incomes near the high-paying jobs in metropolitan areas and lower paying jobs in rural areas (USCB 2017k, USCB 2017n).

14.4.4.3 Unemployment Rates

Figure 14-37 shows the 2017 unemployment rates in the counties in the Study Area by census block group. Table 14-13 presents unemployment rates for each county in the Study Area grouped by demographic region. The average unemployment rate in the Study Area was 8.5%, similar to the State (7.2%) but more than the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area, unemployment rates ranged from 4.8% in Currituck County to 11.9% in Chowan County (both in the Albemarle Region) in 2017 (USCB 2017h).

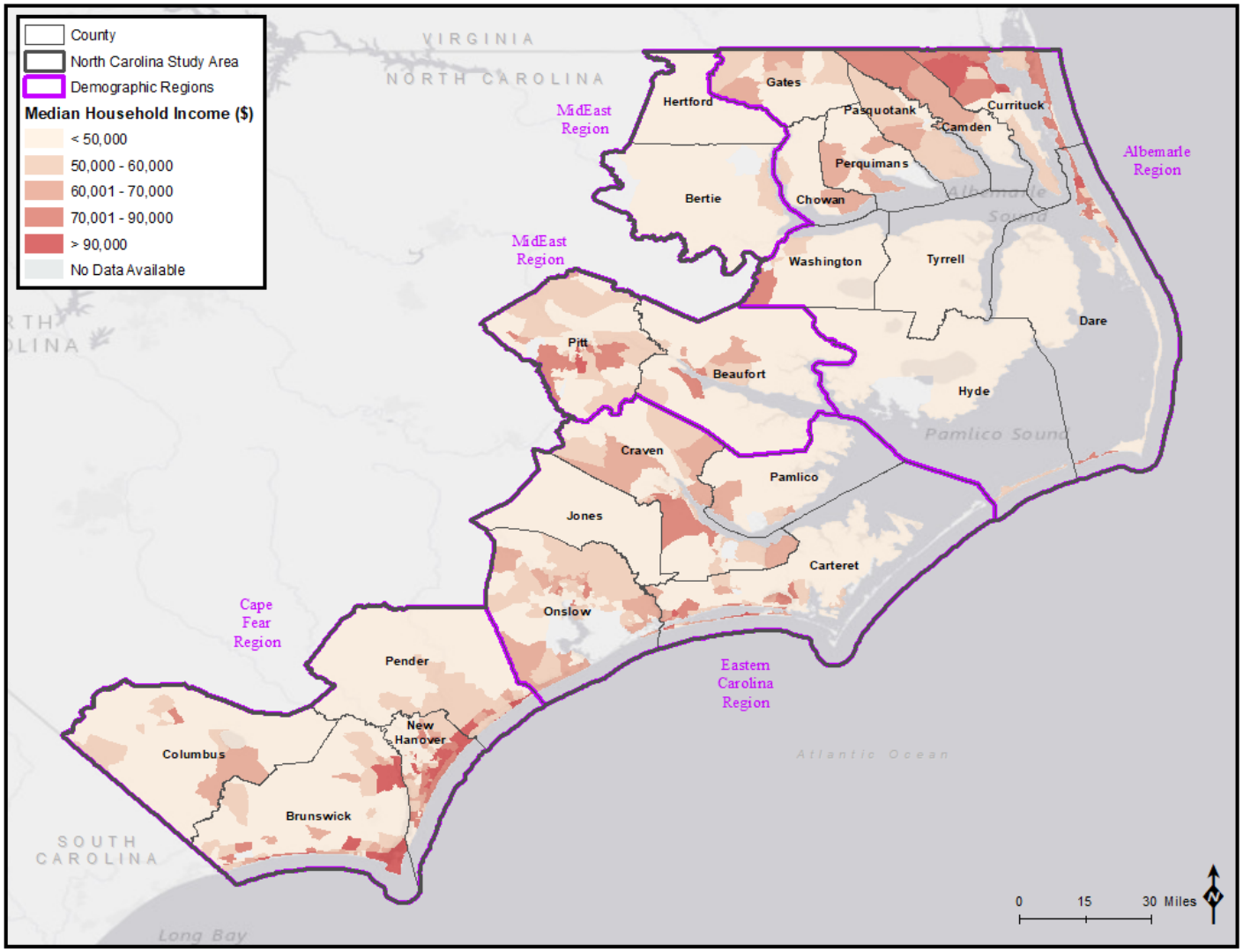
The unemployment rate was 7.3% in the Albemarle and Cape Fear Regions in 2017, with the highest rates occurring in Chowan and Hyde counties (USCB 2017h). The Mideast Region had the highest unemployment rate (10.1%) of the four demographic regions in the Study Area. Rates within the region ranged from 9.0% (Beaufort County) to 12.7% (in sparsely populated Bertie County) (USCB 2017h).

14.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

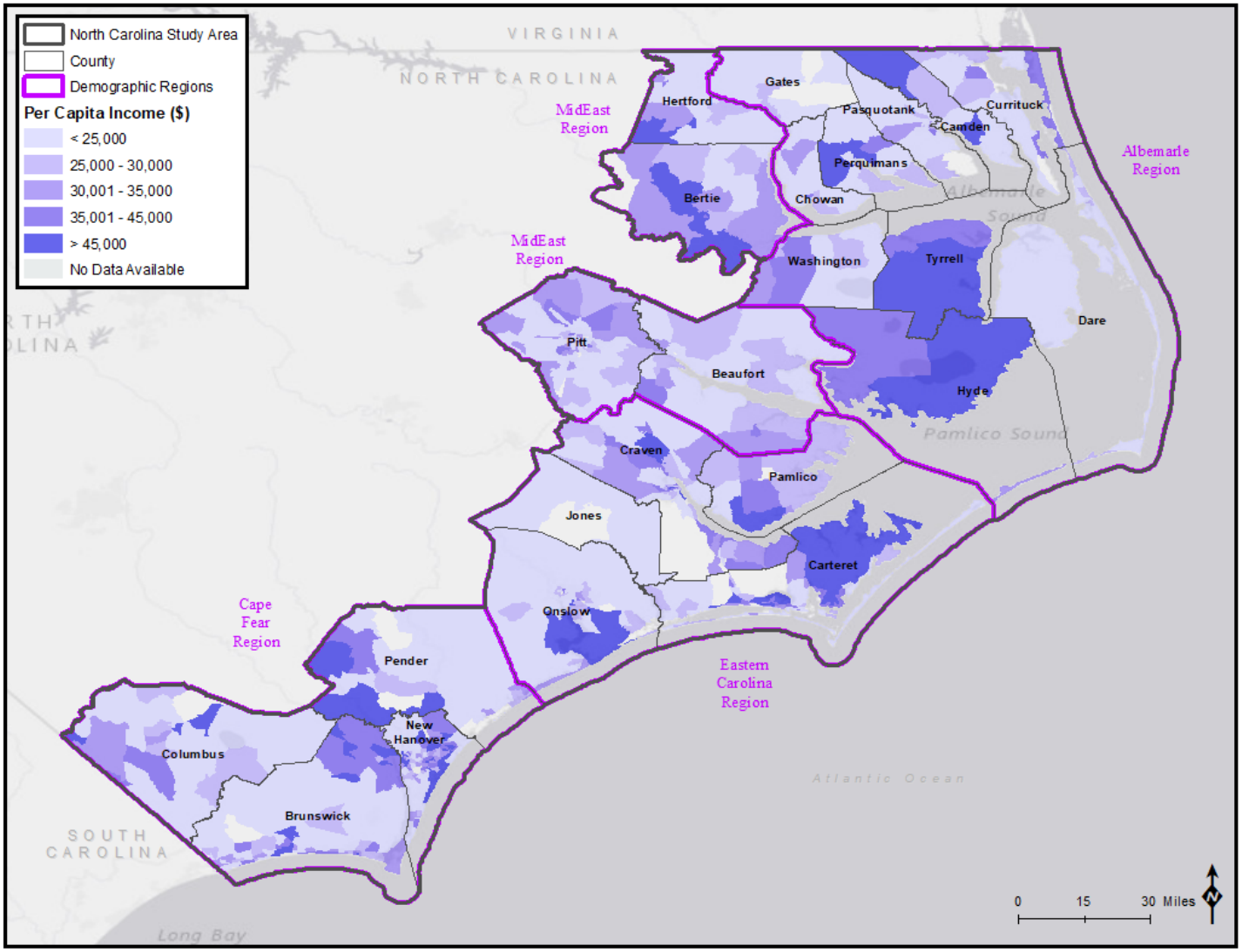
Table 14-14 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State and the Nation (USCB 2017t).

Figure 14-38 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State and the counties comprising the Study Area.



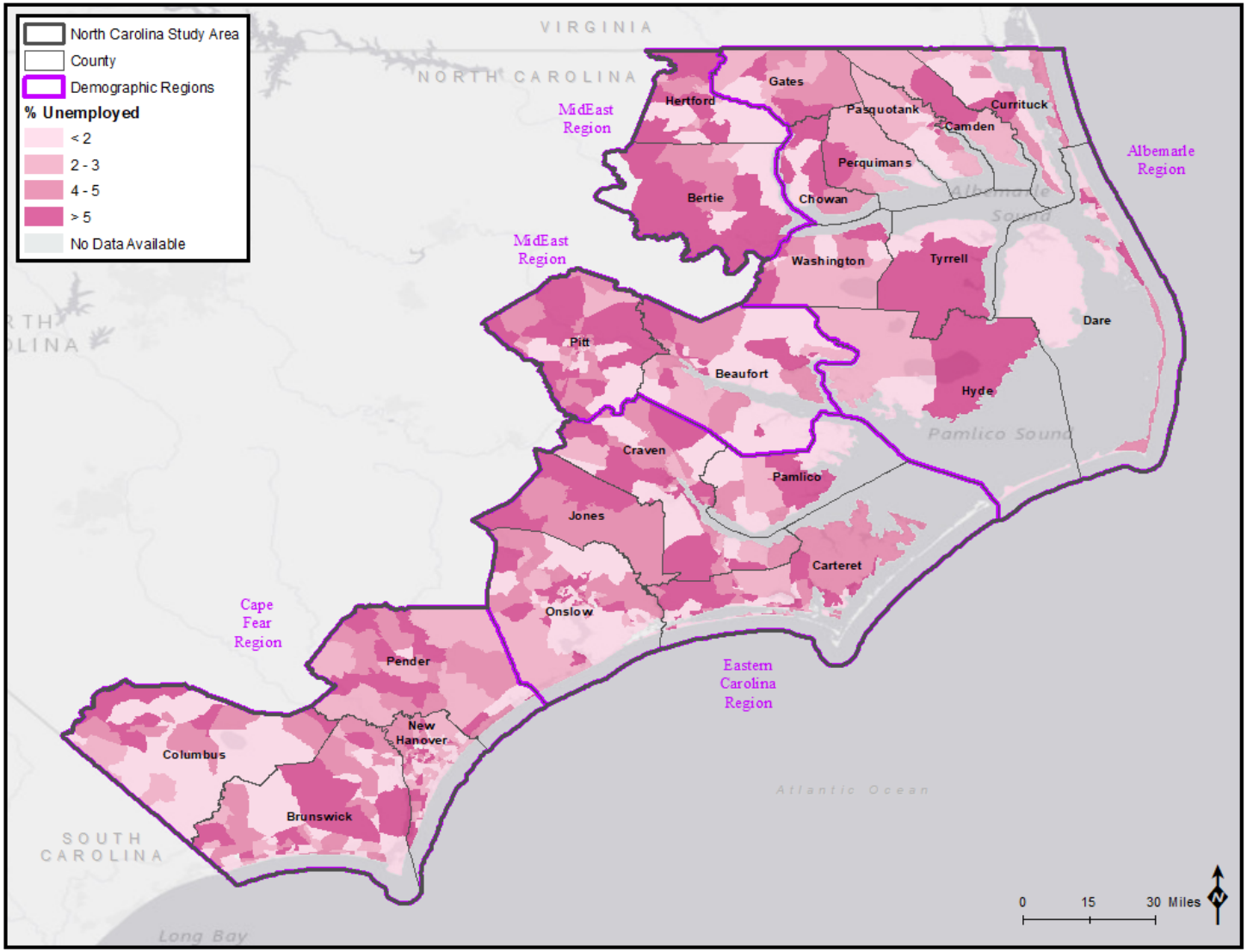
Source: USCB 2017r

Figure 14-35. Median Household Income in the North Carolina Study Area by Census Block Group



Source: USCB 2017r

Figure 14-36. Per Capita Income in the North Carolina Study Area by Census Block Group



Source: USCB 2017r

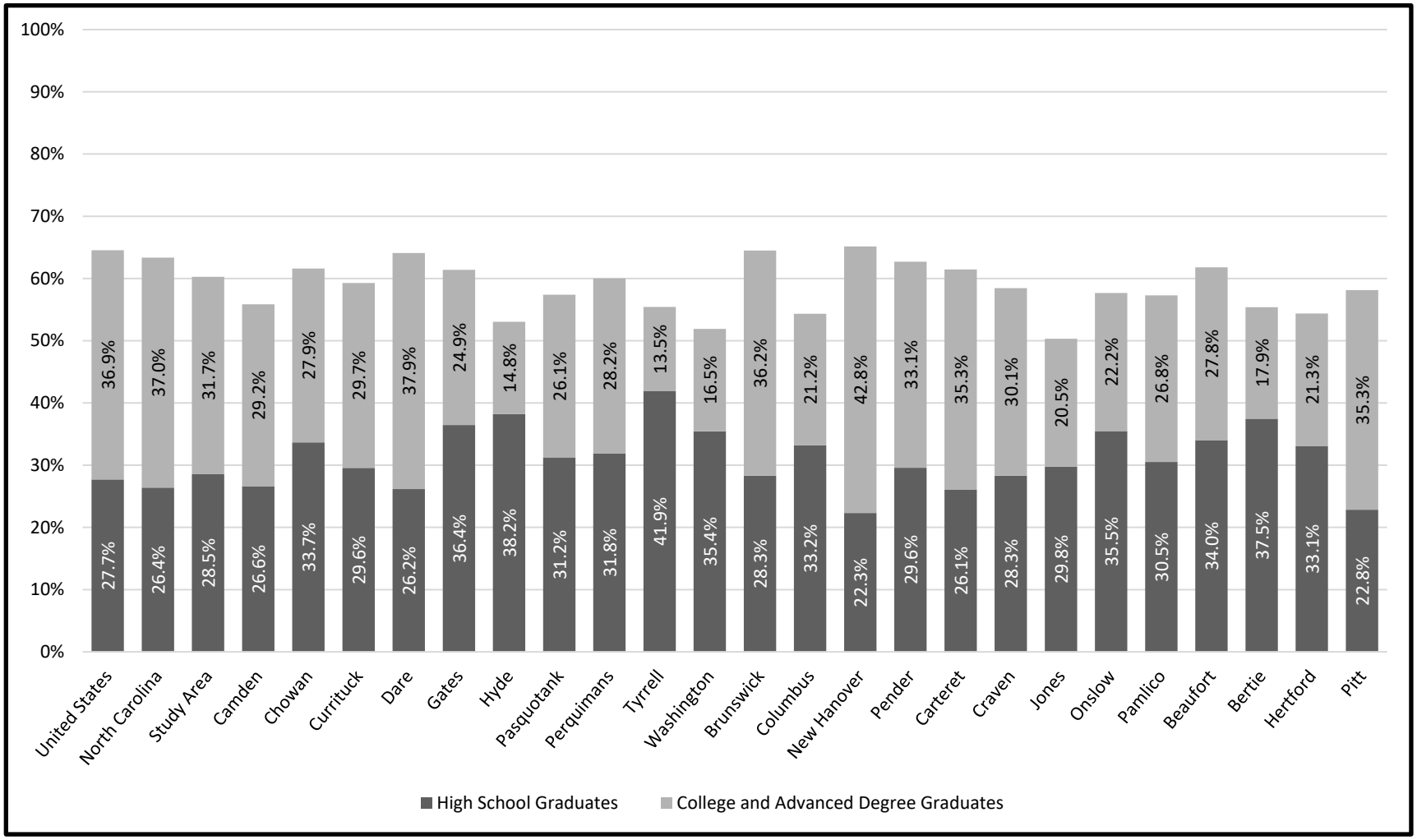
Figure 14-37. Unemployment Rates in the North Carolina Study Area by Census Block Group

Table 14-14. Educational Attainment in the North Carolina Study Area

Region	Geographic Unit	Number							Total	Percent						
		Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less Than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Albemarle	Camden	396	782	2,102	2,307	981	836	491	7,895	5.0	9.9	26.6	29.2	12.4	10.6	6.2
	Chowan	455	1,406	3,821	2,499	1,033	1,406	732	11,352	4.0	12.4	33.7	22.0	9.1	12.4	6.4
	Currituck	540	1,983	5,809	5,477	1,653	3,116	1,069	19,647	2.7	10.1	29.6	27.9	8.4	15.9	5.4
	Dare	854	1,277	7,467	8,124	2,515	5,759	2,557	28,553	3.0	4.5	26.2	28.5	8.8	20.2	9.0
	Gates	320	968	3,341	2,251	947	833	507	9,167	3.5	10.6	36.4	24.6	10.3	9.1	5.5
	Hyde	234	690	1,670	1,128	362	193	93	4,370	5.4	15.8	38.2	25.8	8.3	4.4	2.1
	Pasquotank	1,288	3,032	9,627	8,809	2,388	3,680	1,987	30,811	4.2	9.8	31.2	28.6	7.8	11.9	6.4
	Perquimans	585	977	3,460	2,782	1,030	1,433	597	10,864	5.4	9.0	31.8	25.6	9.5	13.2	5.5
	Tyrrell	229	664	1,470	671	203	179	93	3,509	6.5	18.9	41.9	19.1	5.8	5.1	2.7
	Washington	779	1,548	3,457	2,366	768	599	240	9,757	8.0	15.9	35.4	24.2	7.9	6.1	2.5
	Total Albemarle Region	***5,680***	***13,327***	***42,224***	***36,414***	***11,880***	***18,034***	***8,366***	***135,925***	***4.2***	***9.8***	***31.1***	***26.8***	***8.7***	***13.3***	***6.2***
Cape Fear	Brunswick	3,253	8,246	28,881	24,708	9,695	17,766	9,458	102,007	3.2	8.1	28.3	24.2	9.5	17.4	9.3
	Columbus	2,486	6,332	14,644	11,343	4,172	3,584	1,589	44,150	5.6	14.3	33.2	25.7	9.4	8.1	3.6
	New Hanover	3,859	10,103	39,640	47,927	14,066	42,711	19,301	177,607	2.2	5.7	22.3	27.0	7.9	24.0	10.9
	Pender	1,757	4,338	13,235	10,589	4,170	6,770	3,868	44,727	3.9	9.7	29.6	23.7	9.3	15.1	8.6
	Total Cape Fear Region	***11,355***	***29,019***	***96,400***	***94,567***	***32,103***	***70,831***	***34,216***	***368,491***	***3.1***	***7.9***	***26.2***	***25.7***	***8.7***	***19.2***	***9.3***
Eastern Carolina	Carteret	1,475	4,138	14,665	16,044	5,786	8,437	5,630	56,175	2.6	7.4	26.1	28.6	10.3	15.0	10.0
	Craven	3,242	6,000	22,729	24,102	7,391	10,782	6,016	80,262	4.0	7.5	28.3	30.0	9.2	13.4	7.5
	Jones	408	991	2,343	2,511	561	716	340	7,870	5.2	12.6	29.8	31.9	7.1	9.1	4.3
	Onslow	2,620	8,845	51,626	50,120	10,487	15,619	6,206	145,523	1.8	6.1	35.5	34.4	7.2	10.7	4.3
	Pamlico	269	1,315	3,282	3,010	966	1,219	695	10,756	2.5	12.2	30.5	28.0	9.0	11.3	6.5
	Total Eastern Carolina Region	***8,014***	***21,289***	***94,645***	***95,787***	***25,191***	***36,773***	***18,887***	***300,586***	***2.7***	***7.1***	***31.5***	***31.9***	***8.4***	***12.2***	***6.3***
MidEast	Beaufort	1,626	3,812	12,724	8,852	3,555	4,488	2,352	37,409	4.3	10.2	34.0	23.7	9.5	12.0	6.3
	Bertie	1,081	2,738	6,102	3,445	1,055	1,217	647	16,285	6.6	16.8	37.5	21.2	6.5	7.5	4.0
	Hertford	1,079	2,560	6,480	5,293	1,480	1,778	910	19,580	5.5	13.1	33.1	27.0	7.6	9.1	4.6
	Pitt	3,888	9,198	31,514	44,679	12,627	23,923	12,122	137,951	2.8	6.7	22.8	32.4	9.2	17.3	8.8
	Total MidEast Region	***7,674***	***18,308***	***56,820***	***62,269***	***18,717***	***31,406***	***16,031***	***211,225***	***3.6***	***8.7***	***26.9***	***29.5***	***8.9***	***14.9***	***7.6***
	Study Area Total	**32,723**	**81,943**	**290,089**	**289,037**	**87,891**	**157,044**	**77,500**	**1,016,227**	**3.2**	**8.1**	**28.5**	**28.4**	**8.6**	**15.5**	**7.6**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**
	North Carolina	**314,734**	**672,809**	**2,104,201**	**1,934,132**	**658,224**	**1,504,189**	**783,940**	**7,972,229**	**3.9**	**8.4**	**26.4**	**24.3**	**8.3**	**18.9**	**9.8**

Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 14-38. High School, College, and Advanced Degree Graduate Rates in the North Carolina Study Area

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In North Carolina, 26.4% of the working-age population earned only a high school diploma; 37.0% earned a college or advanced degree.
- In the Study Area, 28.5% of the working-age population earned only a high school diploma; 31.7% earned a college or advanced degree (USCB 2017q).

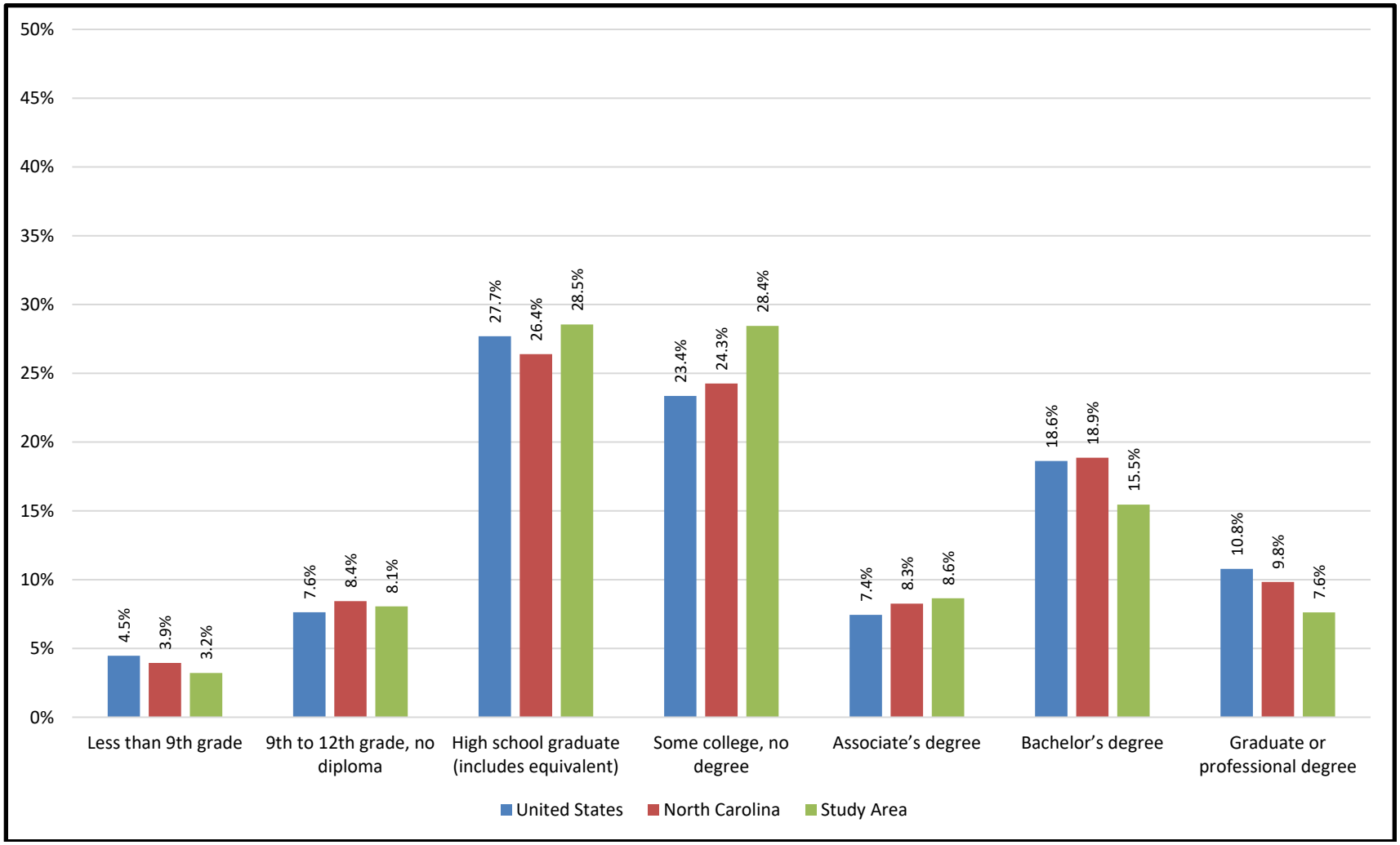
Figure 14-39 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

Percentages of the working-age population with only a 9th grade education or some high school only are fairly equivalent throughout all four regions in the Study Area, with a variance of about 2 to 3 percentage points. The distribution widens for workers with at least a high school degree. The Eastern Carolina Region has the highest percentage of workers with only a high school degree at 31.5%; the MidEast Region has the lowest percentage at 26.9%. Similar educational attainment levels are seen for workers with some college. The Eastern Carolina Region again has the highest percentage at 31.9%; the Cape Fear Region has the lowest at 25.7%. Rates of workers earning an associate's degree only are nearly equivalent across all regions with only a 0.5 percentage point range. Workers earning a bachelor's degree only ranged from 12.2% in the Eastern Carolina Region to 19.2% in the Cape Fear Region. Workers with a graduate or professional degree ranged from 6.2% in the Albemarle Region to 9.3% in the Cape Fear Region. Overall, there does not appear to be a significant difference in educational attainment across the demographic regions. There are more distinct differences within the individual counties. For example, Washington County (Albemarle Region) has the highest percentage of workers with only a 9th grade education, one of the higher percentages of workers without a high school diploma, one of the lower percentages of workers with a bachelor's degree, and the second lowest percentage of workers with a graduate or professional degree. Conversely, New Hanover County (Cape Fear Region) has the second lowest percentage of workers with only a 9th grade education, one of the lowest percentages of workers without a high school diploma, and the highest percentage of workers with both a bachelor's degree and a graduate or professional degree. Therefore, educational attainment appears to be very county rather than region centric.

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

14.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.



Source: USCB 2017q

Figure 14-39. Educational Attainment in the North Carolina Study Area

Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

14.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 14-40 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.

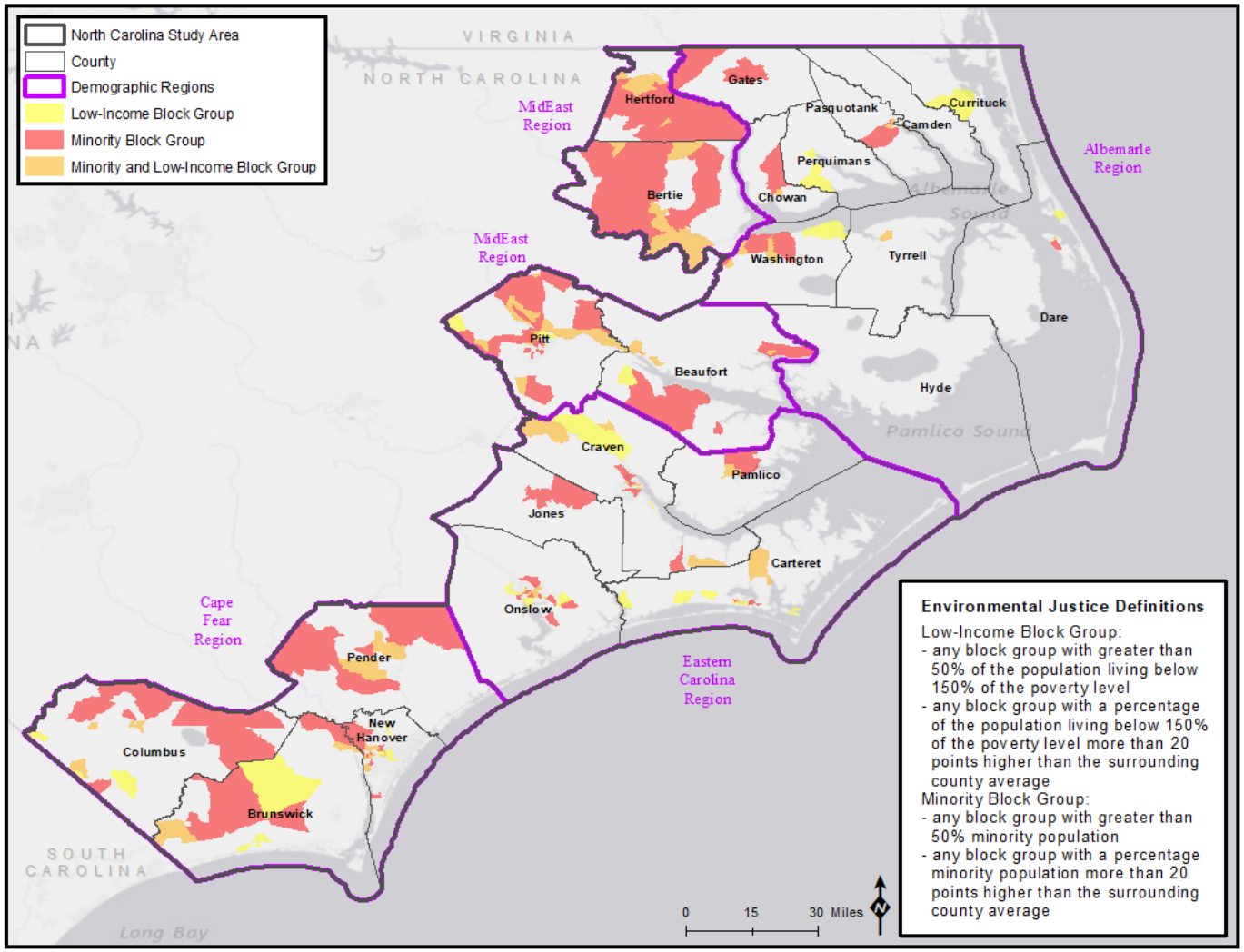
14.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential Environmental Justice communities of concern. Table 14-15 presents population and Environmental Justice-related characteristics for the Study Area regarding minority populations. Of the 1,283,929 people living in the Study Area, approximately 403,274 (31.4%) are minority. This is less than the State (36.4%) and Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 834 block groups in the Study Area, approximately 22.9% (191 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with minority populations. Within the Study Area the largest minority group is Black or African-American (20.6%) followed by Hispanic or Latino (3.8%) (USCB 2017f).

As shown in Table 14-15, the Albemarle, Cape Fear and Eastern Carolina all have similar percentages of minority block groups at 20.8%, 16.6%, and 15.6%, respectively. The MidEast Region is characterized by a relatively high degree of minority block groups at 45.9% (USCB 2017f).

As illustrated in Figure 14-40, many counties contain census block groups with high percentages of minority populations. This is unsurprising for a southern, former plantation and slave-owning State. Table 14-15 provides detail of the high percentages of minority block group populations. The counties with the highest percentages of minority block groups are:, Bertie (66.7%), Hertford (66.4%), and Washington (55.1%). The counties are located adjacent to each other in the Albemarle and MidEast Regions.



Source: USCB 2017r

Figure 14-40. Minority and Low-Income Population in the North Carolina Study Area by Census Block Group

Table 14-15. Low-Income and Minority Populations in the North Carolina Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less Than 150% of the Poverty Level	Percent Population with Incomes Less Than 150% of the Poverty Level (%)
Albemarle	Camden	10,336	8,306	2,030	19.6	5	0	0.0	0	0.0	10,336	1,709	16.5
	Chowan	14,370	8,577	5,793	40.3	12	1	8.3	3	25.0	14,089	5,053	35.9
	Currituck	25,247	22,094	3,153	12.5	14	1	7.1	0	0.0	25,035	4,540	18.1
	Dare	35,412	31,005	4,407	12.4	26	2	7.7	2	7.7	35,205	7,103	20.2
	Gates	11,601	7,254	4,347	37.5	10	0	0.0	2	20.0	11,538	2,533	22.0
	Hyde	5,507	3,294	2,213	40.2	5	0	0.0	0	0.0	4,849	1,377	28.4
	Pasquotank	39,546	21,698	17,848	45.1	25	5	20.0	11	44.0	37,171	10,778	29.0
	Perquimans	13,506	9,718	3,788	28.0	10	2	20.0	0	0.0	13,411	4,366	32.6
	Tyrrell	4,090	2,175	1,915	46.8	4	1	25.0	1	25.0	3,480	1,439	41.4
	Washington	12,331	5,535	6,796	55.1	14	5	35.7	7	50.0	12,156	4,582	37.7
	Total Albemarle Region	***171,946***	***119,656***	***52,290***	***30.4***	***125***	***17***	***13.6***	***26***	***20.8***	***167,270***	***43,480***	***26.0***
Cape Fear	Brunswick	122,586	100,035	22,551	18.4	90	7	7.8	7	7.8	121,480	27,210	22.4
	Columbus	56,589	33,685	22,904	40.5	47	8	17.0	13	27.7	53,644	19,599	36.5
	New Hanover	219,866	169,063	50,803	23.1	120	23	19.2	21	17.5	213,223	57,016	26.7
	Pender	57,630	42,945	14,685	25.5	32	2	6.3	7	21.9	56,329	13,425	23.8
	Total Cape Fear Region	***456,671***	***345,728***	***110,943***	***24.3***	***289***	***40***	***13.8***	***48***	***16.6***	***444,676***	***117,250***	***26.4***
Eastern Carolina	Carteret	68,699	59,330	9,369	13.6	71	8	11.3	4	5.6	67,440	15,681	23.3
	Craven	103,374	68,269	35,105	34.0	64	12	18.8	16	25.0	98,133	24,452	24.9
	Jones	9,776	6,080	3,696	37.8	7	0	0.0	1	14.3	9,738	3,540	36.4
	Onslow	192,685	128,724	63,961	33.2	96	12	12.5	16	16.7	171,498	45,212	26.4
	Pamlico	12,803	9,508	3,295	25.7	12	1	8.3	2	16.7	12,094	3,419	28.3
	Total Eastern Carolina Region	***387,337***	***271,911***	***115,426***	***29.8***	***250***	***33***	***13.2***	***39***	***15.6***	***358,903***	***92,304***	***25.7***
MidEast	Beaufort	47,316	31,150	16,166	34.2	35	7	20.0	12	34.3	46,766	15,158	32.4
	Bertie	19,913	6,834	13,079	65.7	20	4	20.0	13	65.0	18,625	6,761	36.3
	Hertford	24,262	8,140	16,122	66.4	19	3	15.8	17	89.5	21,424	7,785	36.3
	Pitt	176,484	97,236	79,248	44.9	96	29	30.2	36	37.5	170,188	58,200	34.2
	Total MidEast Region	***267,975***	***143,360***	***124,615***	***46.5***	***170***	***43***	***25.3***	***78***	***45.9***	***257,003***	***87,904***	***34.2***
	Study Area Total	**1,283,929**	**880,655**	**403,274**	**31.4**	**834**	**133**	**15.9**	**191**	**22.9**	**1,227,852**	**340,938**	**27.8**
	North Carolina	**10,052,564**	**6,397,460**	**3,655,104**	**36.4**						**9,783,738**	**2,596,452**	**26.5**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

One possibility for the difference in the minority population between the demographic regions is the proximity to the coastal areas. The MidEast Region includes the more rural counties further inland. The other regions include the coastal areas which have higher total population as well as a higher cost of living because of the resort and recreational areas along the coast.

14.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 14-15 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 1,227,852 people for whom poverty status is determined living in the Study Area, approximately 340,938 (27.8%) have incomes less than 150% of the poverty level. This is slightly more than the State (26.5%) and somewhat more than the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 834 census block groups in the Study Area, approximately 22.9% (191 block groups) are considered low-income populations (USCB 2017o).

Many regions contain high percentages of low-income populations. As shown in Table 14-15, The MidEast Demographic Region has the highest percentage of low-income population at 34.2%. The Albemarle, Cape Fear and Eastern Carolina Regions have similar low-income populations at 26.0%, 26.4%, and 25.7%, respectively (USCB 2017o).

As illustrated in Figure 14-40, many counties contain census block groups with high percentages of low-income populations. Table 14-15 provides detail of the high percentages of low-income block groups in Study Area counties. The counties are: Tyrell (41.4%), Washington (37.7%), Columbus (36.5%), Jones (36.4%), and Bertie (36.3%) and Hertford (36.3%) (USCB 2017o).

14.4.5.2 Socioeconomically Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this chapter, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this chapter we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDCs SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and discussed in detail in Fishing Communities (Chapter 14.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 14-41 for the Study Area. As shown in Figure 14-41, several counties (large areas in Jones, Bertie, Columbus, Pender and Chowan, for example) located throughout all four regions have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees (CDC 2016).

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 14-42 combines the CDC SoVI index (as shown in Figure 14-41) with minority and low-income populations (as shown in Figure 14-40) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; particularly notable in Cape Fear and MidEast Regions.

Figure 14-43Figure 14-43 shows the output of CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area.

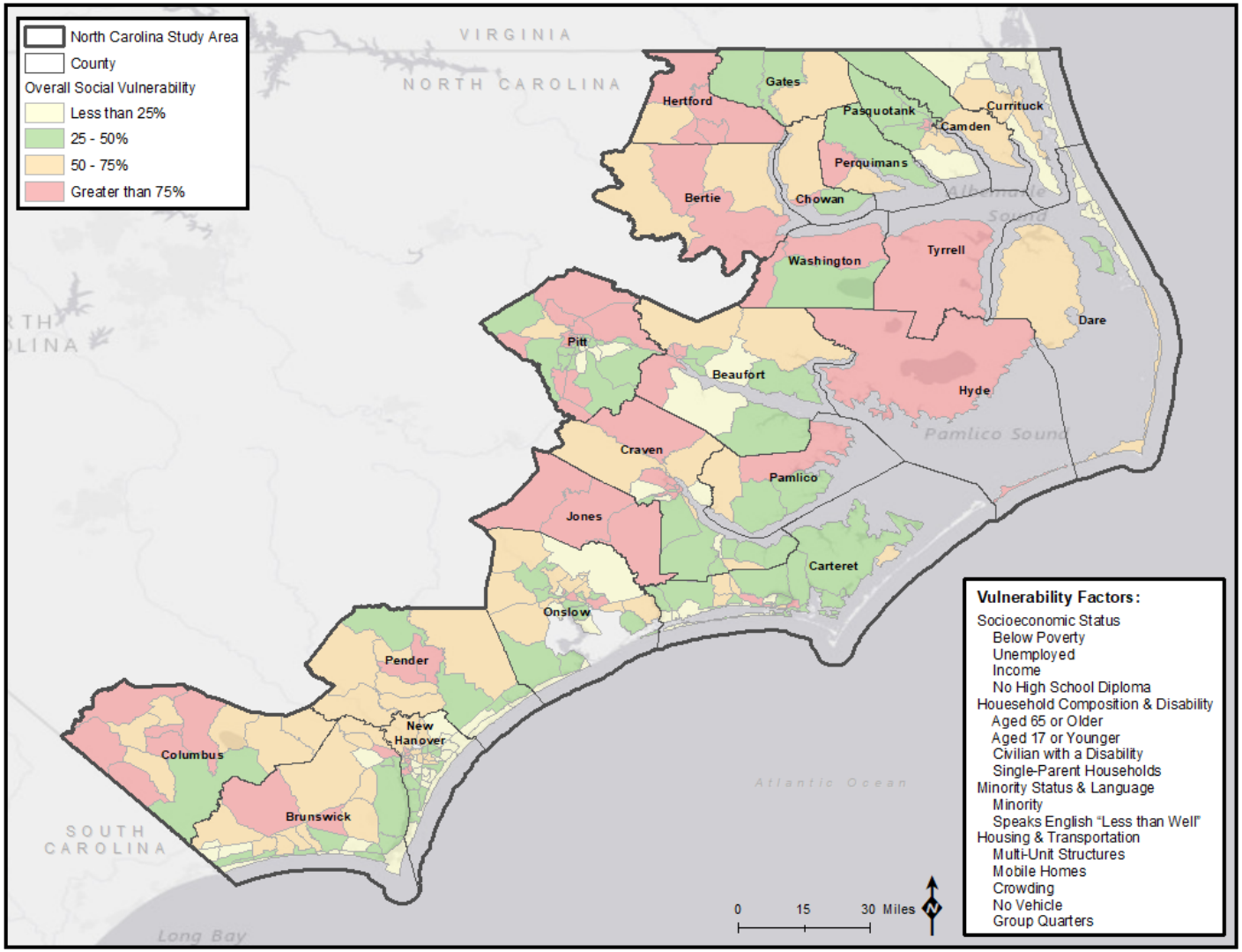
Figure 14-43Figure 14-43 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 14.2.2.2 above), are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure.

As discussed in Chapter 14.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area (CDC 2016).

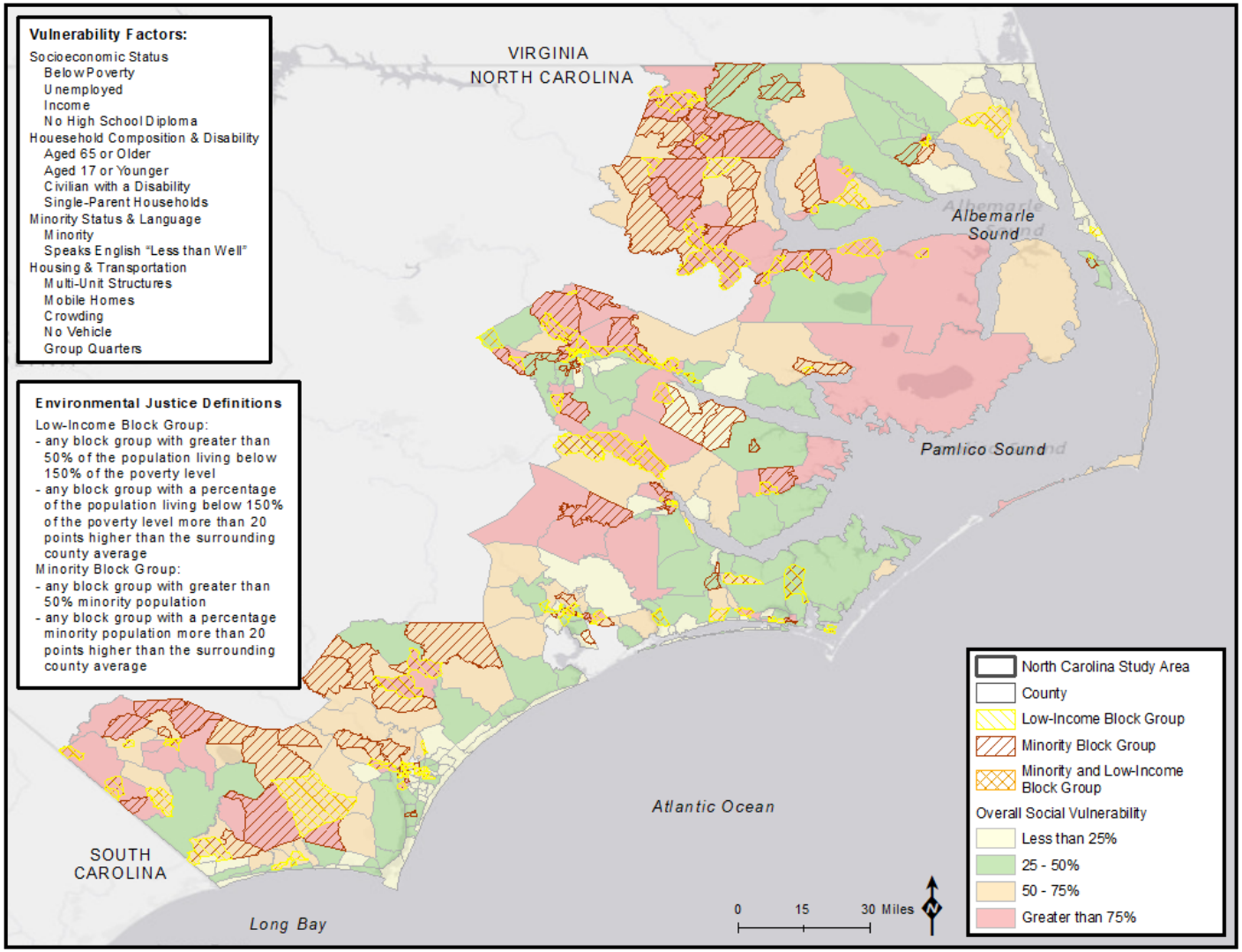
14.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter.



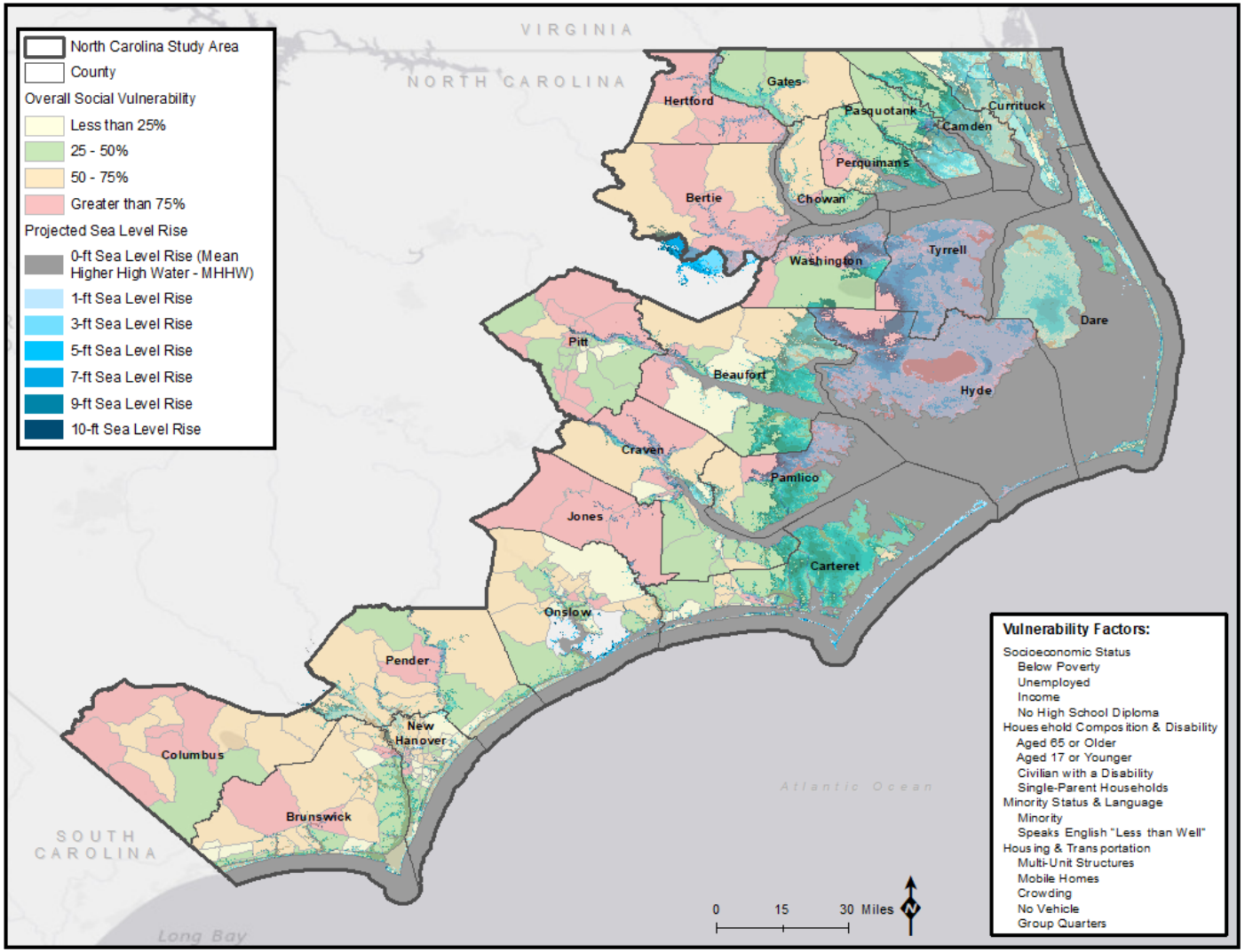
Source: CDC 2016

Figure 14-41. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the North Carolina Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 14-42. Overall Social Vulnerability using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the North Carolina Study Area



Sources: CDC 2016, NOAA 2018a

Figure 14-43. Overall Social Vulnerability using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the North Carolina Study Area by Census Tract

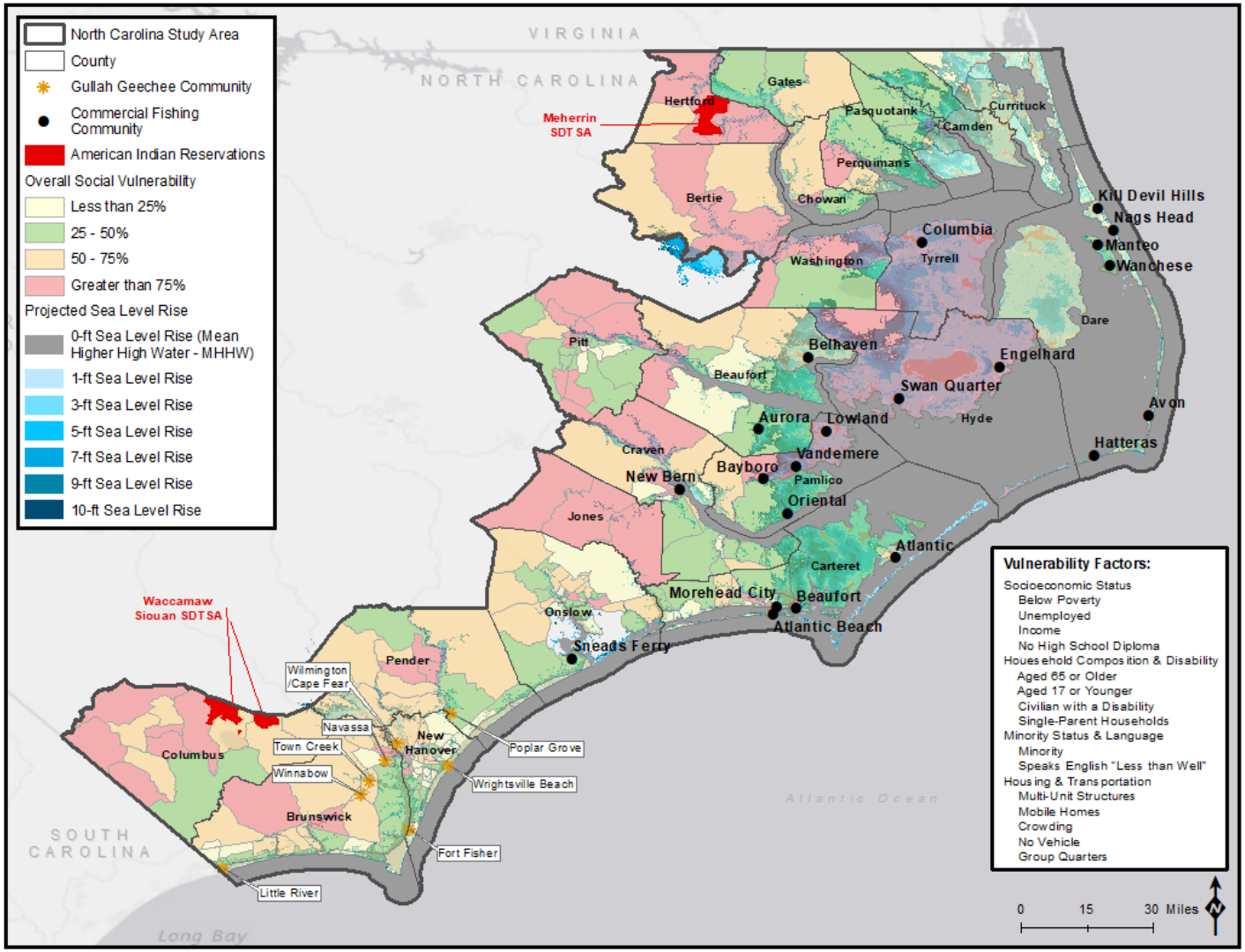
14.4.5.3.1 Fishing Communities

As illustrated in Figure 14-44, there are 16 fishing communities in the Study Area. They are located in the MidEast, Albemarle, Eastern Carolina Regions. No communities are located in the Cape Fear Region. The fishing communities are (NOAA Fisheries 2019g):

- Atlantic, Carteret County
- Aurora, Beaufort County
- Bayboro, Pamlico County
- Belhaven, Beaufort County
- Engelhard, Hyde County
- Kill Devil Hills, Dare County
- Manteo, Dare County
- Nags Head, Dare County
- Oriental, Pamlico County
- Swan Quarter, Hyde County
- Wanchese, Dare County
- Atlantic Beach, Carteret County
- Avon, Dare County
- Beaufort, Carteret County
- Columbia, Tyrrell County
- Hatteras, Dare County
- Lowland, Pamlico County
- Morehead City, Carteret County
- New Bern, Craven County
- Sneads Ferry, Onslow County
- Vandemere, Pamlico County

As can be seen in Figure 14-44, all 16 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 14.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of Environmental Impact Statements required under NEPA. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d). Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

Fishing is a culturally significant activity in the Gullah Geechee community. Therefore, it can be assumed these communities engage in some level of subsistence fishing. This community is discussed in more detail in the following section.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 14-44. Potential Vulnerable Communities in the North Carolina Study Area by Census Tract

14.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 14-44). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

The Gullah/Geechee Heritage Corridor is home to Gullah Geechee people, who are descendants of enslaved Central and West Africans who worked the plantations of the Southeastern U.S. Following the abolition of slavery and the American Civil War, the descendants of the Gullah Geechee settled in remote areas throughout the southern U.S. including many of the barrier islands stretching from North Carolina to Northeast Florida. Cultural and communal ties still remain in these areas today (Jaxson 2018). An estimated 200,000 people of Gullah and Geechee heritage live along the southeast coast according to an environmental impact statement published in 2005 (Otterbourg 2014). Because of the geographic isolation, segregation, and oppression that has continued to the present times, the Gullah and Geechee share similar linguistic, artistic, and societal traits that represent the many ways these peoples maintained their homeland roots while simultaneously assimilating aspects of other cultures they encountered during and after enslavement (NPS 2017).

Also because of the geographic isolation of these communities on islands with no connected infrastructure, subsistence lifestyles were necessary and still persist in the culture. From the 1600s to present-day, Gullah/Geechees depend heavily on resources from both land and the waterways. They have historically harvested from the Intracoastal Waterway in the manner that their indigenous American and African ancestors did (Gonsalves et al. 2015). Because the income and livelihood many Gullah Geechee residents are still heavily dependent on land and water resources (i.e., grasses for the sweetgrass baskets, food from hunting and fishing), the importance of healthy and functioning ecosystems is critical to maintaining the quality and way of life of Gullah Geechee people (GGCHCC 2012).

The Gullah Geechee Cultural Heritage Corridor, which extends from Wilmington, North Carolina in the north to Jacksonville, Florida in the south (NPS 2017). The Gullah/Geechee Cultural Heritage Corridor, shown in Figure 14-44, was created to achieve several objectives. The Corridor was created to endorse the

important contributions of Gullah Geechee to American culture and history. Additionally, the Corridor assists local governments and entities in and preserving Gullah Geechee folklore, arts, crafts, and music. The Corridor also assists in identifying and preserving sites, historical data, artifacts, and objects associated with Gullah Geechee culture for the benefit and education of the public (GGCHCC 2012). In North Carolina, the Gullah Geechee Cultural Heritage Corridor includes 1,523,775 acres in parts of Columbus and Pender Counties and all of Brunswick and New Hanover Counties (GGCHCC 2012). Gullah Geechee communities have been identified in Little River, Winnabow, Town Creek, and Navassa in Brunswick County. There are three communities in New Hanover County: Fort Fisher, Wilmington/Cape Fear, and Wrightsville Beach. One additional community is Poplar Grove in Pender County. There are likely many other Gullah Geechee living elsewhere all four of these Counties and potentially elsewhere in the Study Area (GGCHCC 2012, Hiller 2019, NPS 2005). Impacts to Gullah Geechee communities should be considered for OCS-related project site selection, keeping in mind that these communities may not attend public forums for comment and prefer to be contacted directly.

The fisheries that support the Gullah/Geechee people face a multitude of threats largely derived such as urban, industrial, and agricultural development within coastal watersheds, overfishing, conflict with State agencies for harvesting in their historically traditional manner, competition with commercial fisheries, climate change, sea level rise, ocean acidification, hurricanes, and environmental pollutants (GGCHCC 2012, Gonsalves et al. 2015). The largest threat to Gullah Geechee communities is coastal development adjacent to subsistence waterways, which simultaneously have led to steadily increasing property values and taxes and physically cut off these communities from the marsh and water that is their livelihood (NPS 2005, Vargas 2019). These threats have caused declines in blue crabs, oysters, shrimp, catfish, mullet, spot, croakers, etc., which are staples of the Gullah/Geechee fishing industry and diet (Gonsalves et al. 2015).

Proximity of potentially vulnerable subsistence communities (fishing communities and Gullah Geechee in particular) to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations. Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

14.4.5.4 Tribes

There are six federally recognized tribes and eight State recognized tribes with historical ties to North Carolina. Of the six federally recognized tribes, only the Eastern Band of Cherokee Indians currently live in North Carolina. Although they live outside the Study Area in the western part of the state, they may have ancestral interest in portions of the Study Area (NCDOA 2019a).

Table 14-16 lists the federally and State recognized tribes in North Carolina, their geographic units, and their ties to the Study Area. Federally recognized tribal lands are shown in Figure 14-44.

Table 14-16. Federally and State-Recognized Tribes with Historical Ties to North Carolina

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes Within the Study Area			
Meherrin Nation	State	Yes	Tribal members reside in and near their original lands in Hertford, Gates, North Hampton, and Bertie Counties.
Waccamaw-Siouan Tribe	State	Yes	Tribal members reside in Columbus County and Bladen County (outside Study Area) along the edge of the Green Swamp. Traditional ties to South Carolina.
Federally and State-Recognized Tribes Outside the Study Area			
Catawba Indian Nation	Federal	Yes	Tribal members reside outside North Carolina Area (in South Carolina) but have historical ties to all 23 counties in the Study Area.
Coharie Intra-Tribal Nation	State	No	Tribal members reside outside of the Study Area and are headquartered in Clinton in Sampson County.
Eastern Band of the Cherokee Nation	Federal and State	No	Tribal members reside outside of the Study Area in the Qualla Boundary in Swain and Jackson Counties (western North Carolina).
Haliwa-Saponi Indian Tribe	State	No	Tribal members reside outside of the Study Area in the area traditionally known as “The Meadows” in Halifax and Warren Counties (northeast North Carolina); some tribal members also reside in Nash and Franklin Counties.
Lumbee Tribe of North Carolina	State	No	Tribal members reside outside of the Study Area with historical ties to Robeson County. Tribal members are currently concentrated in Robeson, Hoke, Cumberland, and Scotland Counties.
Monacan Indian Nation	Federal	No	Tribal members reside outside of North Carolina, primarily in Virginia.
Muscogee (Creek) Nation	Federal	No	Tribal members reside outside of North Carolina, primarily in Oklahoma.
Nansemond Indian Tribe	Federal	Yes	Tribal members reside outside of North Carolina (primarily in Virginia) but have historical ties to Bertie, Camden, Chowan, Currituck, Gates, Hertford, Pasquotank, and Perquimans Counties.
Occaneechi Band of the Saponi Nation	State	Yes	Tribal members reside outside of the Study Area and have historical ties the Piedmont area of North Carolina (central) and Virginia. Currently residing in Alamance, Caswell, and Orange Counties.
Sappony	State	No	Tribal members reside outside the Study Area with historical ties to the Piedmont Highlands. Tribal members currently reside in the High Plains area in Pearson County, North Carolina and in Virginia.
Tuscarora Nation	Federal	Yes	Tribal members reside outside of North Carolina (primarily in New York) but have historical ties to Beaufort, Bertie, Cravens, Hertford, Jones, and Pitt Counties
State-Recognized Groups and Special Interest Organizations			
Cumberland County Association for Indian People	State	No	Situated in and for the support of American Indians in Cumberland County.

Table 14-16. Federally and State-Recognized Tribes with Historical Ties to North Carolina

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Guilford Native American Association	State	No	Situated in Guilford County and also supporting surrounding counties.
Metrolina Native American Association	State	No	Situated in Mecklenburg County and also supporting surrounding counties.
Triangle Native American Society	State	No	Situated in Wake County and also supporting surrounding counties.

Sources: NCDOA 2019a, NCDOA 2019b, NCSL 2019, HUD 2019b

Of the eight State-recognized tribes, only the Meherrin Tribe and Waccamaw-Siouan Tribe have tribal lands and/or communities within the Study Area (NCDOA 2019a). The Meherrin Nation (Tribe) live in small communities near the North Carolina and Virginia border in Hertford, Gates, North Hampton, and Bertie Counties. Meherrin share language, traditions, and culture with the Nottoway and other Haudenosaunee Nations. The Meherrin do not live on a reservation, though they do live on their original reservation lands. Their tribal grounds are within walking distance of their last known original village, Old Town Maharinneck which is located along Potecasi Creek (formerly known as Meherrin Creek) (NCDOA 2019a).

The Waccamaw Siouan Indian Tribe originated in southern South Carolina. They retreated to the swamplands of North Carolina following the Waccamaw and South Carolina War in 1749. Tribal members predominantly reside in the southeastern North Carolina counties of Bladen and Columbus, in the communities of St. James, Buckhead, and Council. The community is adjacent to the Green Swamp (NCDOA 2019b).

The federally recognized Catawba Indian Nation were primarily living in an area that is now known as South Carolina and North Carolina, and even areas as far north as Virginia during the time of European arrival (Catawba Indian Nation 2020). Many of the living descendants of the Catawba people with ties to North Carolina live in South Carolina at the Catawba Nation Reservation (Catawba Indian Nation 2020a

North Carolina also has granted legal status to four organizations representing and providing services for American Indians living in urban areas. The Cumberland County Association for Indian People (Cumberland County) is focused on enhancing the socioeconomic, legal, and political self-determination and self-sufficiency of American Indians in the county. The Guilford Native American Association is an advocacy group for Guilford and surrounding counties. Services also include childcare, employment, and community programs for different age groups. The Metrolina Native American Association is focused on promoting cultural awareness and economic development for American Indians in Mecklenburg and surrounding counties. Services include job training and placement, classes, and economic development assistance. The Triangle Native American Society provides educational, social, and cultural programs to American Indians in Wake and surrounding counties (NCDOA 2019b). None of these organizations are located within the Study Area, though they may have some interaction with tribal members that do live within the Study Area.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in

the community. Most of the communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 14-43. Overall social vulnerability for Bertie and Hertford Counties is mixed and ranges from 50% to greater than 75%. Overall social vulnerability for Gates Counties is less than 25% to 5% Overall social vulnerability for Gates Counties is 25% to greater than 75% (CDC 2016). Also shown in Figure 14-43 is NOAA sea level rise data, indicating that all the counties and cities in which tribal populations are present are subject to some level of potential sea level rise vulnerability including inundation risk.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective Federally-recognized tribal groups, giving them the opportunity to consult (NPS 2012). State- or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to:

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

14.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 14-17 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 6.8% of the population do not speak English at home. The Eastern Carolina Region has the highest percentage (8.6%) of this population within the Study Area. Spanish is the language spoken by the majority (55,229 people or 4.6%) of non-English speakers at home within the Study Area population.

Table 14-17. People who Speak a Language Other than English at Home in the North Carolina Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Albemarle	Camden	9,877	513	5.2	255	71	187	0
	Chowan	13,612	344	2.5	245	47	0	52
	Currituck	23,840	852	3.6	599	200	44	9
	Dare	33,756	2,232	6.6	1,822	338	59	13
	Gates	11,097	298	2.7	90	117	64	27
	Hyde	5,216	561	10.8	551	0	0	10
	Pasquotank	37,028	2,342	6.3	1,406	526	391	19
	Perquimans	12,878	396	3.1	256	75	47	18
	Tyrrell	3,984	348	8.7	323	5	8	12
	Washington	11,715	403	3.4	339	40	20	4
	Total Albemarle Region	***163,003***	***8,289***	***5.1***	***5,886***	***1,419***	***820***	***164***
Cape Fear	Brunswick	117,240	6,146	5.2	4,154	1,210	648	134
	Columbus	53,451	3,204	6.0	2,507	477	165	55
	New Hanover	208,530	13,583	6.5	8,405	2,368	2,240	570
	Pender	54,367	3,954	7.3	2,992	651	246	65
	Total Cape Fear Region	***433,588***	***26,887***	***6.2***	***18,058***	***4,706***	***3,299***	***824***
Eastern Carolina	Carteret	65,695	3,811	5.8	2,388	671	630	122
	Craven	96,391	8,105	8.4	5,058	629	2,361	57
	Jones	9,309	423	4.5	362	33	28	0
	Onslow	174,922	17,694	10.1	11,186	2,517	3,023	968
	Pamlico	12,292	633	5.1	380	90	143	20
	Total Eastern Carolina Region	***358,609***	***30,666***	***8.6***	***19,374***	***3,940***	***6,185***	***1,167***

Table 14-17. People who Speak a Language Other than English at Home in the North Carolina Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
MidEast	Beaufort	44,862	2,744	6.1	2,245	439	16	44
	Bertie	19,037	737	3.9	553	110	66	8
	Hertford	23,110	1,266	5.5	974	129	71	92
	Pitt	165,941	11,636	7.0	8,139	1,357	1,592	548
	Total MidEast Region	***252,950***	***16,383***	***6.5***	***11,911***	***2,035***	***1,745***	***692***
	Study Area Total	**1,208,150**	**82,225**	**6.8**	**55,229**	**12,100**	**12,049**	**2,847**
	North Carolina	**9,448,581**	**1,079,175**	**11.4**	**704,788**	**164,454**	**154,874**	**55,059**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 14-45 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Hyde (10.8%) and Onslow (10.1%) (USCB 2017e). As seen in Figure 14-41 and Figure 14-43, Hyde County is ranked as over 75% vulnerable and impacted by rising sea levels. Onslow County is less vulnerable and will experience lesser sea level rise impacts.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

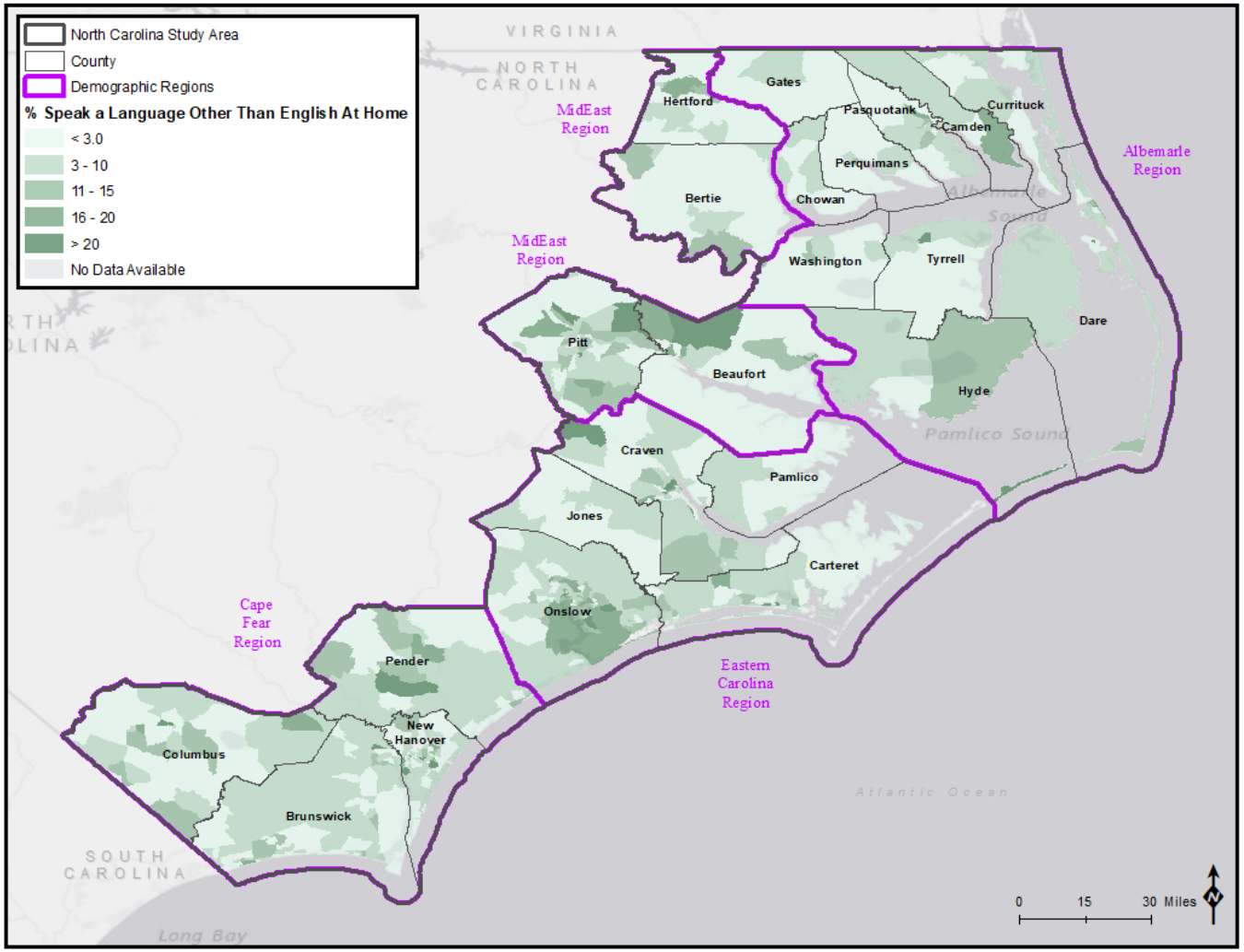
Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

14.4.6 Summary – Demographics and Socioeconomics

North Carolina's population is increasing at a rate faster than the Nation. Population grew 5.4% since the 2010 Census, having added approximately 517,081 people. During the same period, the population of the U.S. grew just 4.0% (USCB 2017a, USCB 2017d). While North Carolina is affected by the nationwide trend of aging population, the State still gains population from natural increase. However, most of the State's growth is from migration, both domestic and international migration.

The Study Area represented 12.8% (1.3 million residents) of the overall State population of 10.1 million. The population of the Study Area is small compared to major centers of population that lie outside the Study Area in the more centrally located areas of the State, near the Raleigh, NC and Charlotte-Concord-Gastonia, NC metropolitan areas. (USCB 2017a, USCB 2017d, USDA 2013, OSBM 2017).

The population of the Study Area grew 3.5% between 2010 and 2017. Growth is primarily in metropolitan counties. During the same period, 10 out of 23 counties gained population, while 13 lost population. Eight of the 13 counties that lost population were rural (Tyrell, Washington, Bertie, Hyde, Chowan, Pasquotank, Columbus and Beaufort. The Cape Fear Region had the highest growth due to population increases in the retirement destination counties of Brunswick , Pender and New Hanover , located along the State's southern coast (USCB 2017a, USCB 2017d, USDA 2013). Population density is highest near major urban areas. Population density of the Study Area was 113 persons per square mile, less than the State (206 persons per square mile) but greater than the Nation (90 persons per square mile). As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the North Carolina Study Area has less population density as compared to the State (USCB 2017d, USCB 2017c, USDA 2013).



Sources: USCB 2017r, USCB 2017e

Figure 14-45. Percent of People Who Speak a Language Other than English at Home in the North Carolina Study Area by Census Block Group

Population in the Study Area is projected to increase 25.7% (1.6 million residents) by 2038 (the last year for which North Carolina produced projections), less than the State (27.4%) (USCB 2017d, USCB 2017c, USCB 2018b). The Nation's population is projected to grow 16.4% (373.5 million) by 2040, less than the State and the Study Area. Growth will not be uniform across the Study Area. Strong growth trends are expected to continue in the Cape Fear Region, and its counties located in the Wilmington metropolitan area. Population is decreasing in rural counties, reflecting a rural-urban divide (USCB 2017d, OSBM 2019, USDA 2013).

The State and the Study Area are aging. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 6.0% in North Carolina, and 5.9% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. The Cape Fear Region had the smallest percentage of young children in 2017 and a further decrease is projected by 2038. The Cape Fear counties of Brunswick, Pender and New Hanover are retirement destinations. The net effect of retiree in-migration is a decline in the fertility rate, resulting in a decreasing population of young children over time (OSBM 2019, USDA 2013)

According to 2017 estimates, the elderly represented 14.9% and 15.1% of the national and State population, respectively. Reflecting its popularity as a retirement destination, the Study Area had 17.0% of elderly population, higher than the State and Nation. The number and proportion of elderly to the overall population are projected to rise in each demographic region of the Study Area, the State and the Nation. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the percentage of elderly Americans is projected to increase in the Study Area (20.8%), the State (21.0%) and the Nation (21.6%). The Cape Fear Region had the largest percentage of elderly in 2017; a further increase is projected by 2038. Large concentrations of elderly are projected in the rural counties of the Albermarle Region; specifically Camden (24.4%), Dare (26.0%), Hyde (25.4%) and Perquimans (28.2%) (USCB 2017b, USCB 2018b, OSBM 2019).

Homeownership in North Carolina was 65.0%, higher than the Nation (63.8%) and the Study Area (64.1%). Renters comprised approximately 35.0% of the State population in 2017, less than the Study Area (35.9%) and the Nation (36.2%) (USCB 2017m). The percentage of owner-occupied housing was highest in the Albemarle Region, and lowest in the MidEast Region.

Median home values were higher in the Nation ($193,500) and the State ($161,000) as compared to the Study Area ($152,550). Median home values were highest in counties in the Cape Fear region, where many beach communities are located, and lowest in less populous predominantly rural MidEast Region (USCB 2017l). Housing affordability for low- and moderate-income workers is a problem in North Carolina. A large proportion of the State (26%) is considered extremely low income, and of these households, 71% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

Home values increased in the State (5.4%) as well as the metropolitan areas within the Study Area, during the 12-month period ending November 2019, according to the online real estate database Zillow (Zillow 2019). Home vacancy rates in the Study Area were 23.5, higher than the State (14.3%) and Nation (23.5), which may be attributed to vacation homes and/or investment properties used as short-term rentals in popular summer tourist destinations (CityLab 2019, USCB 2017g).

The Study Area has a total employment of 500,000 thousand jobs, representing approximately 11.7% of the total jobs in North Carolina, and 0.4% of the total jobs in the U.S. The dominant employment categories in the Study Area are educational services, and health care and social assistance (23.7%), retail

trade (12.8%), and arts, entertainment, and recreation, and accommodation and food services (11.7%) (USCB 2017p). The greater portion of jobs are located in the Cape Fear and MidEast Regions, located in the Wilmington and Greenville metropolitan areas.

North Carolina's ocean economy ranked 19th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy. The Study Area had 50,980 maritime jobs, representing 87.7% of total maritime jobs in the State. The highest percentage of maritime jobs to overall county jobs were in Dare (34.4%), Gates (33.1%, and Carteret (21.1%) counties (USCB 2017i, NOAA 2016b).

Median and per capita income in the Study Area were lower than the State at $45,211 and $24,637, respectively (USCB 2017k, USCB 2017n), indicating that the more urban inland areas of the State are more economically robust than the Study Area.

The average unemployment rate in the Study Area was 8.5%, higher than the State (7.2%) and the Nation (6.6%), reflecting the availability of jobs in high density urban areas. Within the Study Area, unemployment rates ranged from 4.8% in Currituck County to 11.9% in Chowan County (both in the Albemarle Region) in 2017. The unemployment rate was 10.1% in the Mideast Region in 2017, which is the highest rate of the four demographic regions in the Study Area. Rates ranged from 9.0% (Beaufort County) to 12.7% (in sparsely populated Bertie County) (USCB 2017h).

In the Study Area, 28.5% of the working-age population earned only a high school diploma; 31.7% earned a college or advanced degree. These rates are similar to the national high graduation rate (27.7%) but less than the Nation's college and advanced degree rate of 36.9 (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential Environmental Justice communities of concern. Of the 1,283,929 people living in the Study Area, approximately 403,274 (31.4%) are minority. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 834 block groups in the Study Area, approximately 22.9% (191 block groups) are considered minority populations. Each of the demographic regions contain census block groups with minority populations. The Albemarle, Cape Fear and Eastern Carolina all have similar percentages of minority block groups at 20.8%, 16.6%, and 15.6%, respectively. The MidEast Region has 45.9% of minority block groups. Counties containing census block groups with high minority percentages area: Pitt (89.5%), Bertie (65.0%), and Pasquotank (44.0%) (USCB 2017f).

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 1,227,852 people for whom poverty status is determined living in the Study Area, approximately 340,938 (27.8%) individuals have incomes less than 150% of the poverty level. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 834 census block groups in the Study Area, approximately 22.9% (191 block groups) are considered low-income populations. The MidEast Demographic Region has the highest percentage of low-income population at 34.2%. The Albemarle, Cape Fear and Eastern Carolina Regions have similar low-income populations at 26.0%, 26.4%, and 25.7%, respectively. Several counties contain large areas of low-income census block groups. They are Tyrell (41.4%), Washington (37.7%), Columbus (36.5%), Jones (36.4%), and Bertie (36.3%) and Hertford (36.3%) (USCB 2017o). Overlap of minority and low-income population groups are notable in the Cape Fear and MidEast Regions (USCB 2017f, USCB 2017o).

Resource-dependent populations include 16 fishing communities and subsistence populations in the Study Area (NOAA Fisheries 2019g). The Gullah Geechee Cultural Heritage Corridor is present in the southern portion of the Study Area and includes several Gullah Geechee communities which are heavily dependent on plant and fish species from the local ecosystem for subsistence and to support their economy through the creation of traditional sweetgrass baskets. Both the fishing communities and the Gullah Geechee

communities are located in areas vulnerable to rising sea level and associated storm surge impacts. One federally recognized and eight State-recognized American Indian Tribes are also present in the Study Area (NCDOA 2019a).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated in Figure 14-41 for the Study Area. As shown in Figure 14-41, several counties (large areas in Jones, Bertie, Columbus, Pender and Chowan, for example) located throughout all four regions have the highest vulnerability ranking within the Study Area. Most counties have some populations deemed vulnerable to varying degrees. Many communities along the coast of the Study Area are at risk for sea level rise and other coastal hazards (CDC 2016).

Populations that speak a language other than English are present within the Study Area. In the Study Area, 6.8% of the population do not speak English at home. The Eastern Carolina Region has the highest percentage (8.6%) of this population within the Study Area. Spanish is the language spoken by the majority (55,229 people or 4.6%) of non-English speakers at home within the Study Area population. Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact community emergency response planning and implementation or how factors such as sea level rise and storm surge are felt at the local level (by changing drainage, patterns of land use, etc.) or (Siegel et al. 2001).

14.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

14.5.1 Regional Observations

North Carolina's coastal landscape is shallow and easily flooded, which inhibits dense development. Albemarle and Pamlico Sounds separate North Carolina's Outer Banks (barrier islands) from the mainland. With limited influence from ocean waves, tides, and storms, the topography of these sounds continues to influence transportation and, as a result, also influence land use and population characteristics. The presence of the sounds and the myriad beaches along the North Carolina coastline also influences the maritime industry and maritime jobs in the region.

The primary transportation constraint within the Study Area is associated with vulnerabilities due to recurrent flooding. Recurrent flooding happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., increases in sea level and an increase in the frequency and intensity of large storm systems). Flooding in tunnels and near bridges is of concern since road closures in these areas can be a hindrance to evacuation and emergency services.

North Carolina's geography and topography makes it highly susceptible to sea level rise, storm surges, and direct hurricane landfalls. Both subsidence and ocean currents contribute to sea level rise along the North Carolina coast, especially to the north towards the Mid-Atlantic where subsidence is more pronounced. Several coastal counties in North Carolina will continue to have increasing physical vulnerability as sea level rise progresses.

The sounds and other natural resources in the Study Area including other water resources, including the Great Dismal Swamp and other wetlands, floodplains, and critical habitat for the Atlantic sturgeon, loggerhead sea turtle, golden sedge, piping plover, North Atlantic right whale, and Waccamaw silverside are protected by certain regulations and laws. These natural resources within the Study Area are factors which should be considered during evaluation of potential future projects near the Atlantic OCS-related planning area.

The Economic Development Partnership of North Carolina fosters a pro-business environment in the State. Businesses in North Carolina benefit in four key ways. First, North Carolina offers the lowest corporate income tax rate in the country at 2.5%. Second, business costs, utilities, and cost of living are well below the national average. Third, recent tort reform, streamlined legal practices, and improved business courts mean less red tape and litigation for businesses. Lastly, North Carolina has a highly skilled workforce.

The population of the Study Area is small compared to major centers of population that lie outside the Study Area in the more centrally located areas of the State, near the Raleigh, NC and Charlotte-Concord-Gastonia, NC metropolitan areas.

North Carolina is a popular destination for relocation. Reasons for relocating to the State include work related reasons (new job or transfer), a change in marital status, and desire for better housing (Governing.com 2018). USCB 2018 estimates indicate that the biggest domestic in-migration came from Florida, Virginia, South Carolina, New York, Texas and California (USCB 2019c).

14.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Analysis of potential future projects will need to consider the CAMA Land Use Plan and/or Comprehensive Plan (or equivalent) of the particular county or municipality within which the new project would be situated. Statewide comprehensive plans and associated State laws and regulations that may be applicable to the proposed activities should also be considered. Municipalities and regulating State agencies may be more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- New development is likely to be more heavily encouraged and to receive more support in those counties designed as Tier 1 counties under the North Carolina Department of Commerce's County Distress Rankings tier designation. Tier 1 are the most distressed counties and include Beaufort, Bertie, Chowan, Columbus, Gates, Hertford, Hyde, Jones, Pasquotank, Perquimans, Tyrrell, Washington in North Carolina. Some development may also be encouraged/supported in the Tier 2 are moderately distressed counties of Camden, Carteret, Craven, Dare, Onslow, Pamlico, Pitt. New development is likely to receive the least support in Tier 3 counties, which are the least distressed in North Carolina and include Brunswick, Currituck, New Hanover, Pender.
- North Carolina has rich natural resources and multiple protected areas including the sounds and barrier islands. Many of the beaches in the State are critical habitat for the loggerhead sea turtle and piping plover, and preservation of this habitat is a priority that receives nationwide attention.

Analysis for potential future projects will need to carefully consider potential impacts to such protected areas. The barrier islands and beaches of North Carolina are popular tourist destinations. Recreation and cultural resources abound throughout the State. The Tourism and Recreation sector is a significant employer in the Study Area, in particular for ocean-related jobs. Potential future project analysis will need to consider potential impacts on the recreation and cultural resources throughout the Study Area once site-specific information has been identified.

- All fishing communities in the Study Area are located in areas vulnerable to sea level rise and associated storm surge impacts. This must be considered when conducting future project analysis.
- North Carolina is one of only four States with a Gullah Geechee community. The Gullah/Geechee Heritage Corridor spans the South Carolina coast throughout the Study Area. This community is heavily dependent on certain plant species (both for consumption and development of their traditional sweetgrass baskets) and fish species (for consumption). Therefore, a healthy and functioning ecosystem is critical to maintaining the quality and way of life of Gullah Geechee people. Additionally, these communities are frequently located in areas vulnerable to sea level rise and the associated storm surge impacts. Analysis of future projects should carefully consider potential impacts to Gullah Geechee communities and the ecosystems upon which they depend. It is also important to note that these communities may not attend public forums for comment and prefer to be contacted directly.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019/early 2020. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the State Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 15

SOUTH CAROLINA

15 South Carolina

15.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of South Carolina to support development of future BOEM environmental impact assessments related to prospective OCS-related development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

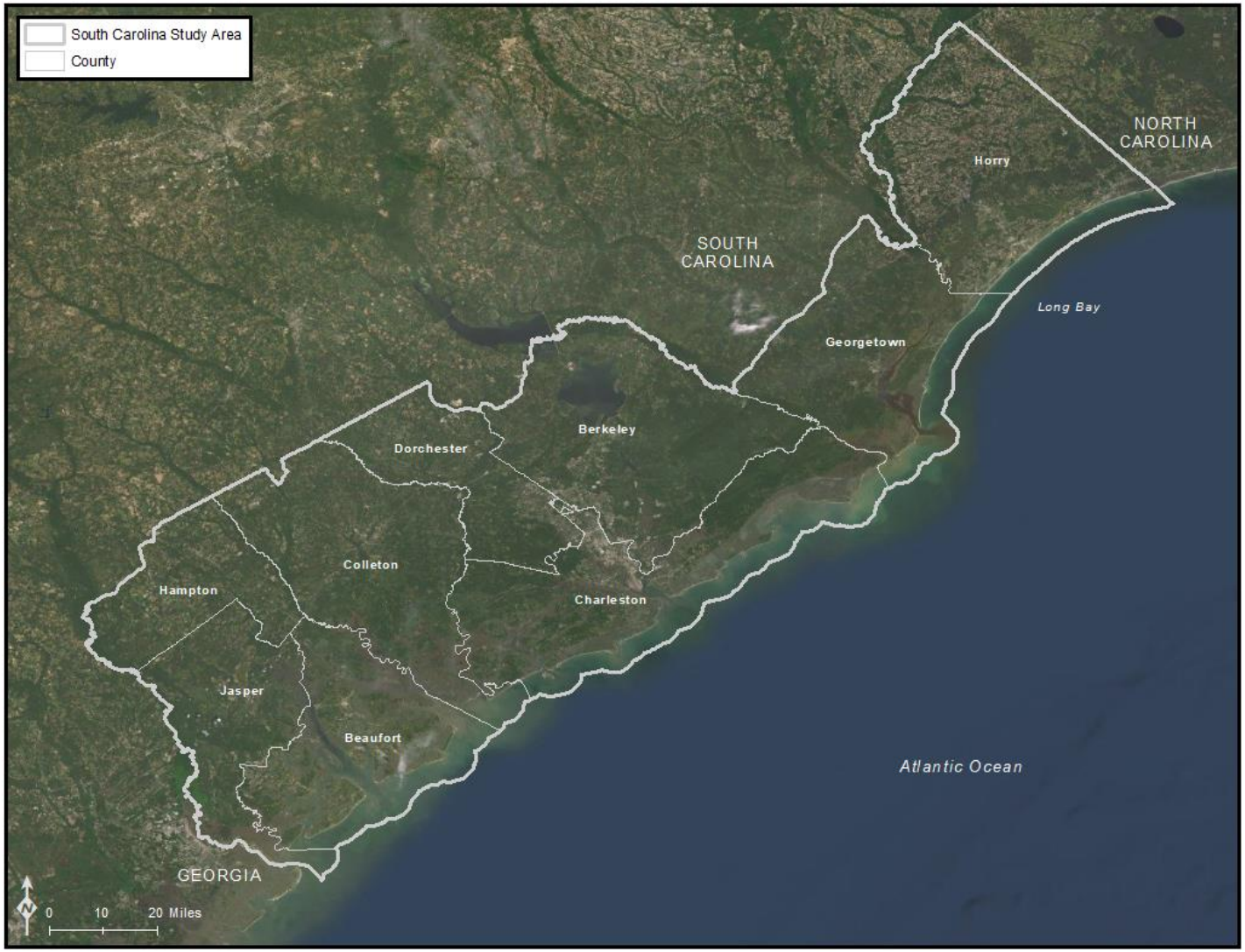
South Carolina is located near the South Atlantic Planning Area. A total of nine counties are located within the South Carolina Study Area (Study Area) along the South Carolina coastline. Counties range in population size from around 20,066 in Hampton County to 387,847 in Charleston County. There are three cities in the Study Area with populations over 50,000 and they are all in the greater Charleston area. Charleston has a population of 139,363, North Charleston has a population of 113,578, and Mount Pleasant has a population of 81,467 (ESRI 2019a). South Carolina cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. South Carolina's location in the south has geographical commonalities with many of the other Atlantic States with open coastlines protected by barrier islands. The South Carolina coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes nine counties located within the State of South Carolina. The Study Area is shown in Figure 6-1 and Figure 6-2 and includes the following counties:

- Beaufort
- Berkeley
- Charleston
- Colleton
- Dorchester
- Georgetown
- Hampton
- Horry
- Jasper

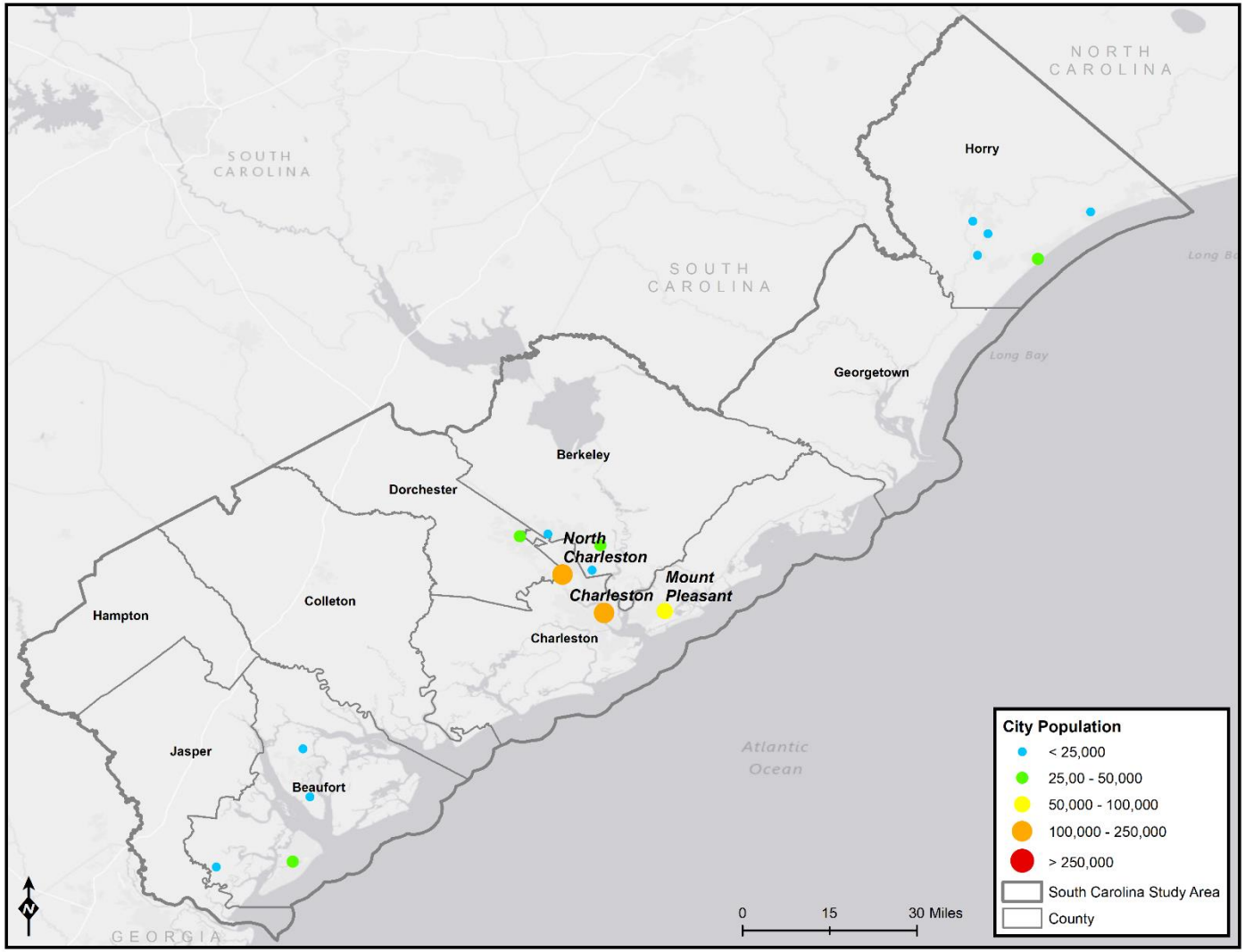
15.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of South Carolina are described below.



Source: ESRI 2019a

Figure 15-1. State of South Carolina Study Area



Source: ESRI 2019a

Figure 15-2. Cities in the South Carolina Study Area

After canvasing all nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as

- South Carolina Geographic Information Systems
- South Carolina Department of Natural Resources
- South Carolina Department of Health and Environmental Control
- MapCruzin.com (South Carolina Points of Interest)

The metadata database for South Carolina specific State, county, and local data sources is included in Appendix A.

15.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

15.2.1 Water Resources

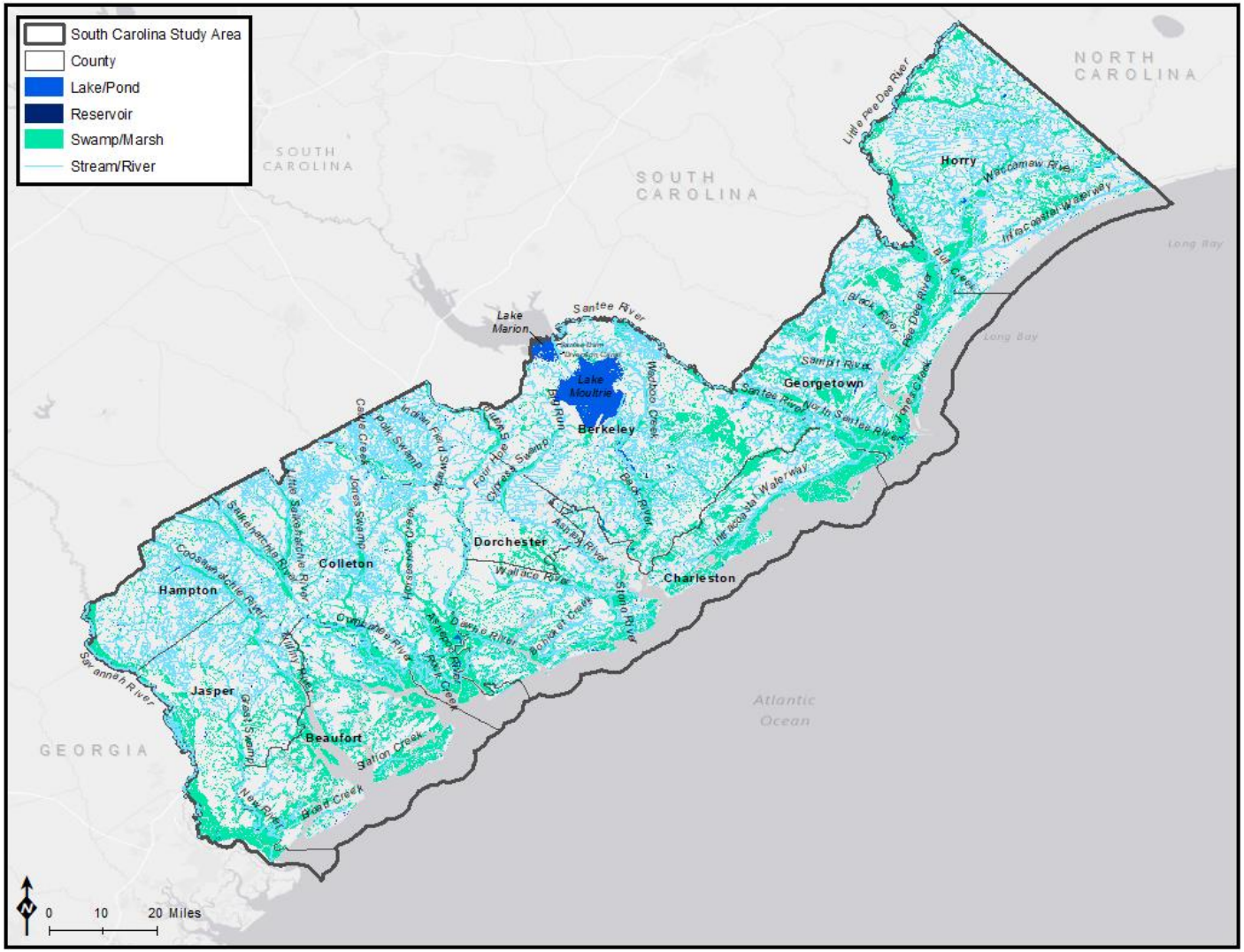
South Carolina's water resources include rivers, lakes, floodplains, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

15.2.1.1 Bays

As shown in Figure 15-3, a prominent water resource in the Study Area is Long Bay. Stretching through both Horry and Georgetown Counties, the Long Bay is a continuous 60-mile stretch of beach with Myrtle Beach at its center. This bay enjoys a mixture of nutrients from freshwater rivers and the ocean. Low oxygen events in the bay last only a few hours to several days and tend to occur from May through October. This typically occurs when summer winds combine with tides and longshore currents to limit mixing of waters, creating a relatively short-term, stratified low oxygen zone that is most pronounced in the tight convex curve of the upper bay. Bay salinity, temperature, turbidity, and oxygen levels are monitored to track and predict these low oxygen occurrences (SCE 2020).

In addition to Long Bay, the South Carolina coast also includes sounds, a series of inlets, as opposed to the distinct opening provided by a bay. To the south of Long Bay, nestled between Charleston, Colleton, and Beaufort Counties, St. Helena Sound is an estuary fed by the Ashepoo, Combahee, and Edisto Rivers, or the ACE Basin. At the southern tip of ACE Basin lies more than 10,000 acres of protected coastal plain and barrier islands known as the St. Helena Sound Heritage Preserve and Wildlife Management Area. Part of the National Estuarine Research Reserve System, this preserve is protected by open water boundaries, providing habitat for the loggerhead sea turtle, piping plover, peregrine falcon, wood stork, and southern bald eagle (SCDNR 2020).

South of St. Helena Sound, the Port Royal Sound is fed by many rivers in Beaufort County, including the Broad River. Developments along Port Royal Sound include the U.S. Marine Corps training facility at Parris Island along with Beaufort, Hilton Head, and Port Royal. While the Port Royal Sound receives waters from nutrient-rich Piedmont rivers and tannin stained coastal rivers, the majority of waters into this deep sound come from salty tidal straits and the Atlantic Ocean. Located on the southern edge of the ACE Basin, with deep channels and tidal ranges averaging over 8 feet, this estuary is rich in salt marshes providing habitat for a vast array of marine life including crabs, lobsters, shark, and fin fish. The Port Royal Sound also provides critical habitat for the loggerhead sea turtle and the piping plover (LowCountry Institute 2011).



Source: USGS 2019e

Figure 15-3. Hydrography in the South Carolina Study Area

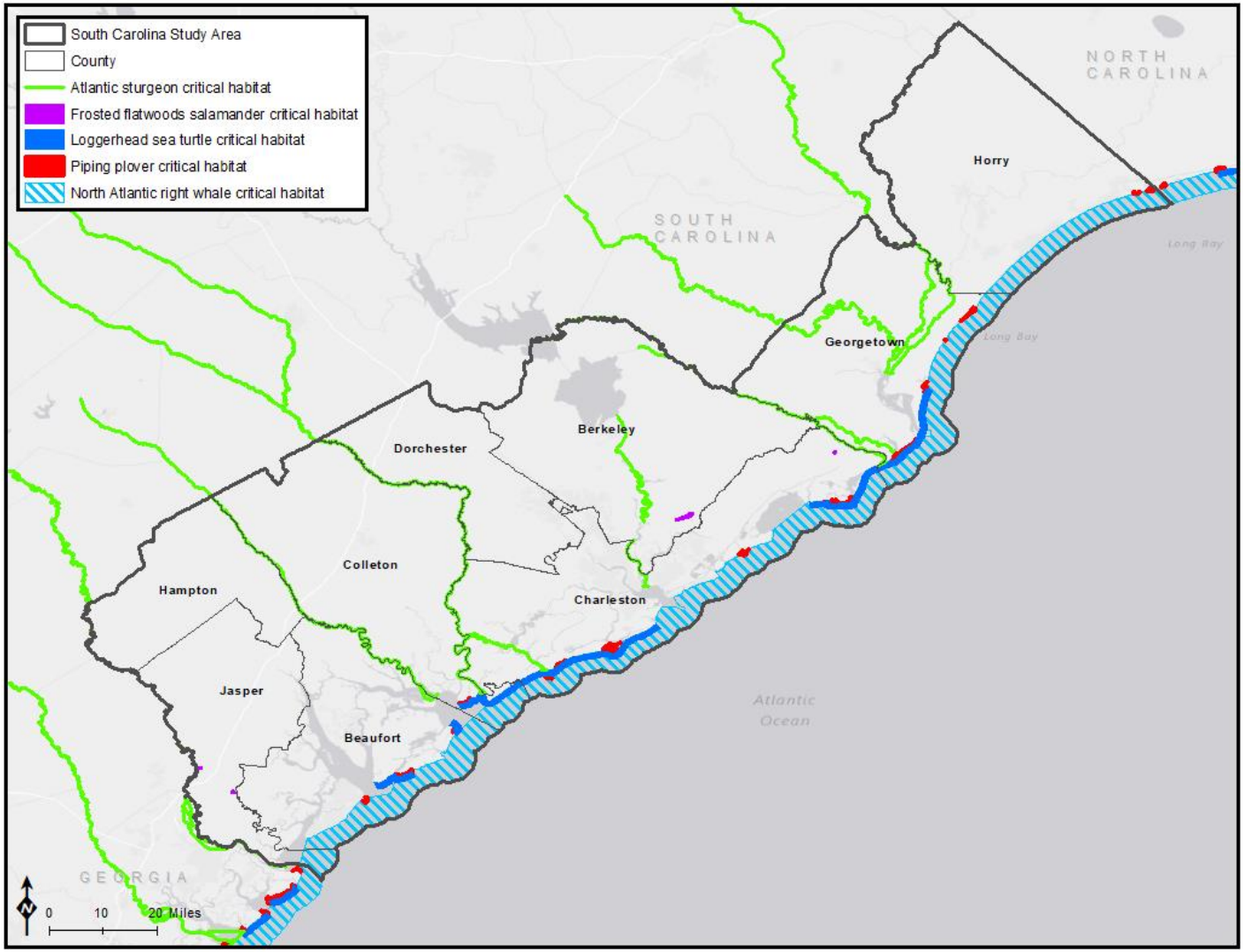
As shown in Figure 15-4, the South Carolina coastal region within the Study Area includes designated critical habitat for multiple species onshore and offshore. Onshore, critical habitats for the frosted flatwoods salamander are slightly inland, critical habitats for the piping plover and loggerhead sea turtle are on beaches and barrier islands along the coastline, and critical habitats for the Carolina and South Atlantic distinct population segments of the Atlantic sturgeon are in four rivers and three rivers, respectively. Offshore, the entire area off the South Carolina coastline is critical habitat for the North Atlantic right whale (southeastern U.S. calving area).

15.2.1.2 Rivers and Lakes

Within the Study Area, the major drainage basins from south to north include the Savanah Basin, the ACE Basin, the Catawba-Santee Basin, and the Yadkin-Pee Dee Basin, which all flow into the Atlantic Ocean (LowCountry Institute 2011). Figure 15-3 shows the major surface water bodies within the Study Area.

The Savannah River marks much of the border between Georgia and South Carolina. The headwaters of the Savannah are in Hart County in eastern Georgia where the Seneca River joins with the Tugaloo River forming the USACE Lake Hartwell Reservoir. The Savannah watershed includes parts of North Carolina, Georgia, and South Carolina. From its headwaters in the Piedmont at the juncture of the three States, the Savannah River flows 313 miles through high bluffs, forests, agricultural lands, and swamps, transporting nourishment and sediment to the Atlantic Coast 15 miles downstream of Savannah, Georgia. Averaging 12,040 cubic feet of water per second, the Savannah supplies water to Augusta City, Savannah City, and Plant Vogtle in Georgia while also supplying Beaufort City, Hilton Head City, and the Savannah River Site in South Carolina. In addition to Lake Hartwell (bordering Georgia and South Carolina), the USACE generates power and regulates flow of the Savannah with the Richard B. Russell and Clarks Hill (also called J. Strom Thurmond) Reservoirs (both straddling the border between Georgia and South Carolina). Leaving the Clarks Hill Dam, the Savannah traverses a series of shoals, crossing from the Piedmont into the Coastal Plain of Georgia and South Carolina. South of the Fall Line in Burke County, Georgia, a 100-foot, chalky white, vertical bluff of weathered limestone with giant fossilized oyster shells (Shell Bluff) marks a 50-million-year-old coastline. Once in the Coastal Plain, the Savannah meanders across its floodplain, becoming tidal about 28 miles upstream from the coast, building a braid of blackwater tributaries, tidal creeks, freshwater marshes, and salt marshes, including the Savannah National Wildlife Refuge (NWR) in both Georgia and South Carolina. At the City of Savannah, Georgia, the Savannah River has a tidal range sometimes exceeding 7 feet. Regular USACE dredging of the Savannah River Estuary is required to maintain a 42-foot depth at the Port of Savannah, where the Savannah River serves as the shipping channel (Georgia River Network 2019, NGE 2019c, NPS 2019d).

North and east of the Savannah Basin, the ACE Basin encompasses over 1,000,000 acres between Beaufort and Charleston and as of 2015, 217,156 acres of the ACE Basin are protected. The ACE Basin is the only major basin that lies entirely in South Carolina and contains three rivers each flowing together through its landscape: the Ashepoo, Combahee, and Edisto Rivers. The Ashepoo River is a blackwater river that rises from swamps near Walterboro and flows southeast. The entire course of the river is contained within Colleton County (Richardson 2011). The Combahee River is a blackwater river in the southern portion of the Study Area. It is formed at the confluence of the Salkehatchie and Little Salkehatchie Rivers, also within Colleton County. The Ashepoo and Combahee Rivers empty into Saint Helena Sound, which in turn empties into the Atlantic Ocean (Encyclopaedia Britannica 2009). The Edisto River is one of the longest free-flowing blackwater rivers in North America and the only major South Carolina river system that lies entirely within the State. It begins in Saluda County and Edgefield County and flows southeast through 10 more South Carolina counties until reaching Edisto Beach (Friends of the Edisto 2019).



Sources: USFWS 2019i, USFWS 2019j

Figure 15-4. Critical Habitat within the South Carolina Study Area

North of the ACE Basin lies a majority of the Catawba-Santee Basin, which is comprised of two rivers, each flowing together through its landscape: the Catawba River and the Santee River. The Catawba River begins in the Blue Ridge Mountains in North Carolina. It enters South Carolina, following the North Carolina/South Carolina border, and goes through Rock Hill, into the Piedmont and drains into Lake Wateree reservoir (Bayley 2006a). There, it converges with the Big Wateree Creek to become Wateree River. Santee River is the second largest river on the East Coast in terms of drainage and flow. The Santee is formed by the converging Wateree and Congaree Rivers, which ultimately enter Lake Marion, a reservoir held by the Santee Dam, and then Lake Moultrie. As the Santee River flows southeast, it forms the northeast boundary of the Frances Marion National Forest, an area of approximately 259,000 acres that includes protected flora and fauna. Shortly before emptying into the Atlantic Ocean, the river branches into two parallel channels, the South Santee and North Santee Rivers. These channels are separated by Cedar Island, which is part of the Santee Coastal Reserve (Reynolds 2016).

Northeast of the Catawba-Santee Basin lies the Yadkin-Pee Dee Basin, shared between North Carolina and South Carolina and includes both Yadkin and Pee Dee Rivers. The Yadkin River originates in Watauga County in North Carolina and flows southeast through Caldwell County. It then turns northeast and flows between nine different North Carolina counties, joining the Uwharrie River in Montgomery County to form the 435-mile Pee Dee River, which travels along county lines into South Carolina, draining into Winyah Bay. Along the way, the Lynches, the Little Pee Dee, the Black, and the Waccamaw each joins the Great Pee Dee before it widens into Winyah Bay and flows into the Atlantic Ocean (Bayley 2006b).

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. While South Carolina has approximately 29,898 miles of river; only 41.9 miles are designated as wild and scenic – slightly more than 1/10th of 1% of the State's river miles. The only designated wild and scenic river in South Carolina is a 41.9-mile stretch of the Chattooga River on the northwest corner of South Carolina, shared with North Carolina and Georgia. There are no designated wild and scenic rivers in the Study Area (USFWS 2019a).

15.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 (Floodplain Management) and Federal agency responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988; therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and would likely need to be considered during site selection for proposed future projects in the area.

As shown in Figure 15-5, floodplains are found in each county in the Study Area. Table 15-1 details the flood zone acreage within the geographic units of the Study Area. Note that the counties of Beaufort, Charleston, Georgetown, and Horry do not have digital floodplain data available for mapping at this scale at this time. Preliminary flood hazard data for these counties are available at https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=e7a7dc3ebd7f4ad39bb8e485bb64ce44.

Table 15-1. Floodplains in the South Carolina Study Area

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Beaufort[1]	NA	NA	NA	NA
Berkeley	226,034	32.0	10,348	1.5
Charleston[1]	NA	NA	NA	NA
Colleton	213,351	31.6	23,440	3.5
Dorchester	102,441	28.2	3,654	1.0
Georgetown[1]	NA	NA	NA	NA
Hampton	71,368	19.9	0	0
Horry[1]	NA	NA	NA	NA
Jasper	213	0.1	0	0
Study Area Total	**614,413**	**13.0**	**37,449**	**0.8**

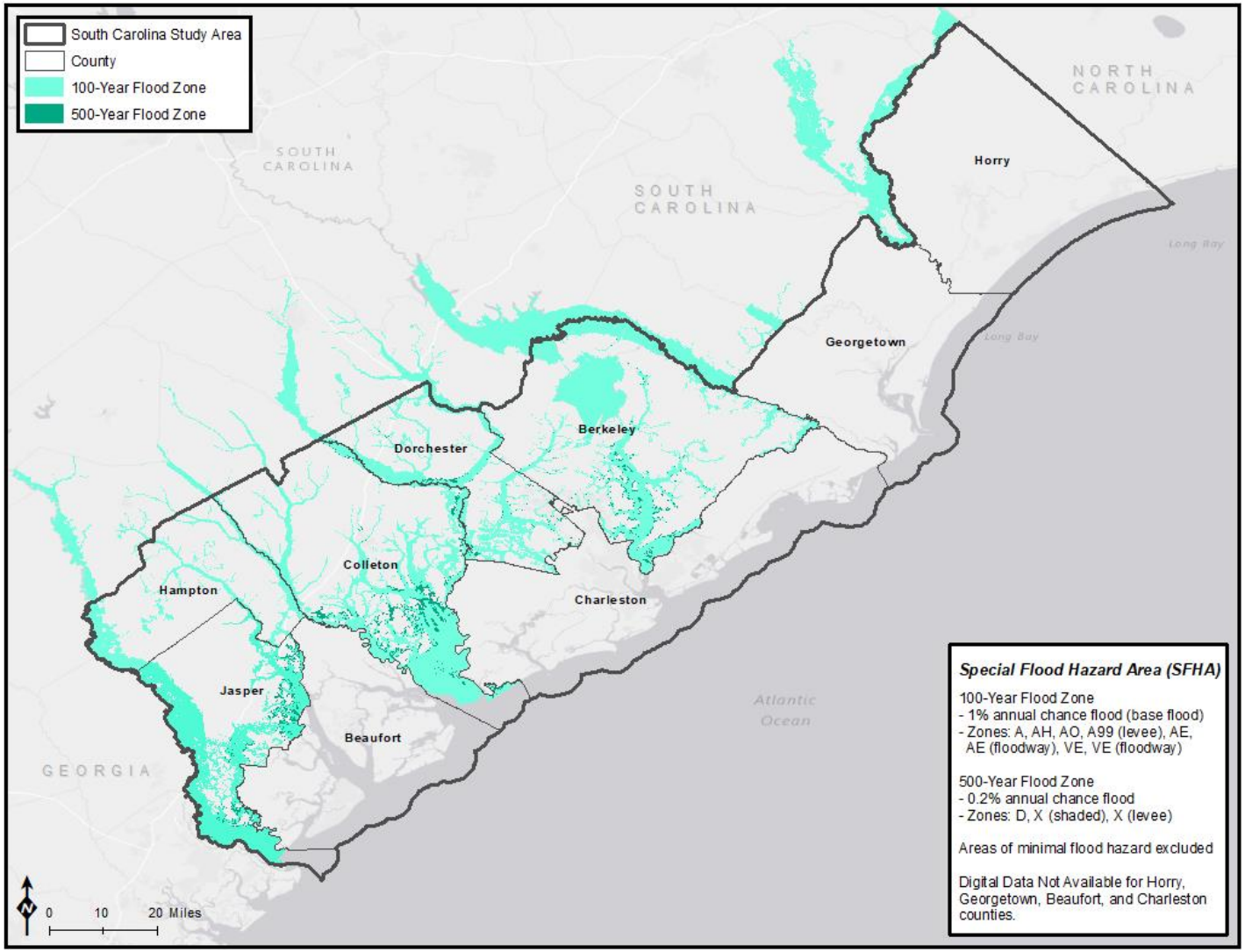
Sources: USFWS 2019i, USFWS 2019j
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.
[1] – Digital floodplains data for Beaufort, Charleston, Georgetown, and Horry Counties are not available.

These preliminary data are for review and guidance purposes and are subject to change until FEMA determines them to be "effective," or final (City of Charleston 2020). Floodplains are located throughout these four counties along the coast, rivers, and tributaries. Nuisance flooding in coastal cities is increasingly common, and all areas are vulnerable to floods from severe storm events, as discussed in Chapter 15.2.2 (Peterson and Porter 2020). Future OCS-related project analysis will need to consider updated floodplain data to determine the potential for impacts to floodplains. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding (ESRI 2020a, Petersen and Porter 2020).

15.2.1.4 Wetlands

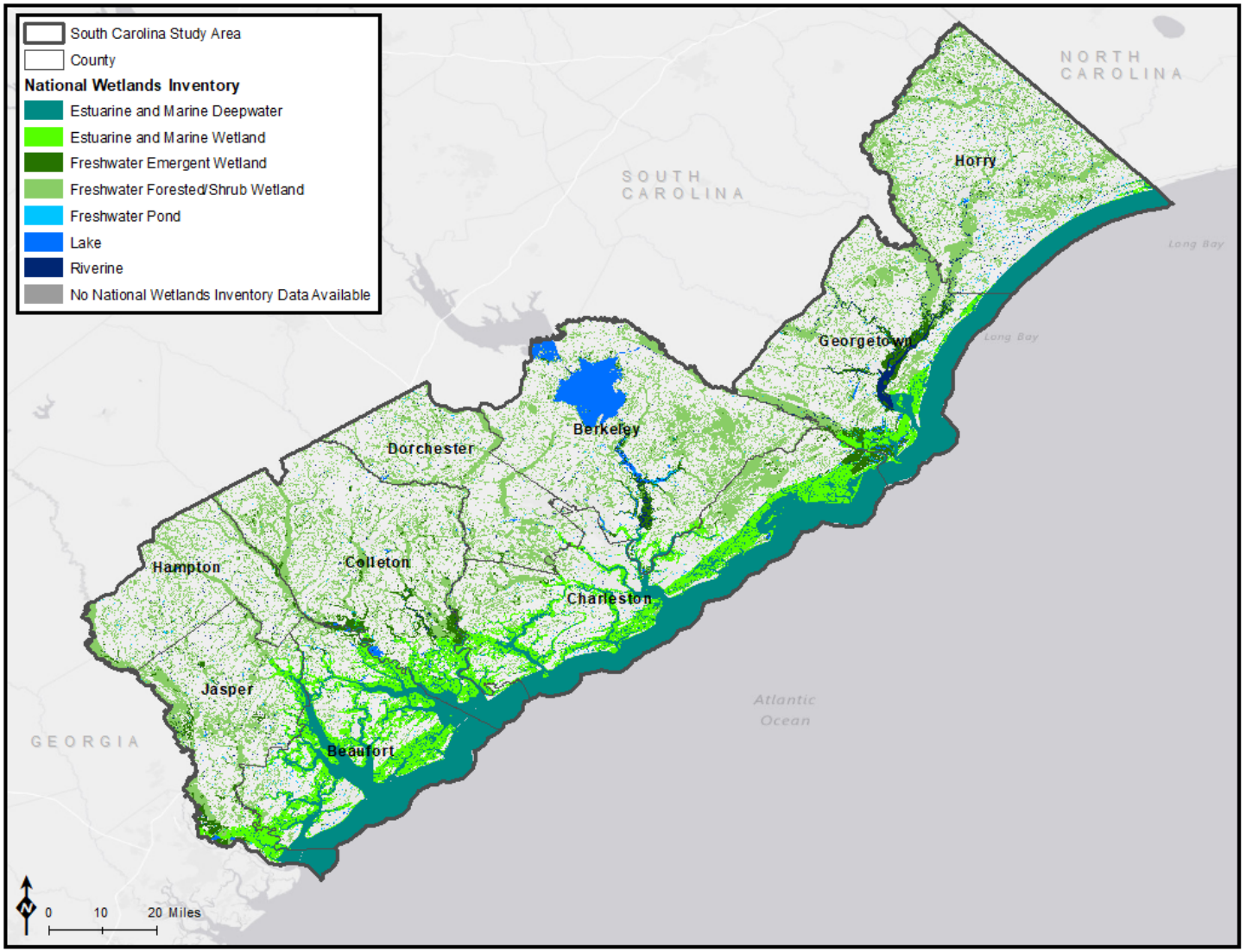
Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. As seen in Figure 15-6, wetlands are a large part of the land area in many of the Study Area counties.

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 15-2 details the wetland acreage in the Study Area, along with other water resources (FGDC 2013, USFWS 2019c).



Source: FEMA 2019b

Figure 15-5. Floodplains of the South Carolina Study Area



Source: USFWS 2018a

Figure 15-6. Wetlands in the South Carolina Study Area

Table 15-2. Wetlands in South Carolina Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Beaufort	401,729	138,298	6,033	35,009	216,713	1,164	3,731	780
Berkeley	315,658	7,296	17,098	203,472	5,206	70,536	4,206	7,845
Charleston	543,169	147,196	17,003	104,953	266,529	1,628	4,056	1,803
Colleton	298,924	37,342	32,118	169,793	50,226	3,001	2,153	4,291
Dorchester	115,614	1,104	3,368	106,730	289	820	1,268	2,035
Georgetown	350,570	30,688	32,692	143,799	117,539	3,320	2,814	19,719
Hampton	108,941	0	4,753	100,042	0	350	1,235	2,562
Horry	343,331	3,111	8,972	241,033	70,913	1,384	7,439	10,479
Jasper	209,846	30,071	20,127	123,686	28,417	1,309	1,763	4,473
Study Area Total	**2,687,783**	**395,106**	**142,164**	**1,228,517**	**755,832**	**83,510**	**28,666**	**53,987**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or national level.

The Emergency Wetlands Act, enacted in 1986 along with the CZMA and amendments, encourages wetland protection through funding incentives. The Emergency Wetland Resources Act requires States to include wetland protection in their Comprehensive Plans in order to qualify for Federal funding for recreational land within the State. The NPS provides guidance for the wetland section of the Comprehensive Plan. Coastal states that adopt coastal zone management programs and plans approved by NOAA are eligible for Federal funding and technical assistance through the CZMA. South Carolina regulates coastal wetlands under the South Carolina Coastal Management Act. This means that the South Carolina Coastal Council regulates any activities pertaining to the filling, removing, dredging, draining, constructing, or in any way altering any critical area within the nine coastal counties that are under its jurisdiction. The State Coastal Management Act provides 10 criteria to guide the Coastal Council in determining whether to issue a permit. Two of the key criteria are "1) a comparison of economic benefits to preservation benefits and 2) the extent to which all feasible safeguards to avoid adverse economic impact are considered. Under the Coastal Council regulations, dredging and filling wetlands is undertaken only if the activity is water dependent and no feasible alternatives exist. Applications are denied for purposes other than access, navigation, mining, or drainage unless an overriding public interest can be demonstrated" (USFWS 1991).

15.2.1.5 Groundwater

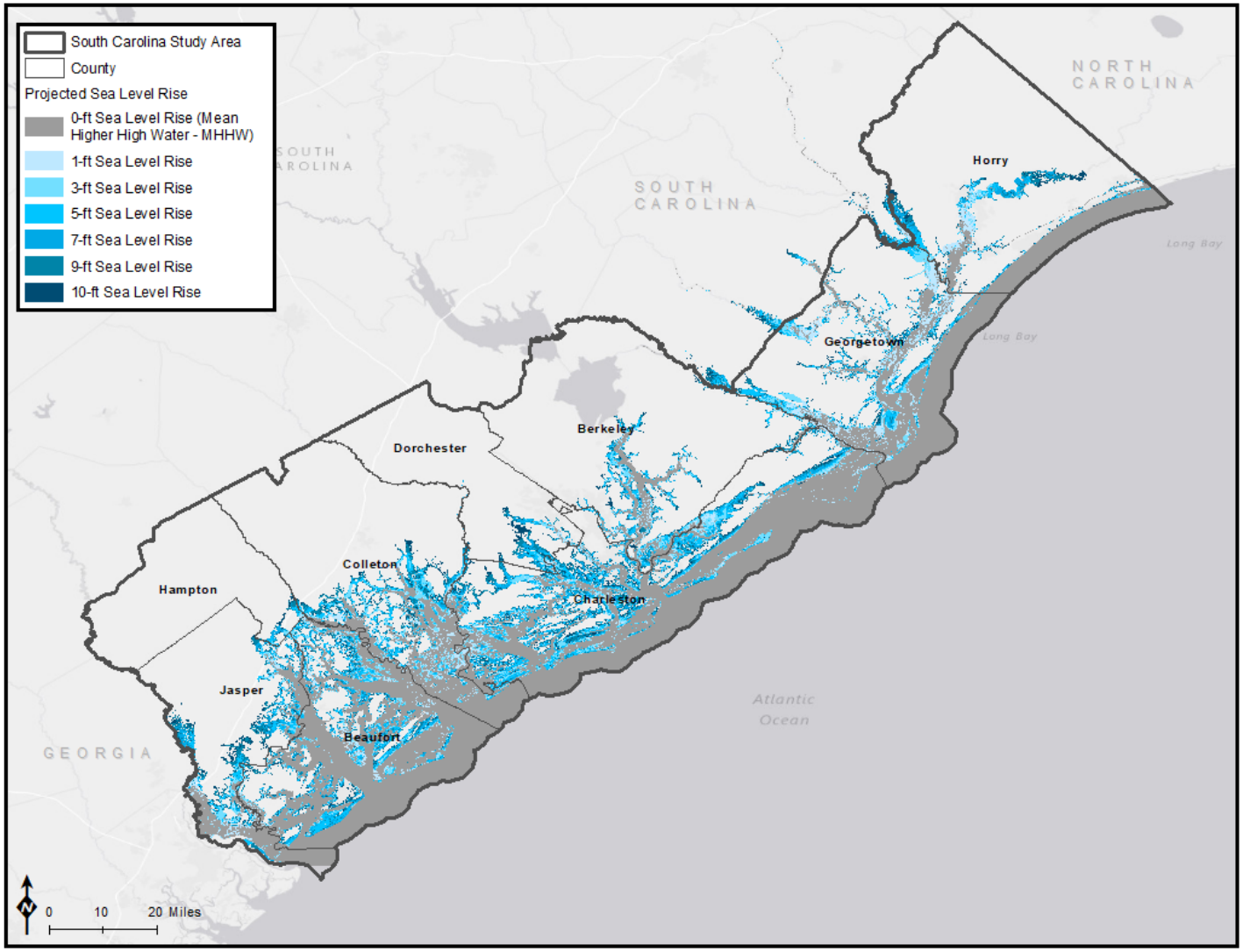
Groundwater is plentiful throughout the Study Area, particularly within the Coastal Plain. The groundwater aquifers within the Coastal Plain are mostly sands, silts, and clay, as well as some sedimentary rock such as limestone. The South Carolina Department of Natural Resources maintains a groundwater-level monitoring network of more than 180 wells in the State, and groundwater use in the Coastal Plain aquifers in South Carolina has increased during the past 70 years as the population increased along with demands for municipal, industrial, and agricultural water needs (Campbell and Coes 2010). As the surrounding population and industrial facilities or processes increase, there is a possibility that it could become increasingly more difficult to draw water from the aquifers in the Study Area. Additionally, groundwater withdrawals in the Hilton Head area are so extensive that salt water enters the available space, resulting in saltwater contamination of the previously freshwater resource (USEPA 2013).

15.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate-driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate with planning and future decision making.

15.2.2.1 Sea Level Rise

Figure 15-7 shows NOAA's results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of a 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account the local effects from geology (subsidence or vertical land movement), hydrography, or physiological effects like erosion.



Source: NOAA 2018a

Figure 15-7. Projected Sea Level Rise throughout the South Carolina Study Area

The sea level off South Carolina's coast is up to 10 inches higher than it was in 1950, due to both global sea level rise and subsidence (Sea Grant Consortium and Tibbetts 2009, SeaLevelRise.org 2019). According to NOAA, the current relative sea level trend in Charleston, South Carolina is 3.32 millimeters/year (0.13 inches/year) based on monthly mean sea level data from 1901 to 2019 (NOAA 2020d, SCEMD 2018). Subsidence is particularly problematic in Charleston, where river delta sediments are naturally compressing. Over the past 70 years, Charleston Harbor has sunk roughly 6 inches while global sea level rise has increased 6 inches, resulting in a foot of relative sea level rise (Sea Grant Consortium and Tibbetts 2009). To the south in Beaufort County, long-term tide gauge data from Fort Pulaski, Georgia is used as a proxy. Since the station's establishment in 1935, relative mean sea level has risen an average of 0.12 inches/year (Georgia Conservancy 2019, Sea Grant Consortium 2015). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the South Carolina Study Area is 0.14 inches/year (NOAA 2019b).

Beaufort, Georgetown, and Colleton Counties are predicted to lose the most land area (SCEMD 2018). A Georgia Conservancy sea level rise study using the same Fort Pulaski tidal gauge data indicates that by 2110, the water level along Georgia's coast will be 1 meter above today's levels, undeveloped dry land on the coast could be reduced by 8%, and open water could increase by 10%. The predicted rates for Fort Pulaski (as a proxy for Beaufort County) correspond to 0.43 inches of sea level rise per year, which is over three times the current global rate (Georgia Conservancy 2019). Table 15-3 shows comparisons of potential sea level rise scenarios in South Carolina coastal counties. Impacts from sea level rise within the Study Area include beach erosion and increased nuisance flooding. Beaches along the South Carolina coast erode and accrete at starkly different rates of change. At Kiawah Island, beaches are steadily accreting, while at Hunting Island, beaches are eroding at significant rates (Sea Grant Consortium and Tibbetts 2009). Prior to 1996, Hunting Island had experienced shoreline erosion at the rate of approximately 130,000 square meters/year over 140 years. Between 1920 and 1971, the shoreline retreated 5-7 meters/year, leaving a famous "boneyard beach," protected only by regular beach nourishment (CSE 2014, Fastenau 2019, Petersen 2019). Shoreline trends of erosion and accretion are predicted to continue over time (Sea Grant Consortium and Tibbetts 2009). Nuisance flooding in Charleston has increased from an average of 2 days of flooding per year in the 1970s to roughly 44 days of minor coastal flooding a year from 2018 to 2019 (Sea Grant Consortium and Tibbetts 2009, SeaLevelRise.org 2019). Some analyses predict 180 days of tidal flooding a year by 2045. There are currently over 90,000 properties at risk from nuisance flooding in South Carolina (SeaLevelRise.org 2019). Charleston is the largest city in the southern portion of the State. The city has identified flood mitigation measures to protect the city which could cost as much as $2 billion and require decades to complete (Smith and Bartelme 2017).

As a result of the effects of sea level rise that South Carolina is already experiencing, the State has established several proactive regulations and organizations to anticipate and adjust for increasing sea level rise. Twenty years ago, a Blue Ribbon Panel was established to address beach erosion. The panel developed recommendations for State beach management policies, including the Beachfront Management Act of 1988 (SCDHEC 2010, SCDHEC 2019). In 2009, a Shoreline Change Advisory Committee evaluated existing coastal management practices given new sea level rise projections (Sea Grant Consortium and Tibbetts 2009). Over the past 20 years, these proactive regulations have significantly limited development and hard stabilization of the shoreline in South Carolina (SCDHEC 2019).

Table 15-3. Projected Inundation from Modeled Sea Level Rise Scenarios

Geographic Unit	0.6m SLR Inundation Water Depths (feet)				1m SLR Inundation Water Depths (feet)				2m SLR Inundation Water Depths (feet)			
	Maximum	Average	Inundated (square miles)	Inundated >2 feet	Maximum	Average	Total Land Area Inundated	Inundated >2 feet	Maximum	Average	Total Land Area Inundated	Inundated >2 feet
Beaufort	7.5	0.7	117	7	8.9	1.1	191	35	12.1	3.4	265	200
Charleston	5.9	1.0	40	5	7.3	1.7	58	17	10.5	3.5	93	66
Colleton	5.8	1.1	37	5	7.1	1.1	104	11	10.4	3.3	172	129
Georgetown	1.6	0.2	62	0	6.7	1.2	147	25	9.9	3.3	207	159
Horry	2.2	0.2	0	0	8.3	1.3	38	4	11.5	3.6	59	47
Jasper	6.5	2.0	12	4	7.8	0.9	53	5	11.1	3.1	99	73

Source: SCEMD 2018

15.2.2.2 Storm Surge

Figure 15-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the South Carolina coastline. It is assumed that storm surge under that worst-case scenario would be incrementally farther inland in certain areas as compared to the Category 4 scenario.

Since 1954, South Carolina has experienced 31 federally declared disasters but has not been hit directly by a major hurricane since Hurricane Hugo in 1989 (Sea Grant Consortium and Tibbetts 2009, SCEMD 2018). Hurricane Hugo was one of the most significant disasters experienced in South Carolina and resulted in $10 billion in damage (SCEMD 2018).

15.2.3 Summary – Physical Characteristics

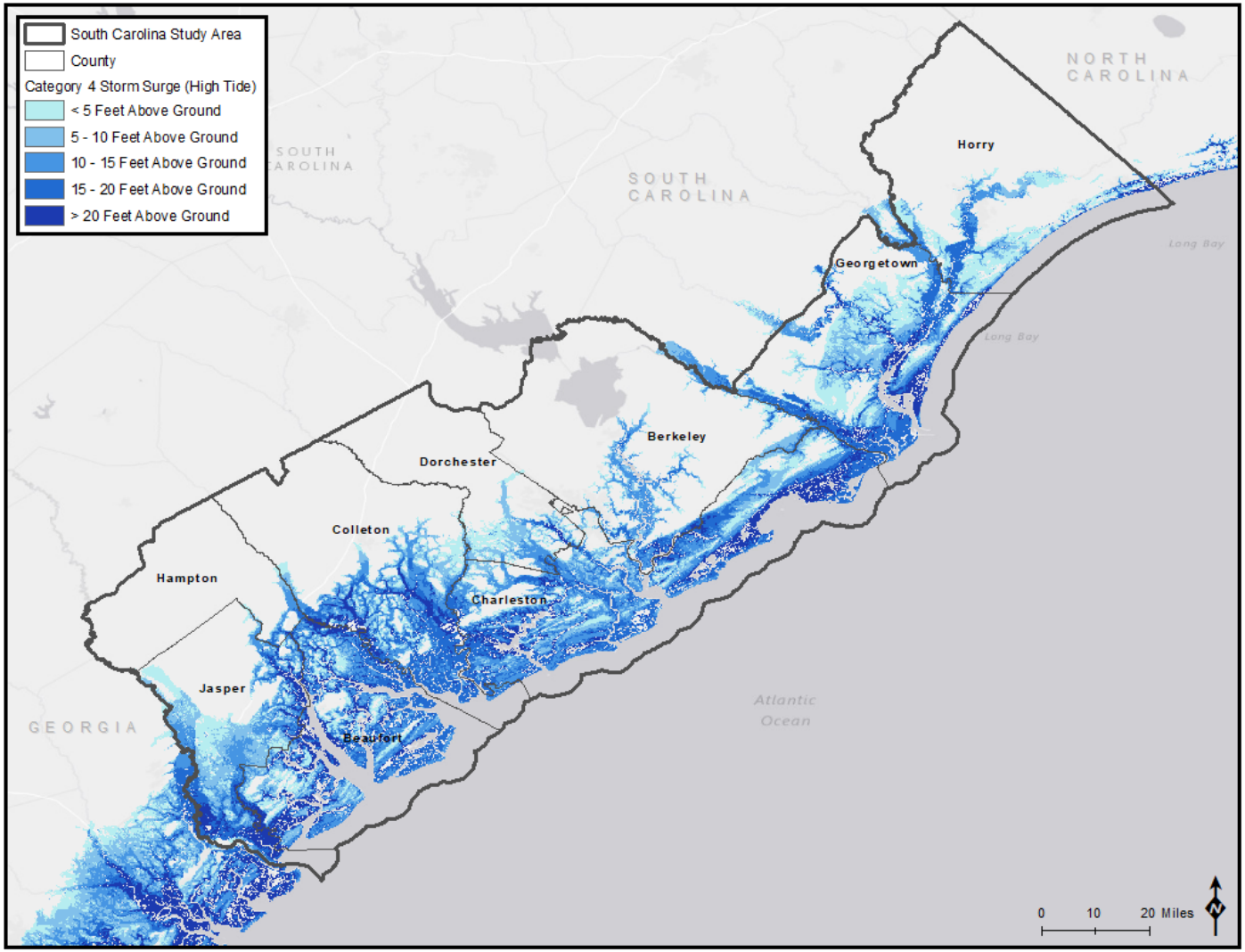
Rivers, lakes, floodplains, and wetlands are all essential water resources throughout the Study Area. Critical habitat is present within the Study Area for the frosted flatwoods salamander, piping plover, loggerhead sea turtle, and Atlantic sturgeon. Offshore of the offshore area along the entire coastline of South Carolina is critical habitat for the North Atlantic right whale.

Floodplains and wetlands are found throughout the Study Area. Note that the counties of Beaufort, Charleston, Georgetown, and Horry do not have digital floodplain data available for mapping at this scale at this time. It is evident that floodplains from surrounding counties do extend into these four counties. Future OCS-related project analysis will need to consider updated floodplain data to determine the potential for impacts to floodplains. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

South Carolina regulates coastal wetlands under the South Carolina Coastal Management Act. This means that the South Carolina Coastal Council regulates any activities pertaining to the filling, removing, dredging, draining, constructing, or in any way altering any critical area within the nine coastal counties that are under its jurisdiction. “Under the Coastal Council regulations, dredging and filling wetlands is undertaken only if the activity is water dependent and no feasible alternatives exist. Applications are denied for purposes other than access, navigation, mining, or drainage unless an overriding public interest can be demonstrated” (USFWS 1991).

Sea level rise and subsidence are an issue in the Study Area. Subsidence is particularly problematic in Charleston, where river delta sediments are naturally compressing. Over the past 70 years, Charleston Harbor has sunk roughly 6 inches while global sea level rise has increased 6 inches, resulting in a foot of relative sea level rise (Sea Grant Consortium and Tibbetts 2009). Beaufort, Georgetown, and Colleton Counties are predicted to lose the most land area as a result of sea level rise (SCEMD 2018). A Georgia Conservancy sea level rise study using the same Fort Pulaski tidal gauge data indicates that by 2110, the water level along Georgia’s coast will be 1 meter above today’s levels, undeveloped dry land on the coast could be reduced by 8%, and open water could increase by 10%. The predicted rates for Fort Pulaski (as a proxy for Beaufort County) correspond to 0.43 inches of sea level rise per year, which is over three times the current global rate (Georgia Conservancy 2019).

Beaches along the South Carolina coast erode and accrete at starkly different rates of change. At Kiawah Island, beaches are steadily accreting, while at Hunting Island, beaches are eroding at significant rates (Sea Grant Consortium and Tibbetts 2009); the island is currently protected by regular beach nourishment (CSE 2014, Fastenau 2019, Petersen 2019).



Source: NOAA 2020a

Figure 15-8. Projected Storm Surge throughout the South Carolina Study Area for a Category 4 Hurricane

Nuisance flooding in Charleston has increased from an average of 2 days of flooding per year in the 1970s to roughly 44 days of minor coastal flooding a year from 2018 to 2019 (Sea Grant Consortium and Tibbetts 2009, SeaLevelRise.org 2019). Some analyses predict 180 days of tidal flooding a year by 2045. There are currently over 90,000 properties at risk from nuisance flooding in South Carolina (SeaLevelRise.org 2019). Storm surge can also contribute to flooding issues.

As a result of the effects of sea level rise that South Carolina is already experiencing, the State has established several proactive regulations and organizations to anticipate and adjust for increasing sea level rise including the Beachfront Management Act of 1988 (SCDHEC 2010, SCDHEC 2019) and implementation of proactive regulations that limit development and hard stabilization of the shoreline in South Carolina based on 2009 Shoreline Change Advisory Committee recommendations (SCDHEC 2019).

15.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

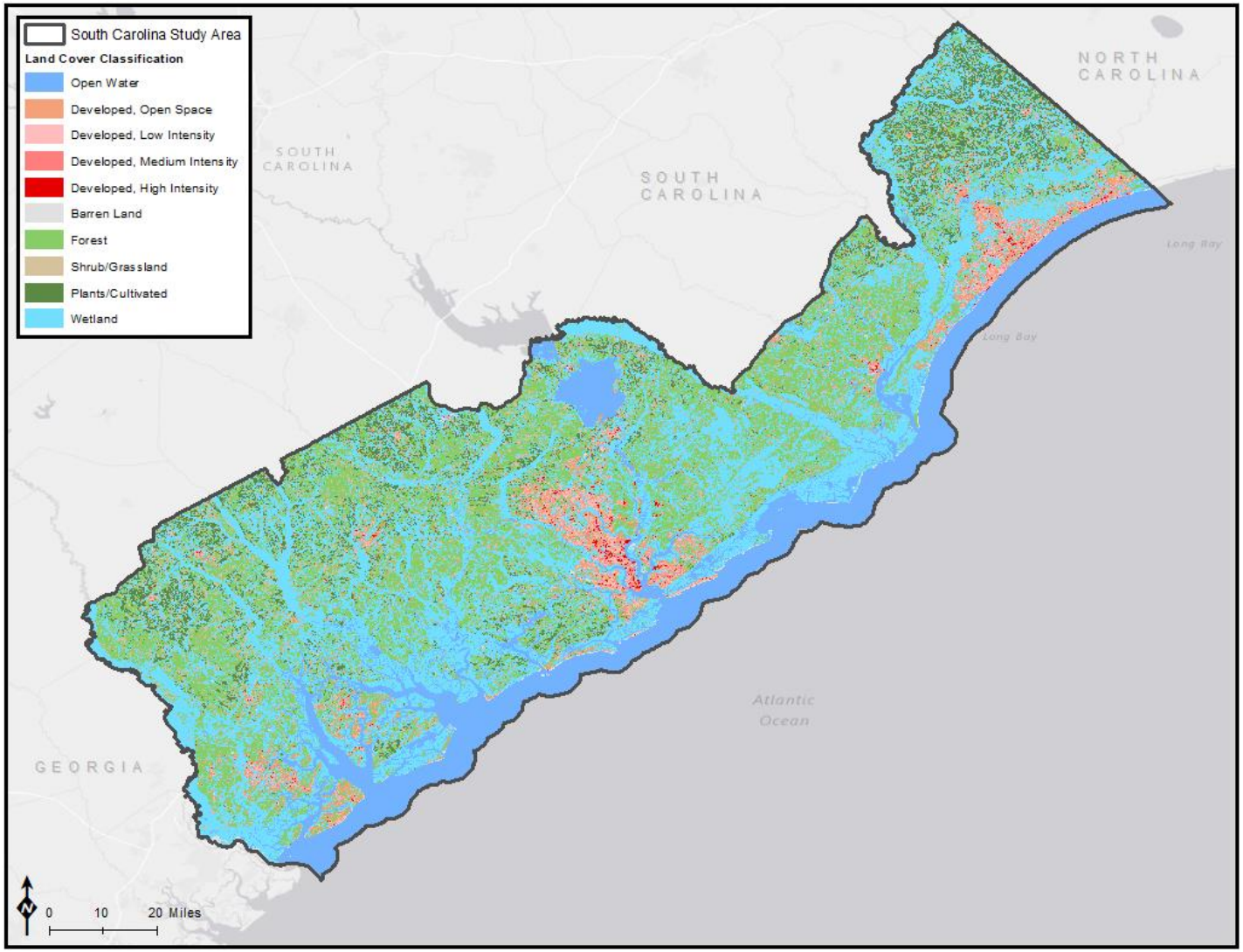
15.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the U.S., including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data are available for future assessments.

Figure 15-9 displays the NLCD data for the Study Area based on the 2016 data release. Table 15-4 presents the NLCD data for each county within the State by acreage. Table 15-5 presents the NLCD data for each county within the State by percentage and presents a summary of the overall land cover for each geographic unit. Open water land use was excluded in Table 15-5 because this type of land cover would not be considered in future industrial development. Each county was then categorized based on its land cover trend as shown in Table 15-5. The following section discusses the key findings of this analysis.

The general land cover within the nine counties within the Study Area varies, with urban development more concentrated along the immediate coasts of the Atlantic Ocean while rivers and forests and agricultural lands are found farther inland. It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serve as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of South Carolina may be classified as forest, they could actually range from suburban areas to national forests. Therefore, the classification of “forest” is very broad.

Table 15-5 presents an assessment of the general land cover for each of the nine counties in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 15-5, Figure 15-9 shows the majority land cover type within each county in the Study Area.



Source: NLCD 2016a

Figure 15-9. National Land Cover in the South Carolina Study Area

Table 15-4. Acres of Land Cover by NLCD Classifications in South Carolina Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Beaufort	591,014	37,675	12,441	5,204	938	56,258	2,131	83,887	9,874	10,225	193,005	235,635
Berkeley	789,683	39,898	18,812	6,820	2,317	67,847	2,374	267,406	28,523	36,096	303,276	84,160
Charleston	860,451	41,648	31,372	14,010	5,751	92,781	6,187	146,754	7,885	22,816	310,326	273,702
Colleton	725,300	25,236	4,869	920	305	31,332	792	229,034	32,278	59,048	312,702	60,114
Dorchester	365,558	24,243	11,398	3,146	880	39,667	906	119,506	13,345	45,580	142,019	4,535
Georgetown	662,489	31,538	7,655	2,332	630	42,155	2,805	198,130	19,167	15,600	241,219	143,414
Hampton	360,131	11,603	4,475	843	176	17,097	103	113,299	31,730	61,711	134,561	1,631
Horry	802,810	59,565	36,849	15,655	3,726	115,795	1,677	108,528	28,271	136,461	327,802	84,275
Jasper	449,011	14,560	4,047	1,338	284	20,229	3,298	140,264	23,755	16,292	211,072	34,103
Study Area Total	**5,606,448**	**285,967**	**131,919**	**50,267**	**15,007**	**483,160**	**20,272**	**1,406,808**	**194,827**	**403,828**	**2,175,982**	**921,570**

Source: NLCD 2016a
Note: Due to the vast quantity of data involved, land cover calculations are not provided at the State or national level.

Table 15-5. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties in the South Carolina Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Beaufort	10.6	3.5	1.5	0.3	15.8	0.6	23.6	2.8	2.9	54.3	Forest/Wetland
Berkeley	5.7	2.7	1.0	0.3	9.6	0.3	37.9	4.0	5.1	43.0	Forest/Wetland
Charleston	7.1	5.4	2.4	1.0	15.8	1.1	25.0	1.3	3.9	52.9	Forest/Wetland
Colleton	3.8	0.7	0.1	0.1	4.7	0.1	34.4	4.9	8.9	47.0	Forest/Wetland
Dorchester	6.7	3.2	0.9	0.2	11.0	0.3	33.1	3.7	12.6	39.3	Forest/Wetland
Georgetown	6.1	1.5	0.5	0.1	8.1	0.5	38.2	3.7	3.0	46.5	Forest/Wetland
Hampton	3.2	1.3	0.2	0.1	4.8	0.0	31.6	8.9	17.2	37.5	Forest/Wetland
Horry	8.3	5.1	2.2	0.5	16.1	0.2	15.1	3.9	19.0	45.6	Wetland
Jasper	3.5	1.0	0.3	0.1	4.9	0.8	33.8	5.7	3.9	50.9	Forest/Wetland
Study Area Total	**6.1**	**2.8**	**1.1**	**0.3**	**10.3**	**0.4**	**30.0**	**4.2**	**8.6**	**46.5**	**Forest/Wetland**

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

As shown in Table 15-6, all of the counties within the Study Area are predominantly covered by a combination of forest and wetland with the exception of Horry County, which is predominantly wetland. As described previously, "forest" land cover in the State of South Carolina could range from natural forested areas to neighborhoods in suburban areas. Some of these areas are, therefore, likely indicative of wooded suburban landscapes. None of the counties have urban development over 20%. Counties with denser urban development are Charleston, Dorchester, and Berkeley, which are referred to as the tri-county area surrounding the city of Charleston; Beaufort County due to Hilton Head, Bluffton, and Beaufort; and Horry County due to Murrell's Inlet, Myrtle Beach, and North Myrtle Beach. There is also a small area of dense urban development immediately surrounding Georgetown in Georgetown County. Although all counties have room for development, development may be impeded by the amount of wetlands. Dorchester and Hampton Counties have relatively less wetland than other counties, but only Dorchester County has urban infrastructure to support industrial development (NLCD 2016a).

Table 15-6. Major Land Cover within Each County in the South Carolina Study Area

Predominant Land Cover Type(s)	Count	Geographic Units
Forest/Wetland	8	Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Hampton, Jasper
Wetland	1	Horry

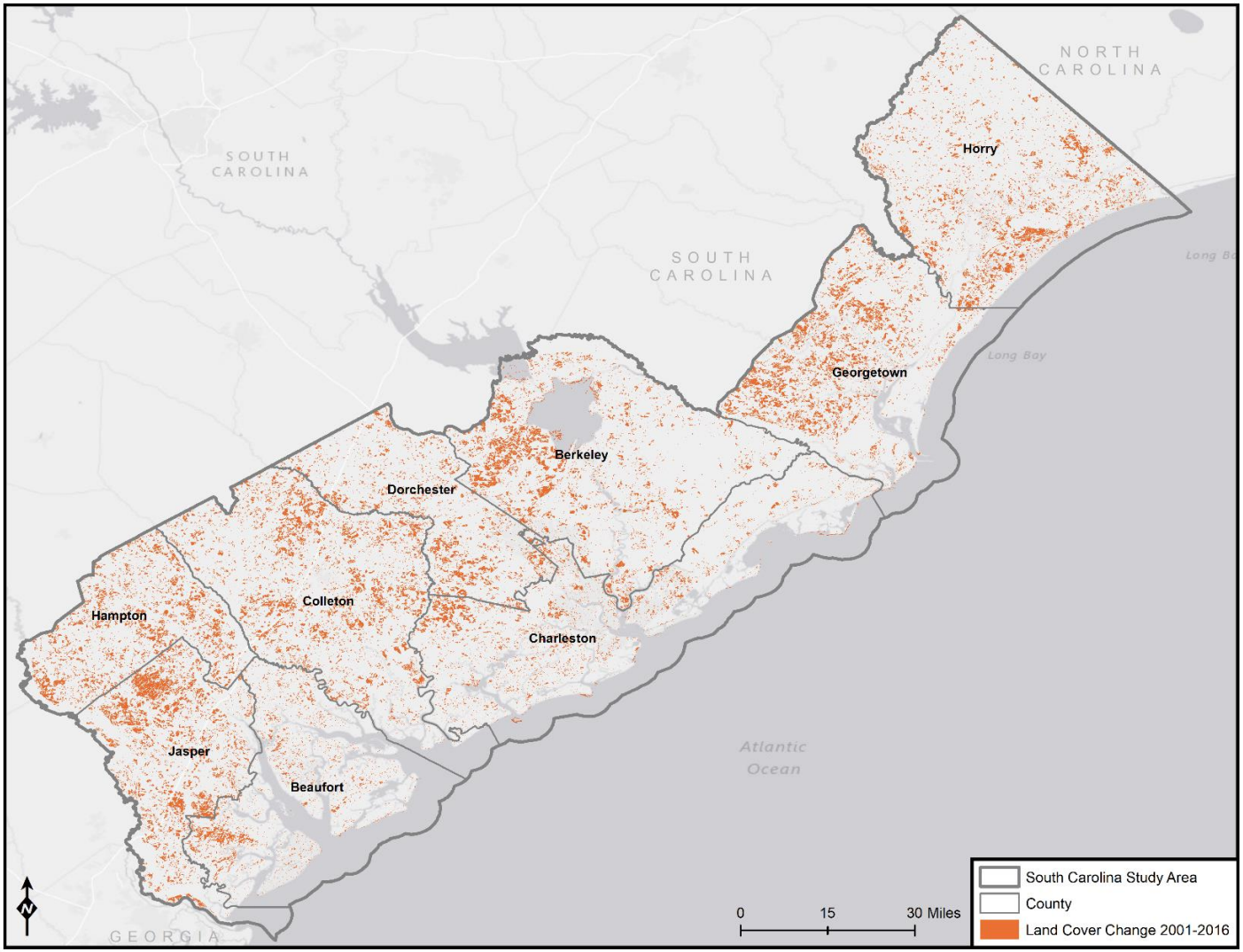
Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 states from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once. In South Carolina, 9.3% of the land cover in the Study Area changed at least once. Figure 15-10 and Table 15-7 show the land cover change within the Study Area from 2001 to 2016. Jasper County experienced the most significant land cover change at 15.4%. These changes were not driven by any specific discernable patterns. Beaufort County experienced the least land cover change at 4.6% followed closely with Charleston County at 4.8%. Most of the change in these two counties was from one type of developed land cover to another and occurred within the urban areas. It is likely that land cover change in the extensive wetland areas in several of these counties is controlled and minimized through regulations.

Table 15-7. Land Cover Change in the South Carolina Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Beaufort	591,028	26,913	4.6
Berkeley	789,683	71,289	9.0
Charleston	869,114	41,946	4.8
Colleton	725,303	83,739	11.5
Dorchester	365,557	38,862	10.6
Georgetown	662,501	74,306	11.2
Hampton	360,131	52,584	14.6
Horry	802,817	65,917	8.2
Jasper	449,012	69,109	15.4
Study Area Total	**5,615,146**	**524,665**	**9.3**

Source: NLCD 2001-2016



Source: NLCD 2001-2016

Figure 15-10. Land Cover Change in the South Carolina Study Area

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types, such as Beaufort, Charleston, and Horry Counties. Dorchester and Berkeley County, because of their proximity to the city of Charleston may also support future industrial development. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities and will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development.

It is also likely that future industrial development would want to avoid counties that are much less developed and have a larger proportion of undisturbed land covers, particularly wetlands which would require additional permitting if development is allowed at all. All of the counties in the Study Area fall into this category, although Georgetown County may support additional development given its proximity to other developed counties.

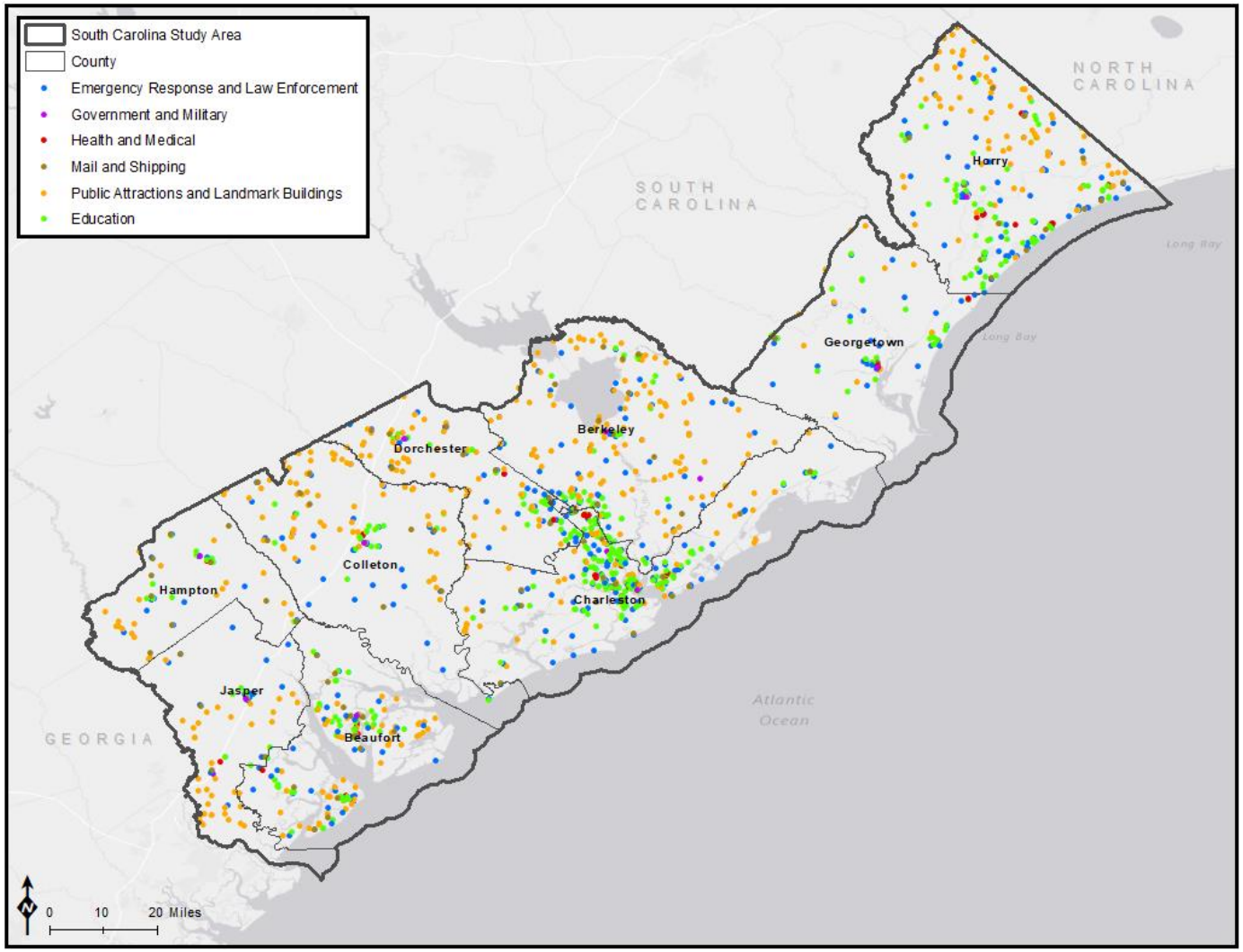
Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including Beaufort, Berkeley, Charleston, Dorchester, Georgetown, and Horry Counties would be the most suitable counties to accommodate future industrial coastal projects.

15.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses within the Study Area.

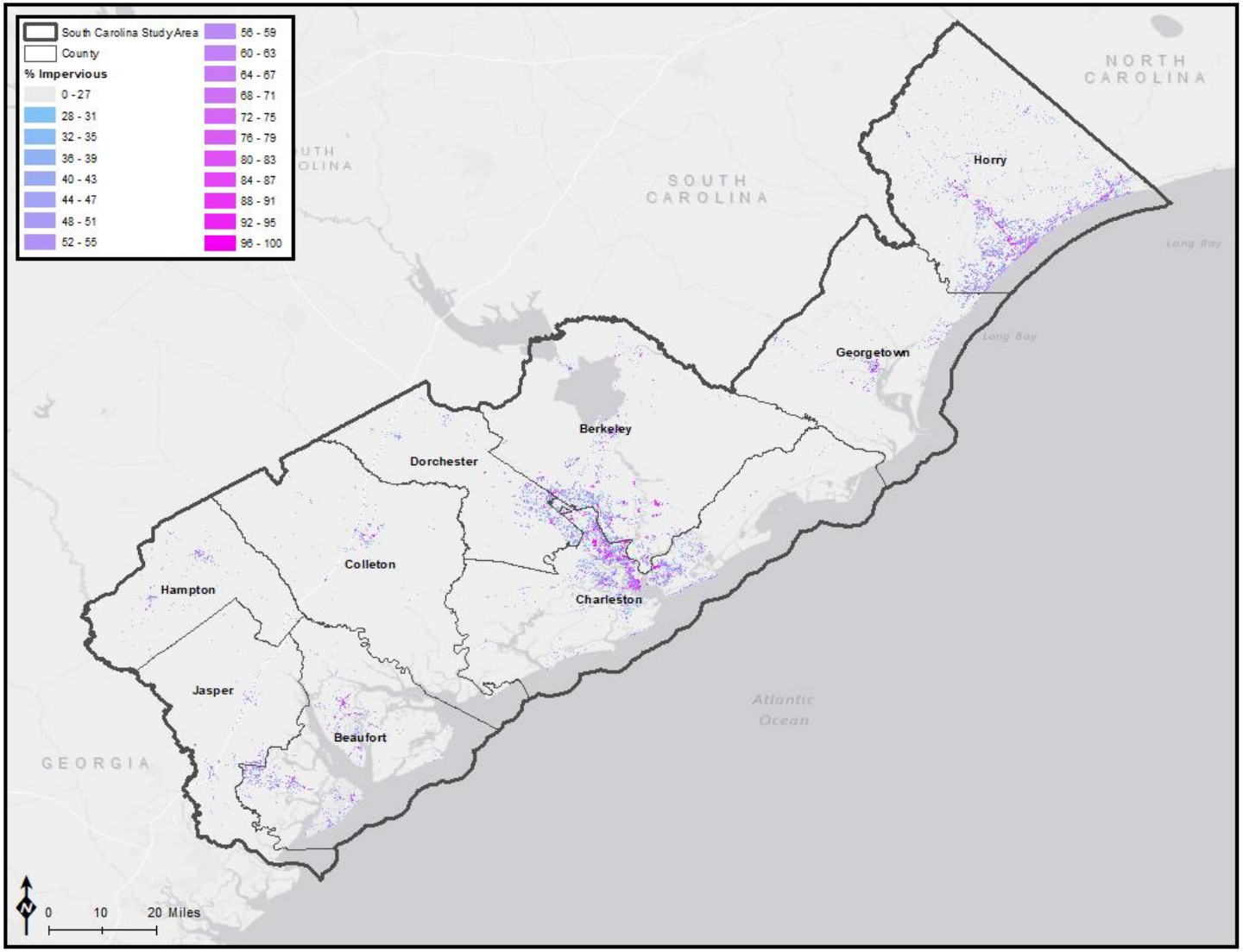
15.3.2.1 Existing and Future Land Use

The land cover data provide an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data are enhanced by the application of more detailed ground-based information. Figure 15-11 presents point locations of select infrastructure to provide a broad look at existing land uses within the Study Area. Figure 15-12 shows impervious areas across the Study Area. These figures show the relationship between land cover analysis, which identified developed areas in Chapter 15.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 15-11. Select Existing Land Uses within the South Carolina Study Area



Source: NLCD 2016b

Figure 15-12. Impervious Surfaces within the South Carolina Study Area

A more refined analysis of land use could be developed at a regional or local level by incorporating information from local land management plans and zoning maps. Each county within the Study Area has developed a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents. Zoning is discussed in more detail in Chapter 15.3.2.2.

In summary, existing land use data show there are higher concentrations of various types of land use within the urban developed areas identified in the land cover analysis. Additionally, the land use data show the influence of the regional topography, geology, and water resources on the distribution and concentration of various land uses. Structures and impervious cover in the Study Area mirror land cover trends for urban development. Counties with more intense land use are Charleston, Dorchester, and Berkeley, which are referred to as the tri-county area surrounding the city of Charleston; Beaufort County due to Hilton Head, Bluffton, and Beaufort; and Horry County due to Murrell's Inlet, Myrtle Beach, and North Myrtle Beach. There is also a small area of denser land use immediately surrounding Georgetown in Georgetown County.

Local governments guidelines for land use planning in South Carolina are defined by the South Carolina Local Government Comprehensive Planning Enabling Act (SCAC 2017). These guidelines encourage that local land use planning organizations include collaboration among the governing body, a planning commission, a professional planning staff, administration and boards, and the public. Local zoning administration, the board of zoning appeals, and the board of architectural review are also components that are important to local government planning.

The State of South Carolina is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. South Carolina has designated 25% of qualifying census tracts as Opportunity Zones, based on the 2011-2015 American Community Survey. Goals of the program in South Carolina are to promote economic vitality in less prosperous areas of the State, funding workforce and affordable housing development, funding new infrastructure, and investing in startup businesses and capital improvement (OpportunitySC 2020).

Future OCS-related projects should investigate resources such as the Opportunity Zones that have already targeted areas for potential development. Additionally, future OCS-related projects would benefit from consideration of local comprehensive plans (or equivalent) for the county within which they are interested in developing a new project. Counties and cities are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the project planners in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time. Upon cursory review of comprehensive land use planning documents from the Study Area, future land use

trends in South Carolina try to balance economic growth with preserving rural land and environmental sustainability.

15.3.2.2 Zoning

As described in Chapter 15.3.2.1, zoning administration is a component of local government planning under the South Carolina Local Government Comprehensive Planning Enabling Act (SCAC 2017). As the Study Area covers multiple municipalities, within multiple counties, there are a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

15.3.2.3 Industrial Incentives

South Carolina offers several tax credits, grants, and other incentives to businesses and industry (SCDC 2020). The incentives range from statutory incentives, incentives benefiting only specific industries, and special State discretionary incentives (SCDC 2020). The following are statewide incentive programs in South Carolina.

The Job Tax Credit is a statutory incentive to drive job creation throughout the State. The credit is available to both existing and new companies that establish or expand operations (corporate headquarters, distribution, manufacturing, and qualified service-related processing, research, and development facilities) within the State. The credit can be used against corporate income taxes (SCA 2020).

The Economic Impact Zone Investment Credit is for manufacturers locating in economic impact zone counties. This incentive is “a one-time credit against a company’s corporate income tax up to 5% of a company’s investment in new production equipment” (SCA 2020). The value of the credit varies and is dependent on the Internal Revenue Code (SCA 2020).

Companies that relocate or expand their corporate headquarters into South Carolina may be eligible for the Corporate Headquarters Credit. The credit applied is based on the cost of the headquarters portion of the facility on direct lease costs for 5 years of operation. These credits could potentially result in reduced or even eliminated corporate income taxes for up to 10 years. Eligibility towards this credit is determined by specific criteria offered by the State of South Carolina (SCA 2020).

Companies utilizing port facilities within the State may be eligible for the Port Volume Increase Credit if they “increase base port cargo volume by 5% over base-year totals” (SCA 2020).

The Rural Infrastructure Fund is available in qualified rural counties in the State. Within the Study Area this includes Colleton, Hampton, Horry, and Jasper Counties. This incentive is available to assist in infrastructure, job creation, and/or product development activities that enhance economic growth and county development(SCA 2020). The Economic Development Set-Aside Program offers companies interested in locating or expanding in South Carolina assistance with business location or expansion costs (roads, water/sewer infrastructure, etc.). This program is overseen by the Coordinating Council for Economic Development (SCA 2020).

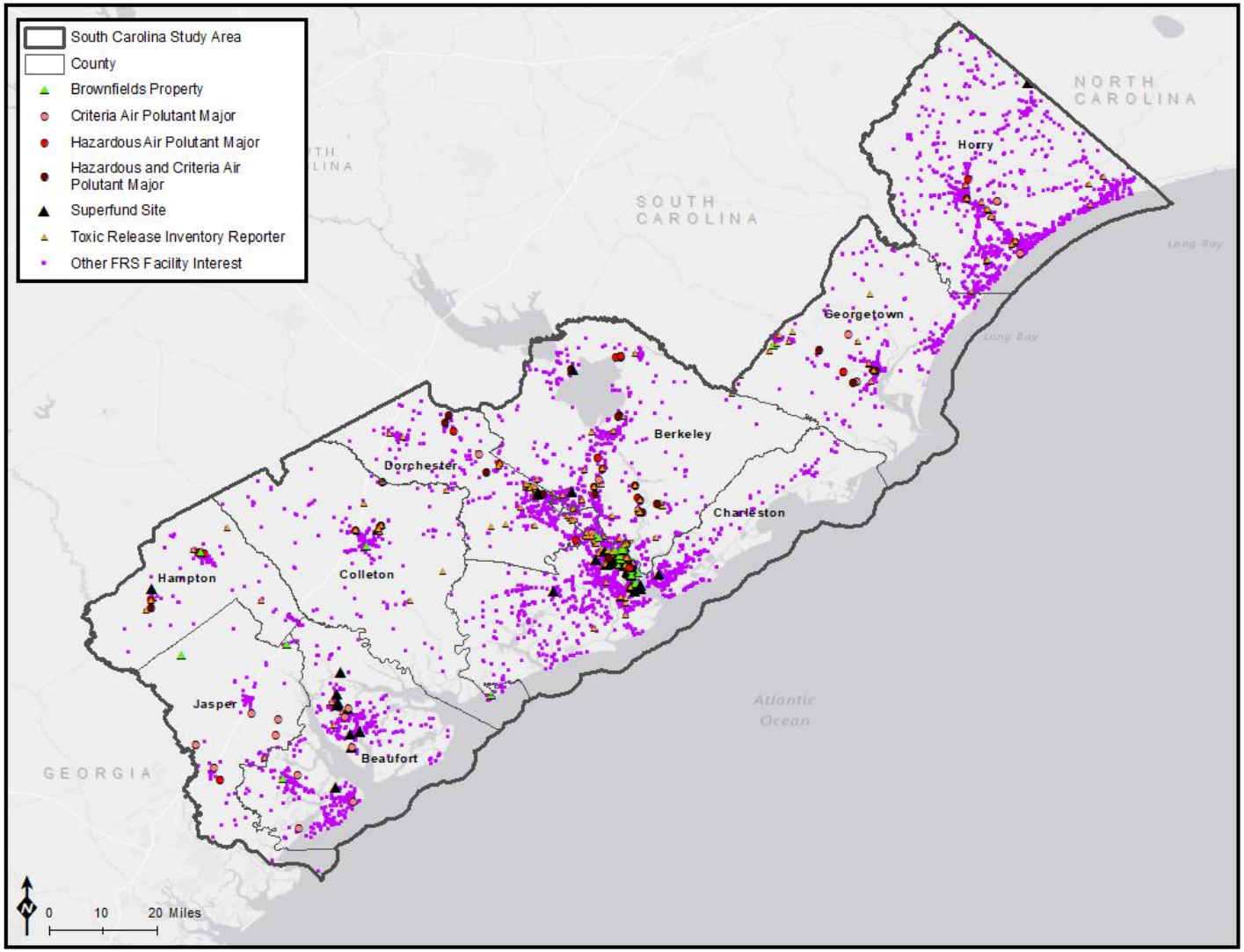
The Job Development Credit is a State discretionary, performance-based incentive. This credit pays companies back a portion of new employees' withholding taxes for the purposes of rent offset or fixed asset investment. This credit is location based and approved on a case-by-case basis. The duration of the credit may last up to 15 years (SCA 2020).

15.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 15-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this figure include:

- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 15-13, industry is concentrated in the major urban center of Charleston in Charleston County, the center of Beaufort County, and the coastline of Horry County. Chapter 15.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 15-13. USEPA Facility Register Service Record for the South Carolina Study Area

15.3.2.5 Protected Areas

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities (USGS 2019f). This will also aid in better understanding land use change over time. Figure 15-14 presents the protected areas within the Study Area.

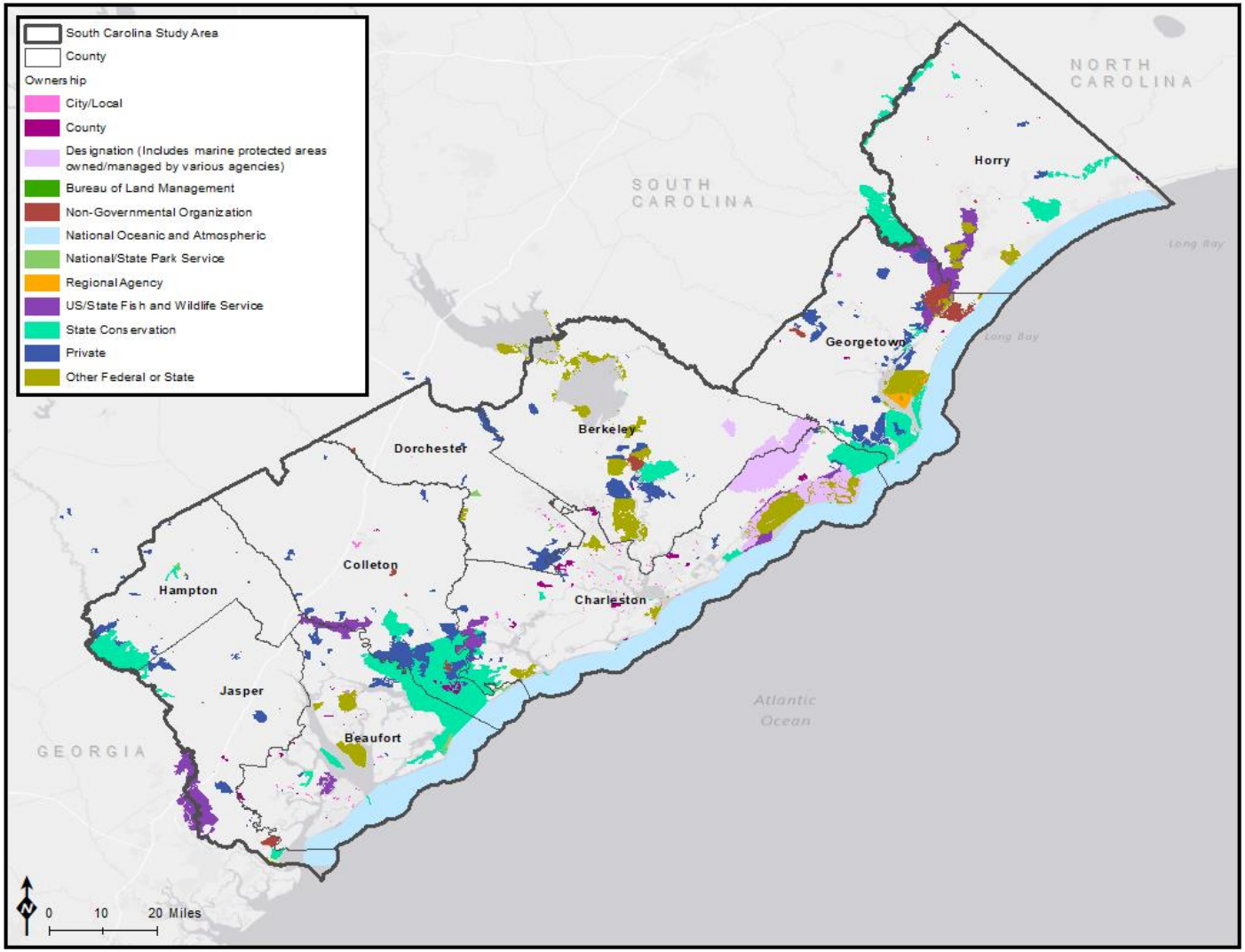
As can be seen in Figure 15-14, there is a large area of protected lands along the boundary between Horry and Georgetown Counties, which include Huntington State Park, Waccamaw NWR, and the Great Pee Dee River Heritage Preserve. The "designation" category in the PAD-US database includes marine protected areas, which are owned/managed by a variety of agencies including NOAA, U.S. Fish and Wildlife Service, and National Park Service. Protected areas in southern Georgetown County include 20,300 acres within in the 525,000-acre Winyah Bay project area (Nature Conservancy 2015), North Inlet-Winyah Bay National Estuarine Research Reserve and Hobcaw Barony that encompasses almost 19,000 acres of tidal marshes and wetlands, and the 20,000-acre Tom Yawkey Wildlife Center Heritage Preserve in Winyah Bay. In northern Charleston County, a large portion of the protected lands include Francis Marion National Forest (inland, and spanning Berkeley County), Santee Coastal Reserve, and Bull's Bay, and other coastal and island reserves, and wildlife centers. There are also several islands off the coast of Colleton County and northern Charleston County near Bull's Bay including Dewees Island, Isle of Palms, and Sullivan's Island. The ACE River Basin spans the coast of Charleston, Colleton, and Beaufort Counties in the southern Study Area and encompasses over 350,000 acres. Within the ACE River Basin, are protected areas including the ACE Basin National Estuarine Research Reserve, ACE Basin NWR, Donnelley Wildlife Management Area, and Bear Island Wildlife Management Area (SCDNR 2009). In Beaufort County, federally protected areas along the coast include the United States Marine Corp Recruit Depot on Parris Island and the marine Corps Air Station north of Parris Island.

There is also a wildlife management area in Hampton County and the Savannah NWR in Jasper County, which are considered protected areas in the Study Area. Information on wildlife management areas and NWRs and preserves in South Carolina can be found on South Carolina's website (SCIWAY 2020a, SCDNR 2016) and the U.S. Fish and Wildlife Service's website (USFWS 2020d). Potential impacts to protected areas will need to be considered during potential future OCS-related project development.

15.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region now referred to as South Carolina resided in the area long before the era of European exploration. The Mississippian cultures of the area were quite advanced and had numerous villages throughout the area. This complex society become known as the "mound-builders" for the structures they built, which are still present in many areas today. Their culture as well as most of their population disappeared due to European contact in the 1500s. Disease, conflict and European expansion continued in the region, and, by the time of the American Revolution, the indigenous population of the South Carolina Region had virtually vanished (Bushman and Winberry 2019).



Source: USGS 2019f

Figure 15-14. Protected Areas within the South Carolina Study Area

The first European known to explore the area was Spanish Captain Diego de Salazar in 1514, who landed in present-day Beaufort County. The large natural harbor in this area drew the attention of Spanish and French explorers (Lewis 2019). The Spanish explorers returned in 1526 in an attempt to build a settlement, but it did not survive (Nelson 2020f). In 1562, French Protestants attempted to build a settlement called Charlesfort in the area of Port Royal (one of the Sea Islands in Beaufort County), but that settlement failed as well (Nelson 2020f). Finally, in 1566, the Spanish established Santa Elena on Parris Island (present-day Beaufort County), where the abandoned colony of Charlesfort was originally established. Santa Elena was an important base of operations for the Spanish until 1587 when the settlers abandoned it and relocated to St. Augustine in Florida (Bushman and Winberry 2019). It was not until 1665 that a charter was given by King Charles II of England to establish the colony of Carolina, which at that time included land that now belong to several states, including North Carolina and South Carolina. In 1670, the first known permanent settlement in South Carolina was Charles Town, established on the west bank of the Ashley River at Albemarle Point (present-day Charleston County). Eventually, Charles Town (now called Charleston) was moved to its present location on Oyster Point on the nearby peninsula formed by the Ashley and Cooper Rivers.

By the early 1700's trade in the area focused on export of deerskins and materials from the indigenous population as well as import items including turpentine, tar, and pine products (Bushman and Winberry 2019). Around 1710, South Carolina formed a government that was separate from North Carolina and, in 1729, they officially became a separate British colony (Bushman and Winberry 2019, Nelson 2020f). The colony's economy became dependent on large cash-crop plantations, and, because of this, large numbers of slaves were brought in to provide labor. By the 1730's slaves and African Americans made up two thirds of the colony's population (History 2019a). The ports of Georgetown, Charleston, and Beaufort became important centers of commerce and culture. Prior to the American Civil War, cash-crop plantations such as rice, indigo, and cotton brought immense wealth to the Low Country or coastal region (Lewis 2019).

During the American Revolutionary War (1775-1783), numerous battles took place on South Carolina soil. South Carolina is one of the states in which a majority of the battles and fights of the Revolutionary War occurred (Bushman and Winberry 2019) (Nelson 2020f), many of which occurred near Charleston (in Charleston County, Berkeley County, and Beaufort County, and Georgetown County) where British troops occupied Charleston. Several battle sites, figures, and artifacts are still present today (Berkeley County SC n.d., City of Georgetown 2020). Two well-known military leaders from South Carolina were Francis Marion and William Moultrie. General Francis Marion, known as Swamp Fox, and his small militia were known for hiding in area swamps and launching bloody, surprise attacks on the British. He is considered a founder of modern guerrilla warfare and small unit tactics, and credited as the father of the modern Army Rangers (Green Berets) (Dembroski 2015). General Moultrie successfully repelled the initial British invasion of Charleston on June 28, 1776, at a fort on Sullivan's Island now known as Fort Moultrie (American Battlefield Trust 2020a). However, in 1780, after the Siege of Charleston, British troops took control of Charleston in a battle that was one of the worst American defeats of the Revolutionary War (Bushman and Winberry 2019, American Battlefield Trust 2020b). In 1786, after the American Revolutionary War ended, the state capital was relocated from Charleston to the city of Columbia (Bushman and Winberry 2019). On May 23, 1788, South Carolina became the eighth state to ratify the U.S. Constitution.

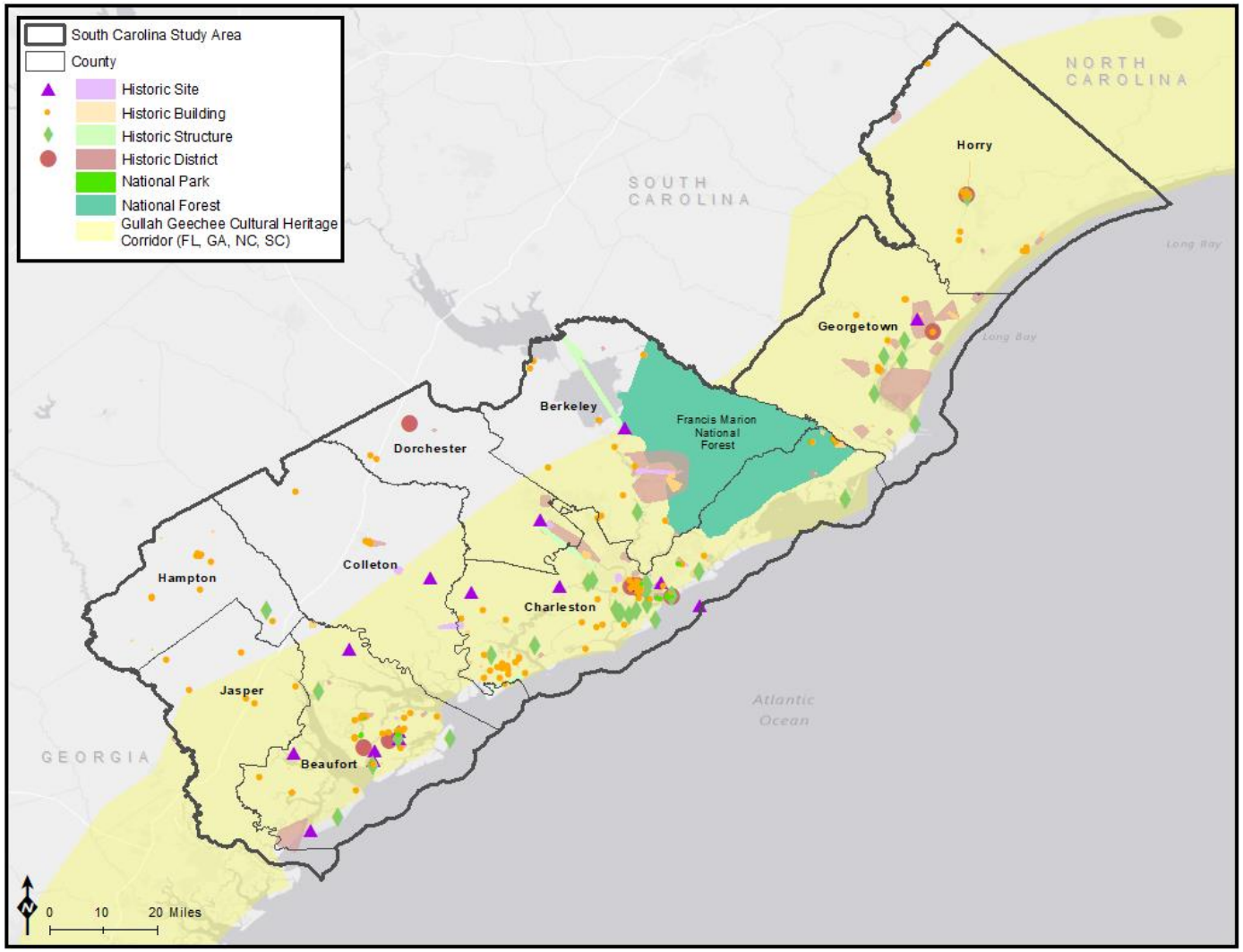
Prior to the Civil War (1861-1865), tensions over issues such as slavery and high Federal tariffs influenced radicals such as Robert Barnwell Rhett to lead South Carolina to become the first state to secede from the Union in December 1860. Ten other Southern states joined South Carolina to form the Confederate States of America (Confederacy). The first shots of the American Civil War began at the Battle of Fort Sumter (in Charleston Harbor) on April 12, 1861. Several significant battles were fought in the Study Area during the Civil War including the Battle at Port Royal (Beaufort County) on

November 7, 1861 (Bushman and Winberry 2019). Additionally, the Confederate submarine, *H. L. Hunley*, became the first combat submarine to sink a warship (*Housatonic*) on February 17, 1864; however, the *Hunley* sank after the encounter in the waters near Charleston. The ship was located in 1995 and recovered in 2000. Today, the *Hunley* is on display in North Charleston (Friends of the Hunley 2020).

Following the conclusion of the Civil War, reconstruction was marked by military occupation, disenfranchisement of various segments of the population, and corruption. The region continued to struggle after World War I when the boll weevil (a destructive insect) destroyed a majority of the cotton crop. This led to out-migration as workers sought employment. The Great Depression in 1929 further exacerbated the economic issues (Bushman and Winberry 2019).

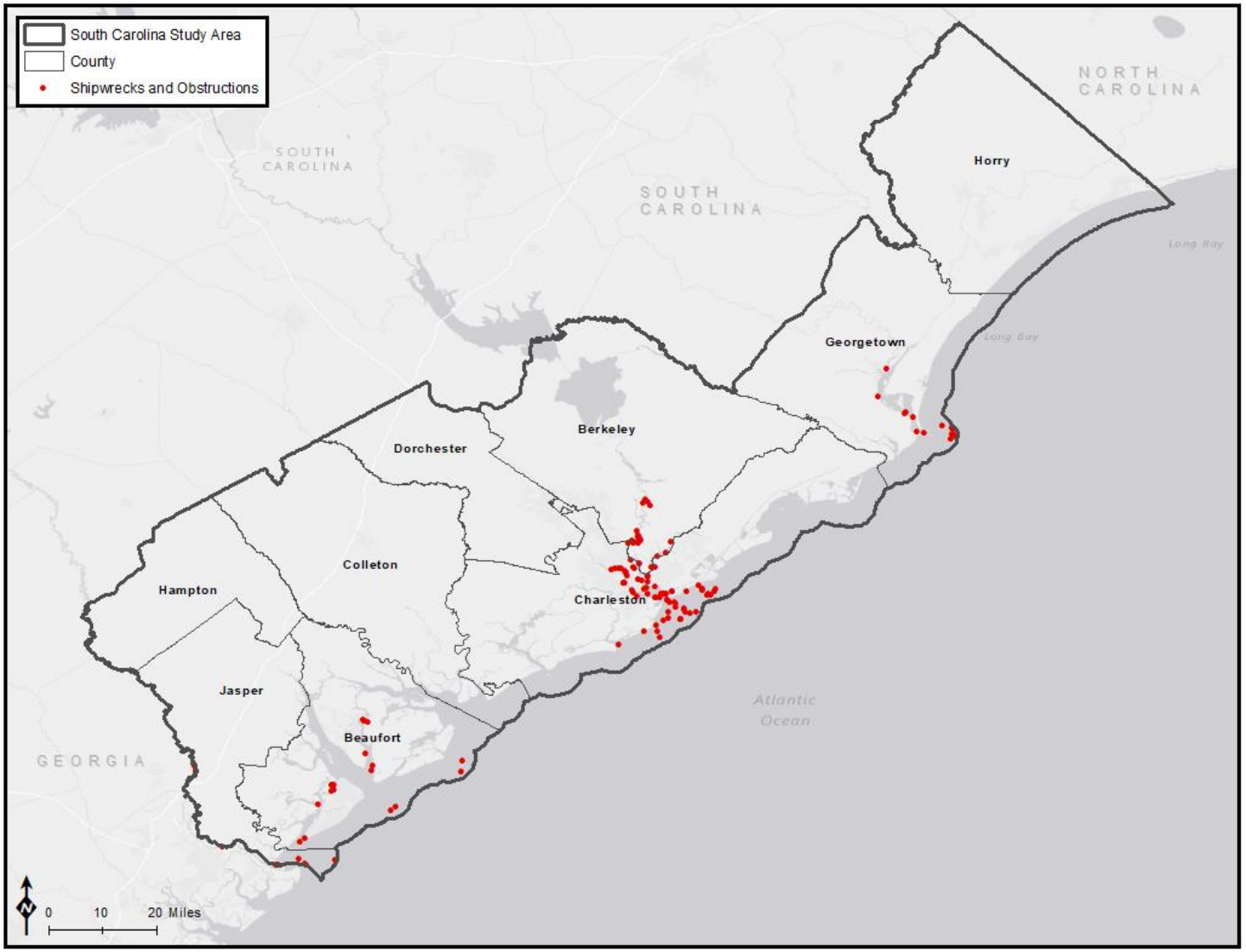
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with American Indians, colonization, the American Revolution, slavery, the American Civil War, reconstruction and the Industrial revolution. South Carolina's economy was historically based on foreign commerce and agriculture of rice, indigo and cotton. Figure 15-15 and Figure 15-16 present a summary of many of these locations, including maritime sites and shipwrecks along the Sea Islands, in the St. Helena Sound, Port Royal Sound, Cooper River, Winyah Bay, and the Atlantic Ocean. Notable in Figure 15-15 is the Gullah/Geechee Cultural Heritage Corridor is the area within which the Gullah culture in the Carolinas and the Geechee culture in Georgia and Florida primarily reside. The Corridor extends from Wilmington, North Carolina to Jacksonville, Florida. The Gullah and Geechee are cultural groups descended from enslaved peoples from West and Central Africa. The geographic isolation of the region has contributed to both cultures being able to preserve their linguistic, artistic, and societal traits while simultaneously assimilating aspects of other cultures in the area (NPS 2017a).

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including South Carolina) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.



Source: NPS 2014

Figure 15-15. Cultural and Historic Sites within the South Carolina Study Area



Source: NOAA 2016a

Figure 15-16. Shipwrecks and Obstructions within the South Carolina Study Area

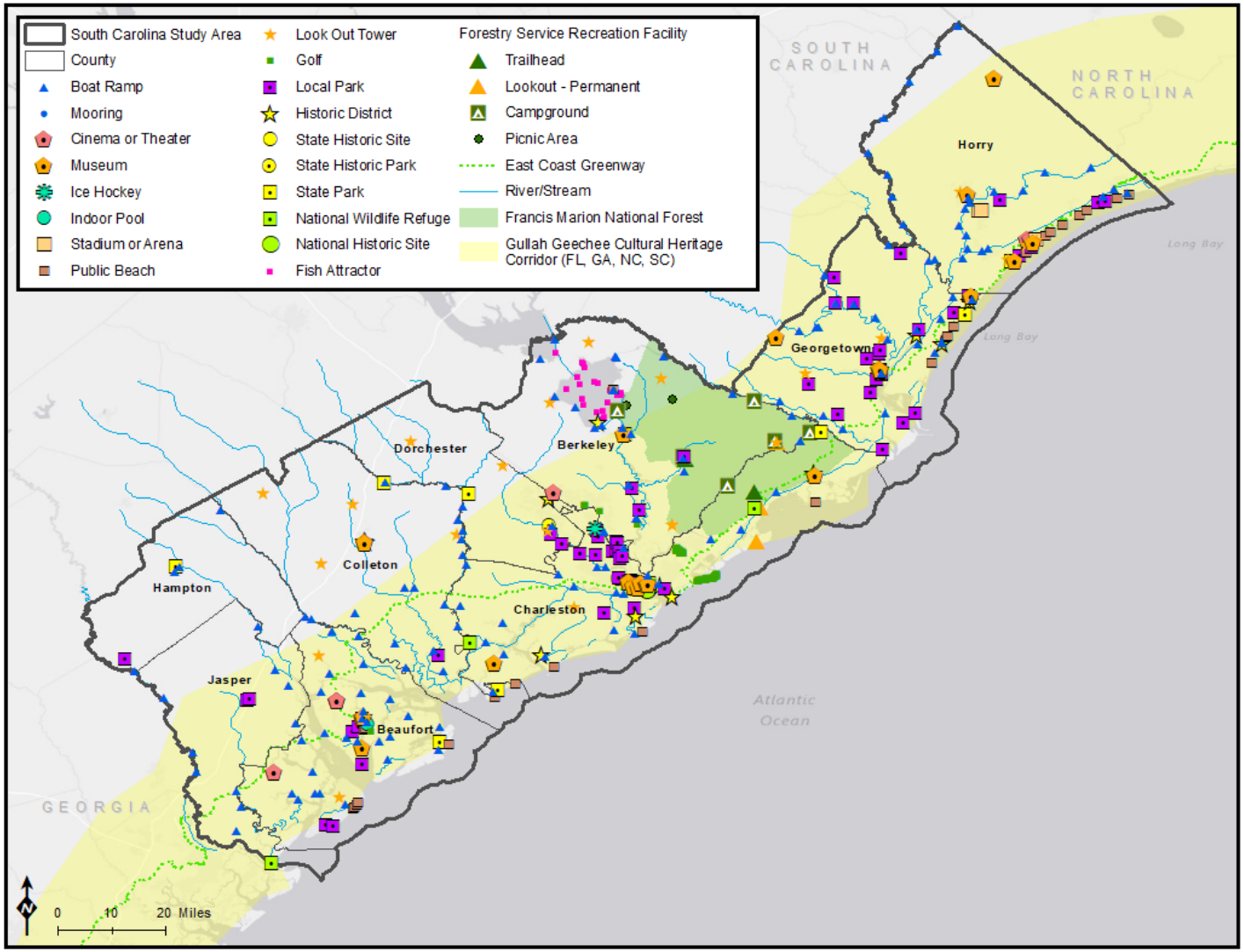
In summary, many cultural sites in the Study Area are identified in Figure 15-15 and Figure 15-16; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of South Carolina's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

15.3.2.7 Recreation

The Study Area has diverse recreational opportunities, including visiting beaches, islands, plantations, State and local parks, a State forest, wildlife management areas, national historic sites, and modern built experiences. A selection of major recreation resources in the Study Area is shown in Figure 15-17. The cultural and historic resources shown in Figure 15-11 and Figure 15-12 can also be considered potential recreational resources, as can many of the protected areas shown in Figure 15-14. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 15.3.2.6), transportation (Chapter 15.3.2.8), tourism employment (included in Chapter 15.4.4), and rental housing (included in Chapter 15.4.3).

Horry and Georgetown Counties

In Horry County, Myrtle Beach is a popular tourist destination. In 2018, approximately 20.4 million people visited the Myrtle Beach area and beaches, which resulted in a $7 billion dollar economic impact and supported 80,000 jobs (MBACVB 2018). The Myrtle Beach area is within the 60 miles of sandy beaches, known as the Grand Strand. The Grand Strand is a popular vacation spot that spans from northern Horry County to southern Georgetown County (Wiersema 2020). Myrtle Beach has a boardwalk, 88 golf courses, several mini golf courses, amusement parks, water parks, museums, casino cruises, fishing fleets, and approximately 1,800 full-service restaurants, 7 live entertainment theaters, and approximately 425 hotels (MBACVB 2018, Visit Myrtle Beach 2020a, Visit Myrtle Beach 2020b). The Myrtle Beach area includes North Myrtle Beach, Myrtle Beach, Surfside Beach, Garden City Beach and Pawley's Island. Other beaches within the Grand Strand area include Murrells Inlet, Hunting Beach State Park, Litchfield Beach and Pawleys Island in Georgetown County. Beach visitation statistics were not readily available; therefore; it is recommended that analyses for future OCS-related projects examine this in greater detail. Myrtle Beach also hosts several festivals and events every year including the Myrtle Beach Marathon (March), World Famous Blue Crab Festival (May), Carolina County Music Festival (September), and the Liter River ShrimpFest (October) (Visit Myrtle Beach 2019).



Sources: SCGIS 2010, SCGIS 2012, MapCruzin.com 2019b, NPS 2014, USFS 2019b

Figure 15-17. Select Recreational Resources within the South Carolina Study Area

The city of Georgetown in Georgetown County is on the coast in Winyah Bay. Georgetown is a historic town that has several plantations (e.g., Hopsewee and Hampton Plantations), museums (e.g., Rice Museum and Gullah Museum), and shops, as well as sightseeing tours, ghost tours, and boat tours (Simm 2018). The coast of Georgetown County also has the Georgetown Lighthouse, Georgetown Harbor Walk, the Lowcountry Zoo and Brookgreen Gardens near Huntington Beach State Park, wildlife centers, and island and estuarine reserves that are often visited.

Berkeley, Charleston, and Dorchester Counties

Berkeley, Charleston, and Dorchester Counties are in the central region of the Study Area. The most popular tourist destination in this area, and in the State of South Carolina, is the city Charleston. Charleston and North Charleston span multiple counties. In 2018, almost 7.3 million people visited Charleston, which resulted in a total economic impact of over $8 billion and supported over 47,000 jobs (Williams 2019, Charleston RDA 2020b). In this area, visitors are drawn to Charleston's historic district, the beaches, islands, plantations, museums, aquarium, and historical landmarks, such as Fort Moultrie, Fort Sumpter, and Charleston Harbor (U.S. News 2019d). In 2019, there were approximately 877,900 visitors to Fort Sumpter and Fort Moultrie (NPS 2018a). The Historic Charleston City Market is the most visited tourist attraction in Charleston (Charleston City Market 2020). At the Charleston City Market, one type of highly sought-after souvenirs are sweetgrass baskets, made by resident Gullah artisans. The tradition of sweetgrass baskets was brought to South Carolina by way of West African slaves who worked on plantations (SCIWAY 2020b). The Gullah/Geechee Cultural Heritage Corridor extends from North Carolina Florida and spans the coast of South Carolina (NPS 2017c). Tours of Gullah Geechee sites, museums, trails, and other destinations are popular, particularly in the Charleston area. Gullah/Geechee traditions are explained in greater detail in Chapter 15.4.5.3.2, Subsistence Populations.

There are also several annual events and festivals in the city of Charleston, including the Cooper River Bridge Run (April), one of the largest 10K races in the U.S., Volvo Car Open Tennis Tournament (April), North Charleston Arts Festival (April-May), Spoleto Festival (May-June), MOJA Arts Festival (September-October), and the Lowcountry Oyster Festival (January) (CACVB 2020, Travel Channel 2020). Another attraction in the central Study Area is Francis Marion National Forest, which is a 259,000-acre forest where people can go camping, canoeing, hunting, and horseback riding, and to rifle ranges (USDA 2020).

Beaufort County

In Beaufort County, Hilton Head Island is a popular tourist destination. In 2018, Hilton Head Island was visited by over 2.6 million tourists who spent approximately $13.8 million, which supported almost 15,800 jobs (Carey and Salazar 2019). Visitors to Hilton Head Island can ride bikes along the bike trails and visit beaches, parks, museums, the Pinckney Island NWR, and Sea Pines Forest Preserve (Trip Advisor 2020c). There are also several things to do in Beaufort, which is a coastal city north of Hilton Head. Activities include visiting beaches, State parks, historical landmarks, and museums; taking river tours; fishing charters; kayaking; and biking (Visit Beaufort 2020). Annual events in this area include the Soft-Shell Crab Festival (April), Beaufort Air Show (April), Beaufort Water Festival (July), Lands End Woodland River Festival (August), Hilton Head Island Music Festival (April), Gullah/Geechee Seafood Festival (October), and Hilton Head Island Boat Show (May) (Jones 2020, Eventbrite 2020).

In summary, there are several islands, beaches, and State and local parks that are popular destinations for residents and tourists throughout the Study Area. Information on State parks in the Study Area can be found on the South Carolina State Parks website (SC State Parks 2020). The most popular tourist attractions in the Study Area are along the coast, especially in Horry, Georgetown, Charleston, and Beaufort Counties. Tourism in the Study Area has grown over the past few years, and tourism in destinations such as Myrtle Beach, Charleston, and Hilton Head Island are expected to continue to grow.

Because of the warm climate, the spring and fall are very popular times for tourists to visit the Study Area; however, the summer is also a popular season. December through February is considered the off-peak season. The busiest months for tourism in Charleston are July, followed by March and June (ChampionTraveler 2020). Therefore, it is likely that travel costs (e.g., hotels) will be highest during these months. Also, there are several annual festivals and events that occur through the Study Area, especially in Charleston and Beaufort Counties. Local information on additional attractions and events should be considered by checking relevant city and county tourism websites and event pages. Therefore, future developers should consider the potential impacts on recreation during the planning phase and site-selection process.

15.3.2.8 Transportation Resources

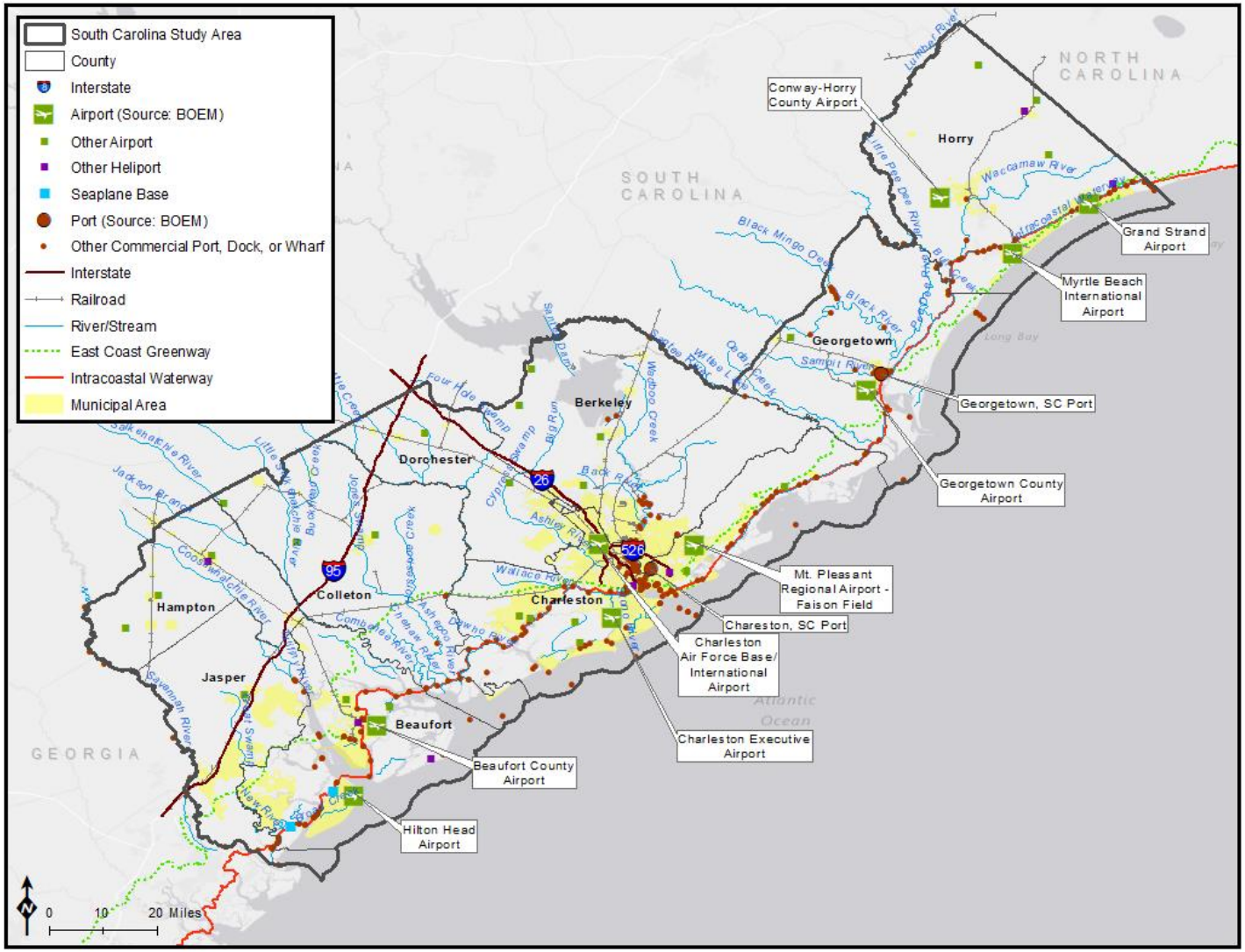
The South Carolina Department of Transportation (SCDOT) is responsible for planning, construction, maintenance, and operation of the State highway system and statewide mass transit system. The SCDOT also coordinates all State and Federal programs relating to highways with the goal of providing adequate, safe, and efficient transportation services for the movement of people and goods. One of the primary long-term planning documents for South Carolina's multimodal transportation system is the South Carolina Multimodal Transportation Plan, "Charting a Course to 2040" (SCDOT 2020a).

Figure 15-18 shows the transportation resources throughout the Study Area. The main freight truck corridors in the Study Area include I-95, which passes through the southern half of the Study Area, and I-26/I-526, which runs from Charleston north through Columbia into North Carolina. Other major truck corridors within the Study Area include U.S. Routes 278, 21, 17, 52, 501, and 22.

The SCDOT is South Carolina's "State Rail Transportation Authority." The freight rail system in South Carolina totals 2,378 miles with operations involving 11 different carriers. Within the Study Area, the primary Class I railroad is operated by CSX. The main CSX rail line runs the length of the Study Area from east to west. The other Class I railroad is Norfolk Southern, which operates a rail line between Charleston and Columbia. The East Cooper and Berkley Railroad, which is a subdivision of Palmetto Railways operates a short line in southern Berkeley County. The railroad serves BP Chemical, Nucor Steel, and Santee Cooper Cross Generating Station, interchanging with CSX at State Junction. Several industrial sites are also available for development adjacent to this 17-mile line (SCDOT 2014d).

Aviation in South Carolina is overseen by the South Carolina Aeronautics Division. South Carolina's airport system is owned by both public and private entities located throughout the State. Three primary commercial service airports are located within the Study Area: Hilton Head, Charleston Air Force Base/International, and Myrtle Beach International. In addition to the three primary airports, 10 general aviation are also located within the Study Area.

The South Carolina Ports Authority is the governing authority for seaport operations in South Carolina. The State has two port facilities owned and operated by the South Carolina Ports Authority, Port of Charleston, and Port of Georgetown. The Port of Charleston operates five terminals along the Cooper River and one located on the Wando River. The port primarily handles containerized cargo with container activities focused at the North Charleston, Wando Welch, and Naval Base Terminals. The other terminals handle break-bulk, roll-on/roll-off, heavy-lift, and project cargo. Cruise ship operations are also located at the Union Pier Terminal. Norfolk Southern and CSX operate intermodal rail terminals near the Port Charleston terminals. The Port of Georgetown is a break-bulk and bulk cargo facility located on Winyah Bay in Georgetown. The port has four berths totaling 1,800 feet in length, open and covered storage, specialty cargo handling facilities (metals, cement, aggregates, forest products and ore), and on-dock rail (SCDOT 2013).



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 15-18. Transportation Resources within the South Carolina Study Area

The South Carolina Ports Authority and the Georgia Ports Authority have discussed developing a new marine terminal located in Jasper County, South Carolina on the Savannah River. The 1,500-acre terminal site is located just east of and across the river from the city of Savannah, Georgia.

The multimodal transportation network of South Carolina faces several challenges and constraints, including aging infrastructure, congestion, and climate impacts. Population growth and increased tourism within the Study Area will continue to put increased pressure on the existing surface transportation infrastructure and services.

SCDOT planning and projects to address transportation infrastructure and congestion are addressed in various long-range and strategic planning documents (e.g., South Carolina Multimodal Transportation Plan) and programs like the 2017 - 2022 Statewide Transportation Improvement Program (SCDOT 2020b).

Vulnerabilities from climate impacts (see Chapter 15.2.2) also contribute to transportation constraints. Recurrent flooding is flooding that happens repeatedly in the same areas and is a problem both in coastal areas (typically due to storm surge) and in inland areas (typically due to heavy rainfall). It is also anticipated that storm surge flooding will worsen from climate change effects (i.e., sea level and an increase in the frequency and intensity of large storm systems). With 2,876 miles of tidal shoreline and a dependence on coastal tourism-based tax revenue, sea level rise poses a disproportionate threat to the natural resources, infrastructure, and economy of the State (GlobalChange.gov 2014).

Potential future development will depend on the integrated transportation network that exists within the Study Area during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site-selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Available maritime ports are both large enough to service potential future projects. Therefore, an understanding of the integrated transportation network will be essential for future project development.

15.3.3 Summary – Land Cover and Land Use

Throughout the Study Area, land cover is predominantly forest and wetlands. Horry County is the exception where the predominant land cover type is wetlands. The prevalence of wetlands, particularly along the coastal counties, also appears to influence and control land cover change over time.

Counties with more urban development, and thus also higher density of land use and more industrial properties are Charleston, Dorchester, and Berkeley, which are part of the tri-county area surrounding the city of Charleston, Beaufort County and include Hilton Head, Bluffton, and Beaufort. Horry County also has more urban development, a higher density of land use, and more industrial properties due to Murrell's Inlet, Myrtle Beach, and North Myrtle Beach. There is also a small area of denser land use immediately surrounding Georgetown in Georgetown County. Within the Study Area, most of the industrial concentration is in and around the City of Charleston, in Charleston and Beaufort Counties, and along the coastline of Horry County around the Myrtle Beach area.

Local governments guidelines for land use planning in South Carolina are defined by the South Carolina Local Government Comprehensive Planning Enabling Act (SCAC 2017). Zoning administration is a component of local government planning under the South Carolina Local Government Comprehensive Planning Enabling Act (SCAC 2017). Thus, zoning information cannot be generalized across the scale of

the Study Area. Future OCS-related project analysis should evaluate the project in the context of the relevant land use, planning, and zoning documents for the site-specific area of interest.

The State of South Carolina is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities (OpportunitySC 2020). Additionally, South Carolina has a wide variety of programs, grants, and tax credits to incentivize business and industrial growth in the State. These industrial incentives focus on developing the infrastructure or workforce skills within more rural counties and making industrial and urban centers, such as the city of Charleston, more competitive against other business markets. Development incentive opportunities include in the Study Area include: the Job Tax Credit, the Economic Impact Zone Investment Credit, the Corporate Headquarters Credit, the Port Volume Increase Credit, the Rural Infrastructure Fund, the Economic Development Set-Aside Program, and the Job Development. Future OCS-related project analysis should consider the applicability of such incentive and development programs when site-specific information is known.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternative sites may have lesser impacts to these areas.

Transportation resources in the Study Area include I-95, which passes through the southern half of the Study Area, and I-26/I-526, which runs from Charleston north through Columbia into North Carolina. Other major truck corridors within the Study Area include U.S. Routes 278, 21, 17, 52, 501, and 22. Freight rail runs parallel to the South Carolina coast and from Charleston to interior portions of the State. Several primary commercial service and general aviation airports are found throughout the Study Area. Two ports are also located within the Study Area: the Port of Charleston and the Port of Georgetown. Potential future development will depend on the integrated transportation network and the transportation needs for future OCS-related projects should be considered as part of the site-selection process.

15.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

15.4.1 Population

After decades of rapid growth, South Carolina's population is still increasing but at a slower rate. According to the USCB, South Carolina's estimated population was 4.9 million in 2017. As shown in Table 15-8, the population of South Carolina grew 5.8% since the 2010 Census, having added approximately 268,080 people. During the same period, the population of the U.S. grew just 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d).

Table 15-8. 2010 and 2017 Total Population and Population Projections Through 2040 in the South Carolina Study Area

Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Beaufort	162,233	179,316	197,630	215,300	238,000	10.5	32.7
Berkeley	177,843	204,632	228,930	219,100	241,200	15.1	17.9
Charleston	350,209	387,847	429,490	396,700	438,900	10.7	13.2
Colleton	38,892	37,581	36,500	39,500	44,200	-3.4	17.6
Dorchester	136,555	151,716	169,150	190,200	211,500	11.1	39.4
Georgetown	60,158	61,065	62,200	65,100	72,400	1.5	18.6
Hampton	21,090	20,066	19,020	20,700	20,800	-4.9	3.7
Horry	269,291	310,186	354,830	371,700	407,500	15.2	31.4
Jasper	24,777	27,465	31,840	28,800	32,600	10.8	18.7
Study Area Total	**1,241,048**	**1,379,874**	**1,529,590**	**1,547,100**	**1,707,100**	**11.2**	**23.7**
South Carolina	**4,625,364**	**4,893,444**	**5,175,800**	**5,730,490**	**6,352,502**	**5.8**	**29.8**
United States	**308,745,538**	**321,004,407**	**332,527,548[4]**	**357,975,719[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - CTSDC 2017, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, SCRFA 2018; 4 - USCB 2018b
Note: South Carolina projections are derived from multiple sources.

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While South Carolina is affected by the nationwide trend of aging population, as indicated by the declining rate of natural increase between 2010 and 2018, natural increase continues to contribute to population growth. However, the majority of the State's growth is from domestic migration. According to 2018 estimates, the State gained 62,908 residents, 6,462 (10.3%) from natural increase, 50,775 (80.7%) from domestic migration, and 5,490 from international migration (USCB 2019b).These values are USCB estimates. As estimates, they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). South Carolina is not part of this national trend, as it is one of the southern states that is a popular destination for relocation. According to William H. Frey, demographer at the Brookings Institution, a nonprofit public policy research group, a long-term "broad migration pattern in the U.S…. from Snow Belt to Sun Belt," is underway driven by older generations and retirees seeking a better quality of life, lower cost of living, and more temperate weather. This trend was stalled by the Great Recession (which lasted from 2007 to 2009), due to the housing crisis and unemployment (Rich 2013). Migration resumed slowly after the recession as the economy recovered. However, in comparison to previous migration flows of the 1940s and 1950s, the current migration rate is much slower. Mr. Frey further noted that "many areas hoping to attract members of two huge generations: the young adult millennial generation and the increasingly graying baby boomers. Millennials, a highly educated and diverse generation now squarely in their late 20s and 30s, are forming the backbone of various regions' emerging labor forces and consumer bases. Baby boomers, now all aged 55 and above, can reinvigorate communities that retain or attract their more affluent members" (Frey 2019).

Reasons for relocation, derived from the Census Bureau survey data for 2015-2017, include work-related reasons (new job or transfer), a change in marital status, and desire for better housing (Governing.com 2018). Census Bureau 2018 estimates indicate that the biggest domestic in-migration came from North Carolina, Georgia, Florida, New York, and California (USCB 2019c).

15.4.1.1 Study Area Trends

Nine counties comprise the Study Area. According to 2017 population estimates, the Study Area represented 28.2% (1.4 million residents) of the overall State population of 4.9 million. Table 15-8 shows population growth and decline in the Study Area counties. Between 2010 and 2017, seven out of nine counties gained population, while two geographies lost population. Counties gaining population are located in or near metropolitan areas; counties losing population are rural, indicating an urban-rural divide. During the same period, the population of the Study Area grew 11.2%, faster than the State (5.8%) and the Nation (4.0%) (USCB 2017a, USCB 2017d).

Retirement destination counties (Horry, Dorchester and Beaufort) posted strong growth between 2010 and 2017. Horry County posted the strongest growth (15.2%). Dorchester and Beaufort grew 11.1% and 10.5%, respectively. Rural counties of Colleton and Hampton Counties decreased 3.4% and 4.9%, respectively, during the same period (USCB 2017a, USCB 2017d, USDA 2013).

Figure 15-19 shows population counts in census block groups within the Study Area. The figure illustrates geographic high-density concentrations in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 15-20, the MSAs present in the Study Area are:

- Savannah, GA
- Hilton Head Island-Bluffton-Beaufort, SC
- Charleston-North Charleston, SC
- Myrtle Beach-Conway-North Myrtle Beach, SC-NC.

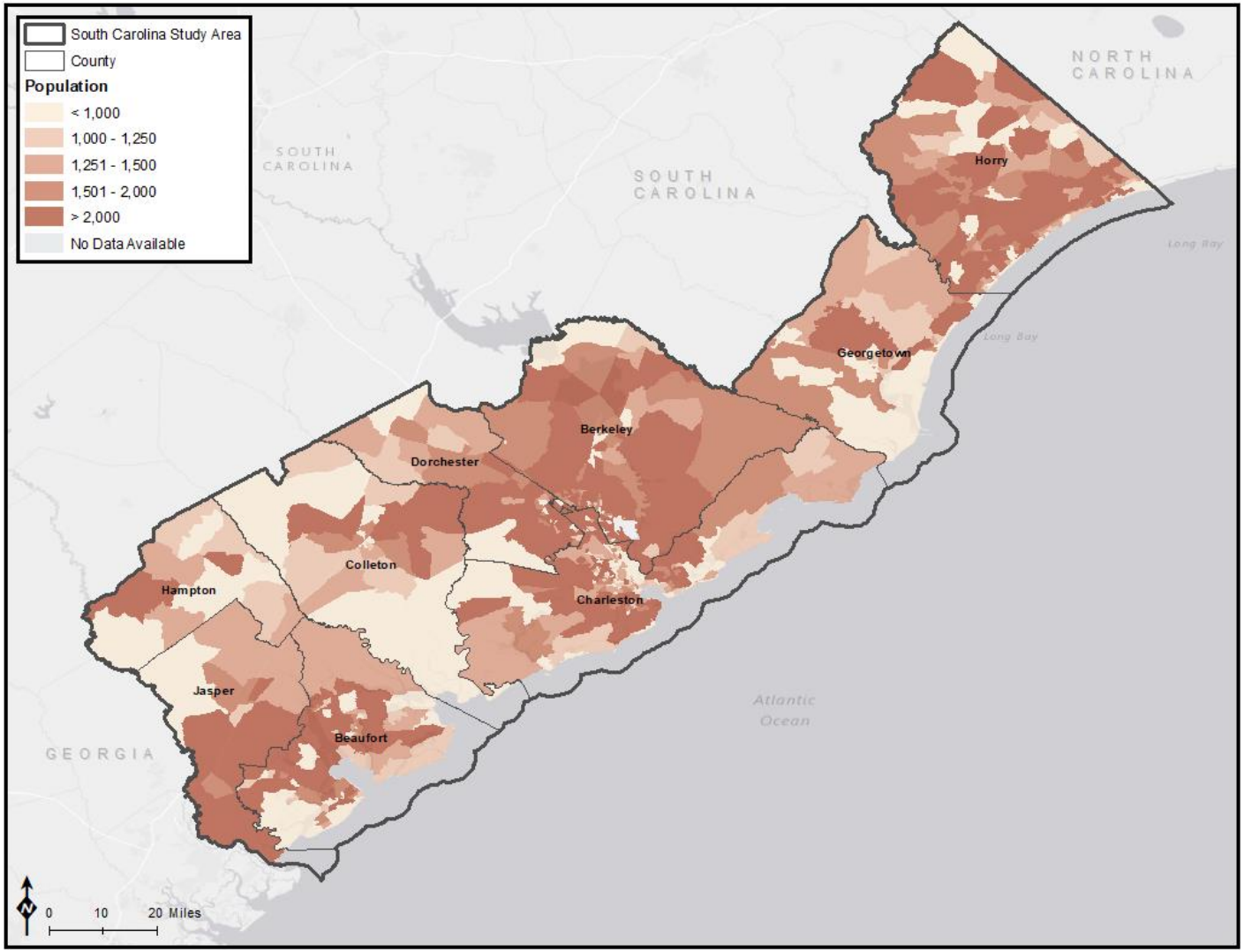
No portion of any MSA is located within sparsely populated rural counties of Georgetown, Colleton, and Hampton (Data.gov 2017).

Figure 15-21 shows population per square mile in the Study Area. The figure illustrates geographic high-density concentrations in major urban areas, surrounded by contiguous low-density areas comprising the "less than 200 persons per square mile" category. As shown in Table 15-9, the population density of the Study Area was 186 persons per square mile in 2017, greater than the State (162 persons per square mile) and the Nation (90 persons per square mile), signifying that the coastal counties are slightly more densely populated than the State and significantly more than the Nation. Population densities in the Study Area ranged from 35 persons per square mile in Colleton and Hampton Counties to 422 persons per square mile in Charleston County (containing the populous Charleston-North Charleston metropolitan area) (USCB 2017d, USCB 2017c).

Table 15-9. 2017 and 2040 Population Density in the South Carolina Study Area

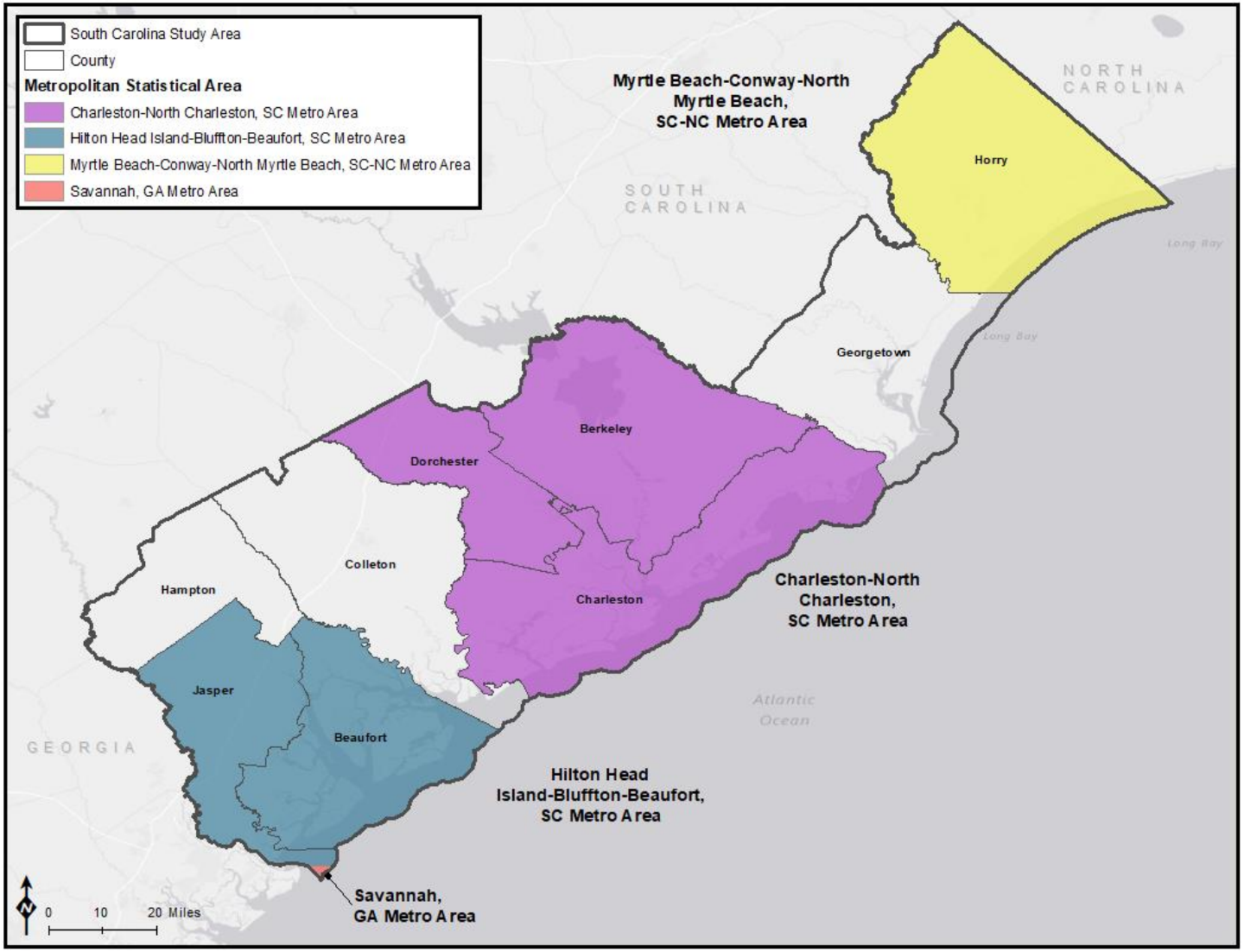
Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Beaufort	179,316	238,000	576	311.2	413.1
Berkeley	204,632	241,200	1,104	185.4	218.6
Charleston	387,847	438,900	918	422.5	478.1
Colleton	37,581	44,200	1,056	35.6	41.8
Dorchester	151,716	211,500	569	266.8	372.0
Georgetown	61,065	72,400	814	75.0	89.0
Hampton	20,066	20,800	560	35.8	37.1
Horry	310,186	407,500	1,134	273.6	359.4
Jasper	27,465	32,600	655	41.9	49.8
Study Area Total	**1,379,874**	**1,707,100**	**7,385**	**186.8**	**231.1**
South Carolina	**4,893,444**	**6,352,502**	**30,111**	**162.5**	**211.0**
United States	**321,004,407**	**373,528,000**	**3,531,905**	**90.9**	**105.8**

Sources: SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, SCRFA 2018, USCB 2017c, USCB 2017d, USCB 2018b
Note: South Carolina projections are derived from multiple sources.



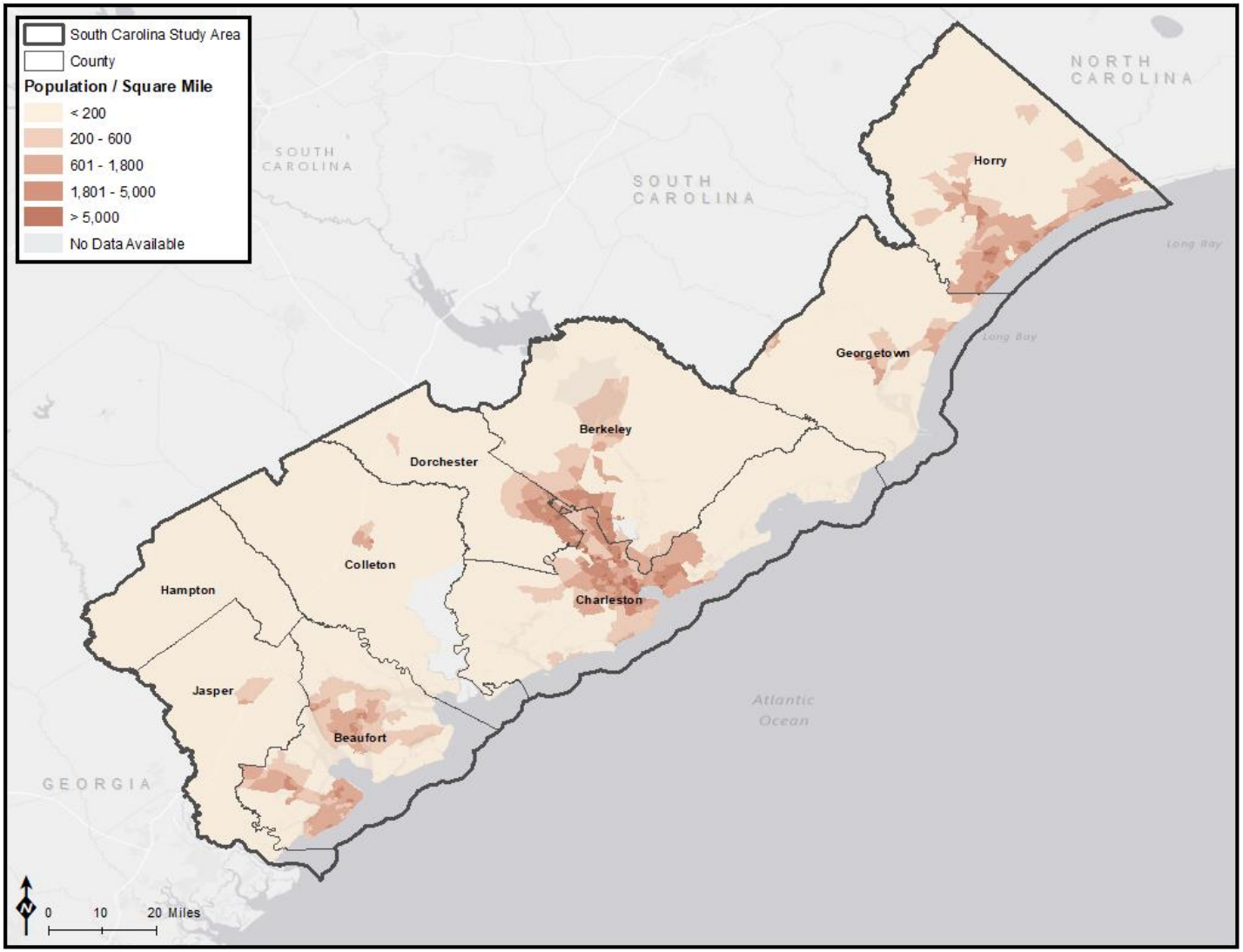
Source: USCB 2017r

Figure 15-19. Population in the South Carolina Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 15-20. Metropolitan Statistical Areas Located within the South Carolina Study Area



Source: USCB 2017r

Figure 15-21. Population Density in South Carolina Study Area by Census Block Group

15.4.1.2 Population Projections

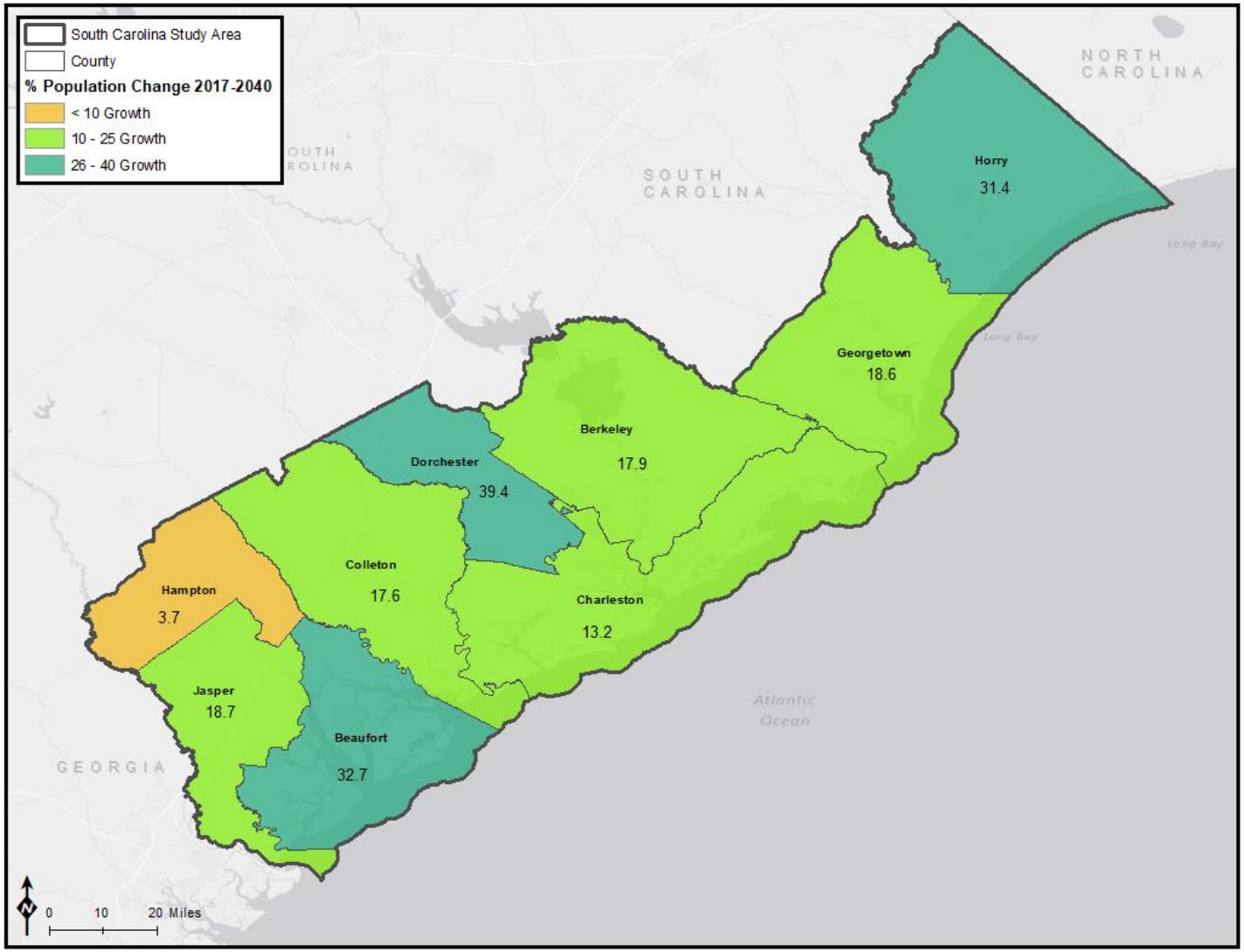
According to the SCDOT, South Carolina's population is projected to grow 29.8% (6.4 million residents) by 2040. Population in the Study Area is projected to grow 23.7% (1.7 million residents) by 2040, more than the Nation (16.4%) million) but less than the State (29.8%). Table 15-8 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040 (USCB 2017d, USCB 2018b, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c). Figure 15-22 shows the overall projected percent change in population in each county during the same period.

As shown in Table 15-8, projections indicate that 26.9% (1.7 million people) of the State's population will reside in the Study Area by 2040 as compared to 28.2% (1.4 million people) in 2017. Growth will not be uniform across the Study Area. Projected growth by county ranges from Dorchester (39.4%) to Hampton (3.7%). No counties are projected to experience a population decrease. As shown in Table 15-8, strong growth trends are expected to continue in Dorchester, Beaufort and Horry Counties, projected to be 39.4%, 32.7%, and 31.4%, respectively, between 2017 and 2040. As shown in Table 15-9, population density in the Study Area is projected to increase from 186 persons per square mile to 231 persons per square mile between 2017 and 2040 (USCB 2017d, USCB 2017c, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

15.4.2 Demographics

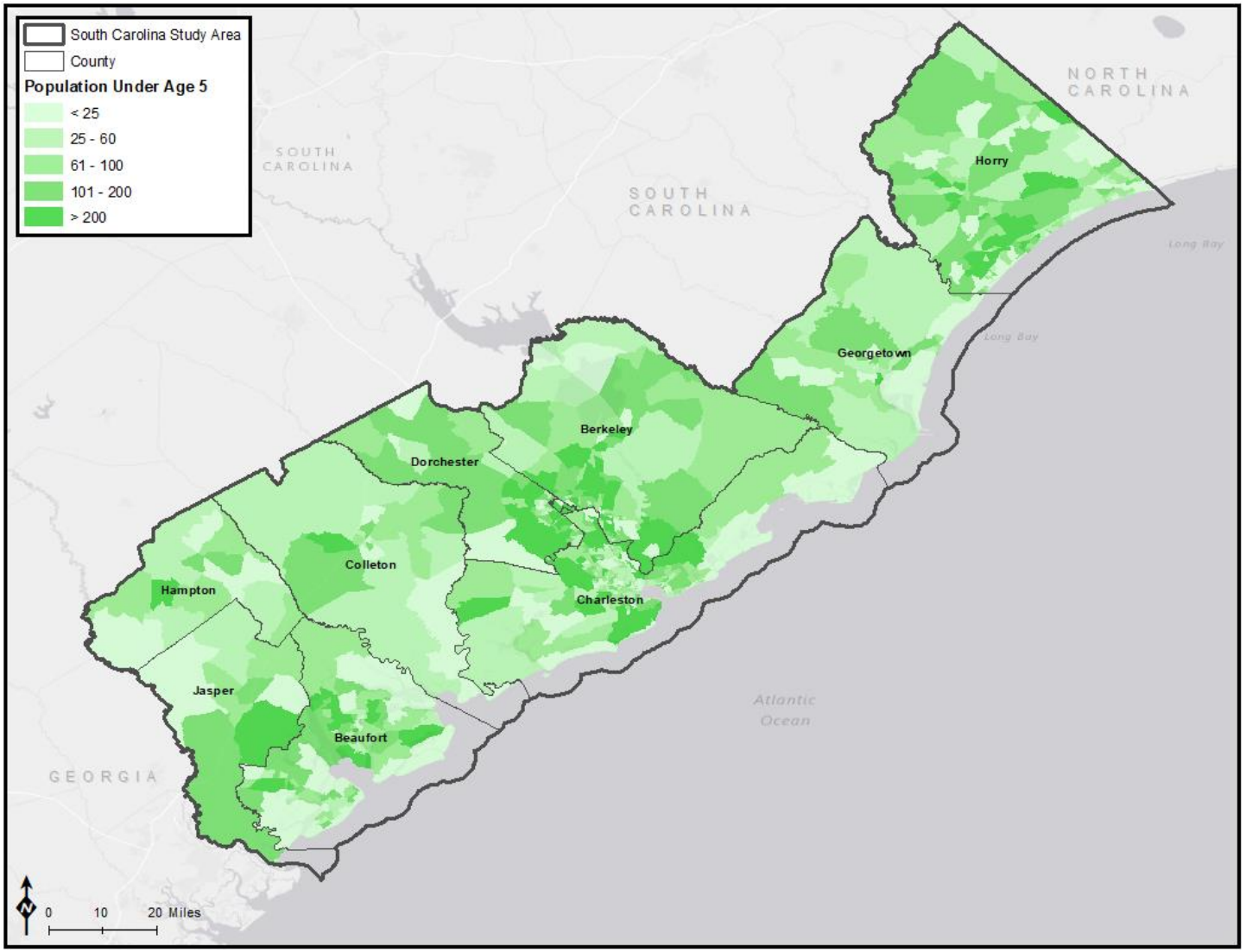
As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80-year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact South Carolina and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under age 5 and adults over age 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 15-23 and Figure 15-24 show the 2017 estimated population Under Age 5 and Over Age 65, respectively. Population projections for the "Under Age 5" group are not available. Figure 15-25 shows the projected change in the "Over Age 65" group 2040. Table 15-10 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., South Carolina, and the Study Area (Brookings Institute 2018, USCB 2017b, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in South Carolina and 5.8% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Table 15-10 shows the breakdown by county. Projections by the year 2040 indicate this group's decline to 5.7% in the Nation, but no change in the Study Area, which is expected to remain at 5.9%. Projections are not available on the county level (USCB 2017b, USCB 2018b).



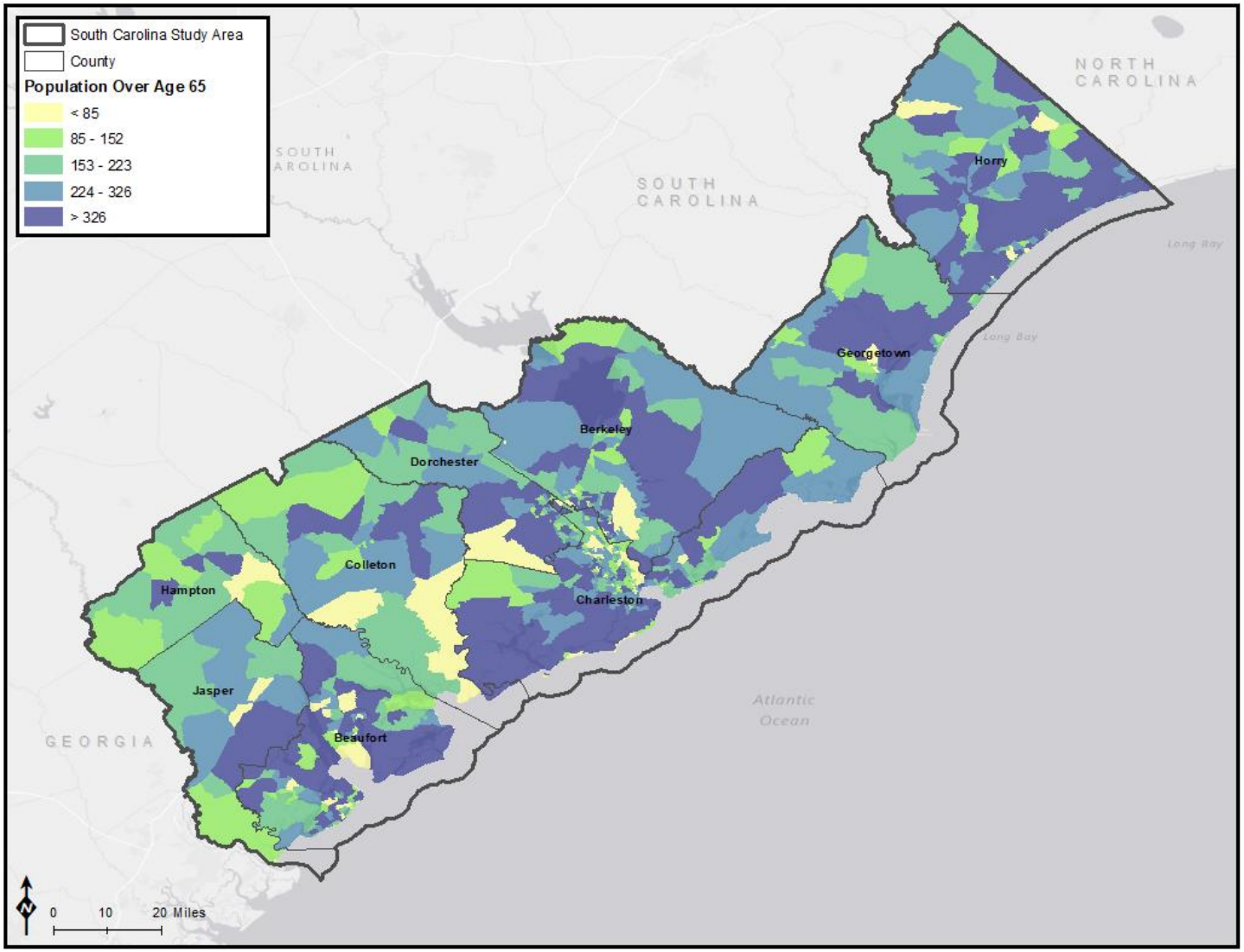
Sources: SCDOT 2014a, SCDOT 2014b, SCDOT 2014c

Figure 15-22. Overall Projected Population Change from 2017-2040 in the South Carolina Study Area by County



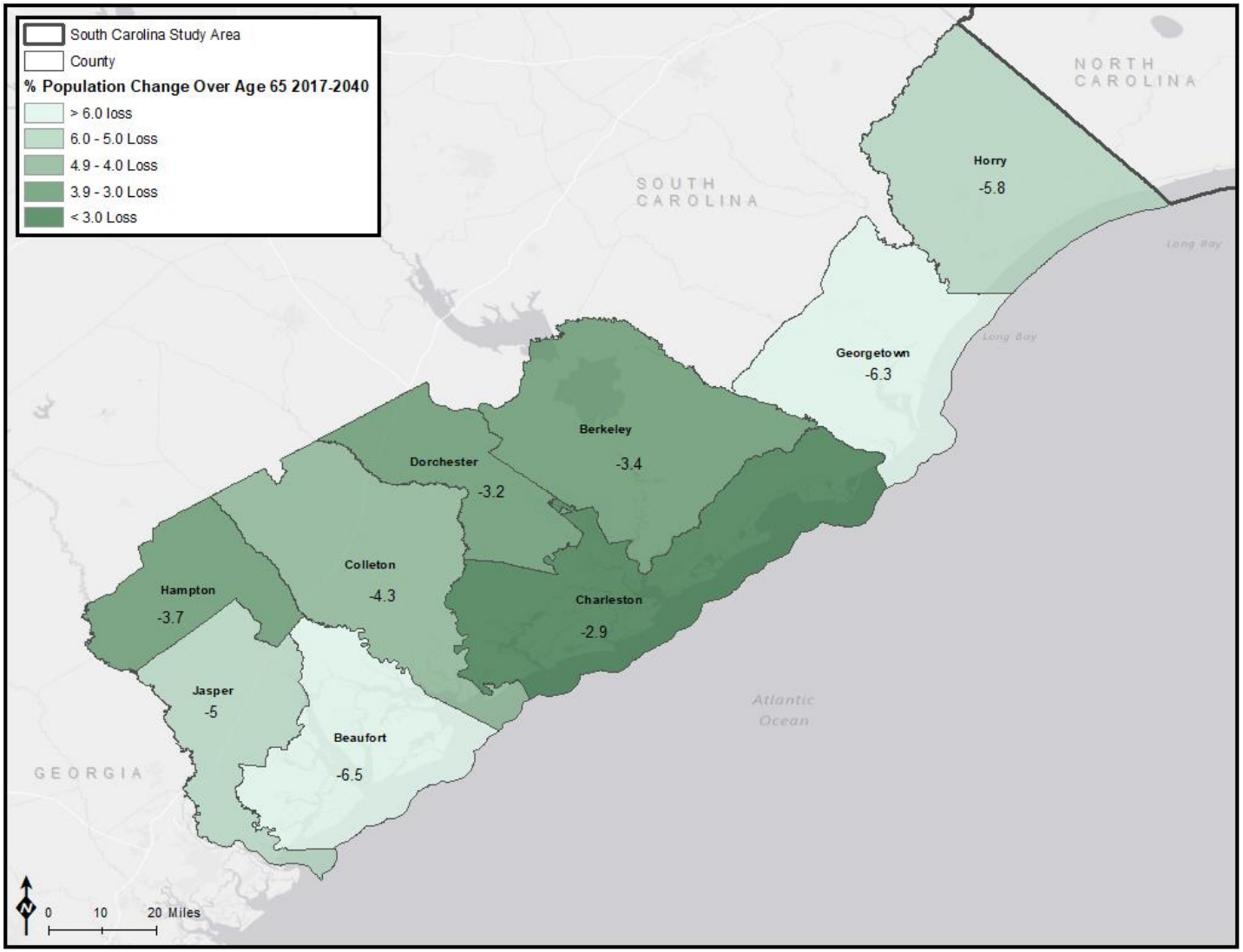
Source: USCB 2017r

Figure 15-23. Population Under Age 5 in the South Carolina Study Area by Census Block Group



Source: USCB 2017r

Figure 15-24. Population Over Age 65 in the South Carolina Study Area by Census Block Group



Sources: SCDOT 2014a, SCDOT 2014b, SCDOT 2014c

Figure 15-25. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the South Carolina Study Area by 2040

Table 15-10. Population Under Age 5 and Over Age 65 in the South Carolina Study Area

Geographic Unit	2017 Estimates					Data Unavailable at County Level				
	Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Beaufort	179,316	10,134	5.7	44,675	24.9	238,000	0	0.0	43,814	18.4
Berkeley	204,632	13,600	6.6	25,975	12.7	241,200	0	0.0	22,349	9.3
Charleston	387,847	23,485	6.1	58,018	15.0	438,900	0	0.0	52,786	12.0
Colleton	37,581	2,160	5.7	7,050	18.8	44,200	0	0.0	6,399	14.5
Dorchester	151,716	9,422	6.2	18,918	12.5	211,500	0	0.0	19,674	9.3
Georgetown	61,065	2,928	4.8	15,363	25.2	72,400	0	0.0	13,629	18.8
Hampton	20,066	1,102	5.5	3,394	16.9	20,800	0	0.0	2,756	13.3
Horry	310,186	15,750	5.1	66,092	21.3	407,500	0	0.0	63,313	15.5
Jasper	27,465	1,651	6.0	4,370	15.9	32,600	0	0.0	3,545	10.9
Study Area Total	**1,379,874**	**80,232**	**5.8**	**243,855**	**17.7**	**1,707,100**	**0**	**0.0**	**228,265**	**13.4**
South Carolina	**4,893,444**	**289,964**	**5.9**	**795,256**	**16.3**	**6,352,502**	**374,646**	**5.9**	**1,275,881**	**20.1**
United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: SCDOT 2014a, SCDOT 2014b, SCDOT 2014c, USCB 2017b, USCB 2018b
Note: South Carolina projections are not available for the “Under Age 5” population. Projections for the “Over Age 65” population are derived from multiple sources.

According to 2017 estimates shown in Table 15-10, the elderly represented 14.9% of the U.S. population; 16.3% in South Carolina and 17.7% in the Study Area. The number and proportion of elderly to the overall population are projected to rise, fueled by aging baby boomers. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% and 20.1% in the Nation and State, respectively, but decline to 13.2% in the Study Area. Sparsely populated Georgetown County had the largest percentage (25.5%) of elderly in 2017; a decline to 18.8% is projected by 2040. For the study area, this is an overall decrease of 4.3% in the proportion of the population over age 65 from 2017-2040 (USCB 2017b, USCB 2018b, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c).

15.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner-occupied versus rental housing for the Study Area, are presented in Table 15-11.

As shown in Table 15-11, in 2017 homeownership in South Carolina was 68.6%, higher than the Nation (63.8%) and the Study Area (67.9%). Renters comprised approximately 31.4% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was slightly higher (32.1%) (USCB 2017m).

Figure 15-26 illustrates median home values in the Study Area, indicating higher values near the coasts. Median home values were higher in the Study Area ($152,550) than the State ($148,600) but lower than the Nation ($193,500). As shown in Table 15-11, Beaufort County, located in the Hilton Head Island-Bluffton-Beaufort SC metropolitan area, has the highest median home value ($283,800); Hampton County had the lowest ($75,400) (USCB 2017l).

Home values in the State increased 4.2% during the 12-month period ending November 2019 according to Zillow, an online real estate database company that provides information about housing market trends, based on three metrics: the list-to-sale price ratio, the prevalence of price cuts on home listings, and time-on-market (Zillow.com 2019e). The market temperature of the State is characterized as very hot (Zillow.com 2019e), which indicates market conditions favorable to sellers. In the 12-month period ending November 2019, metropolitan area market temperatures ranged from warm to very hot, and home values increased at the following rates:

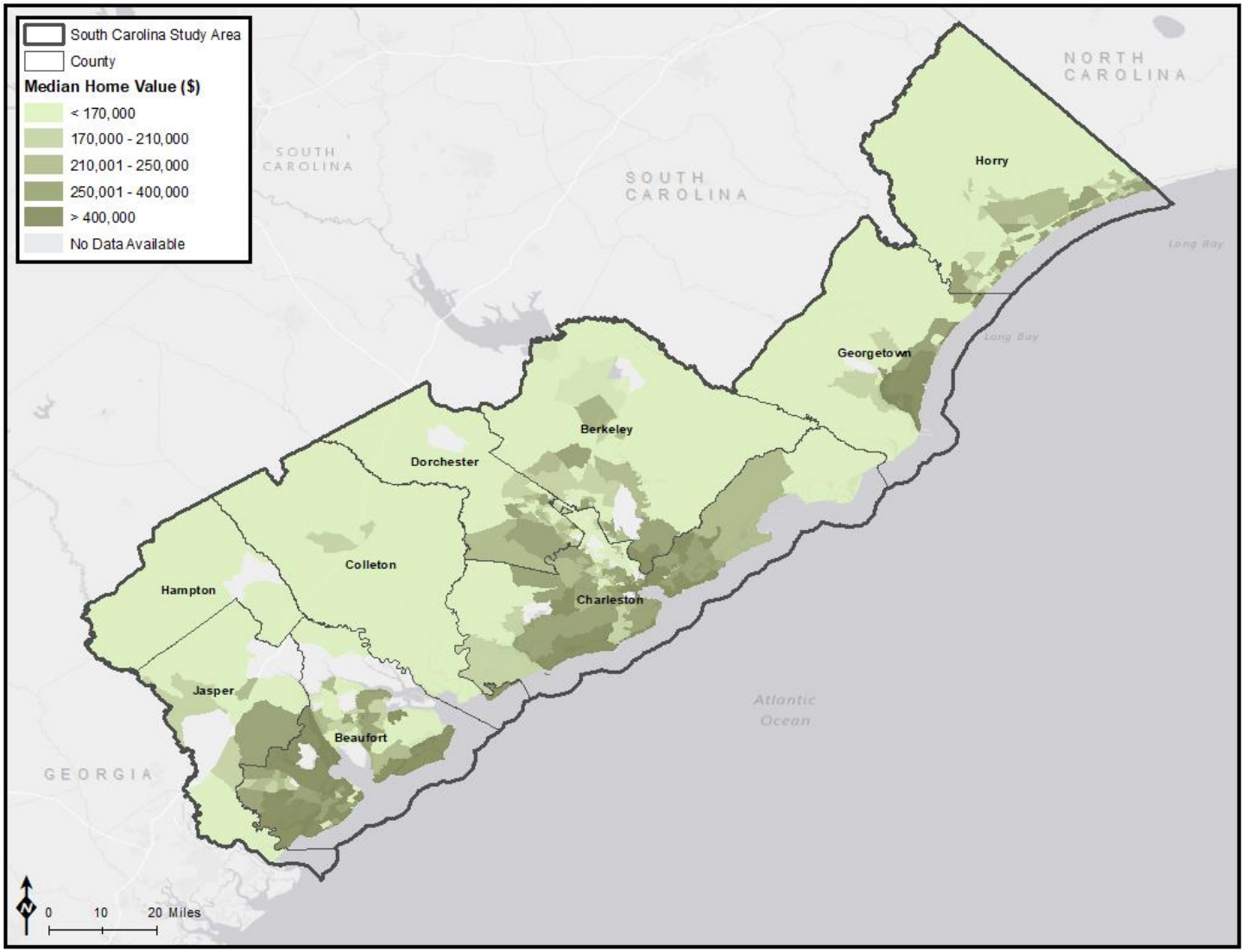
- Charleston-North Charleston, SC – 2.2%; warm (Zillow.com 2019f)
- Hilton Head Island-Bluffton-Beaufort, SC – 1.4%; hot (Zillow.com 2019g)
- Myrtle Beach-Conway-North Myrtle Beach, SC-NC – 2.6%; warm (Zillow.com 2019h)
- Savannah, GA – 4.3%; very hot (Zillow.com 2019i)

Chapter 1.6.3 discusses additional home value trends across the overall Study Area, including South Carolina.

Table 15-11. Housing Utilization and Vacancy Rates in the South Carolina Study Area

Geographic Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Gross Rent
Beaufort	96,401	68,790	27,611	28.6	48,493	70.5	20,297	29.5	$283,800	$1,105
Berkeley	80,049	73,168	6,881	8.6	51,215	70.0	21,953	30.0	$164,900	$1,014
Charleston	181,326	154,049	27,277	15.0	93,308	60.6	60,741	39.4	$273,100	$1,084
Colleton	19,976	15,134	4,842	24.2	11,016	72.8	4,118	27.2	$84,600	$703
Dorchester	59,038	54,028	5,010	8.5	38,389	71.1	15,639	28.9	$177,500	$1,003
Georgetown	34,628	24,840	9,788	28.3	18,992	76.5	5,848	23.5	$178,600	$918
Hampton	9,131	7,129	2,002	21.9	5,399	75.7	1,730	24.3	$75,400	$550
Horry	198,229	125,168	73,061	36.9	87,486	69.9	37,682	30.1	$166,500	$883
Jasper	11,306	9,715	1,591	14.1	6,737	69.3	2,978	30.7	$130,700	$838
Study Area Total	**690,084**	**532,021**	**158,063**	**22.9**	**361,035**	**67.9**	**170,986**	**32.1**	**$166,500**	**$918**
South Carolina	**2,229,324**	**1,871,307**	**358,017**	**16.1**	**1,284,532**	**68.6**	**586,775**	**31.4**	**$148,600**	**$836**
United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



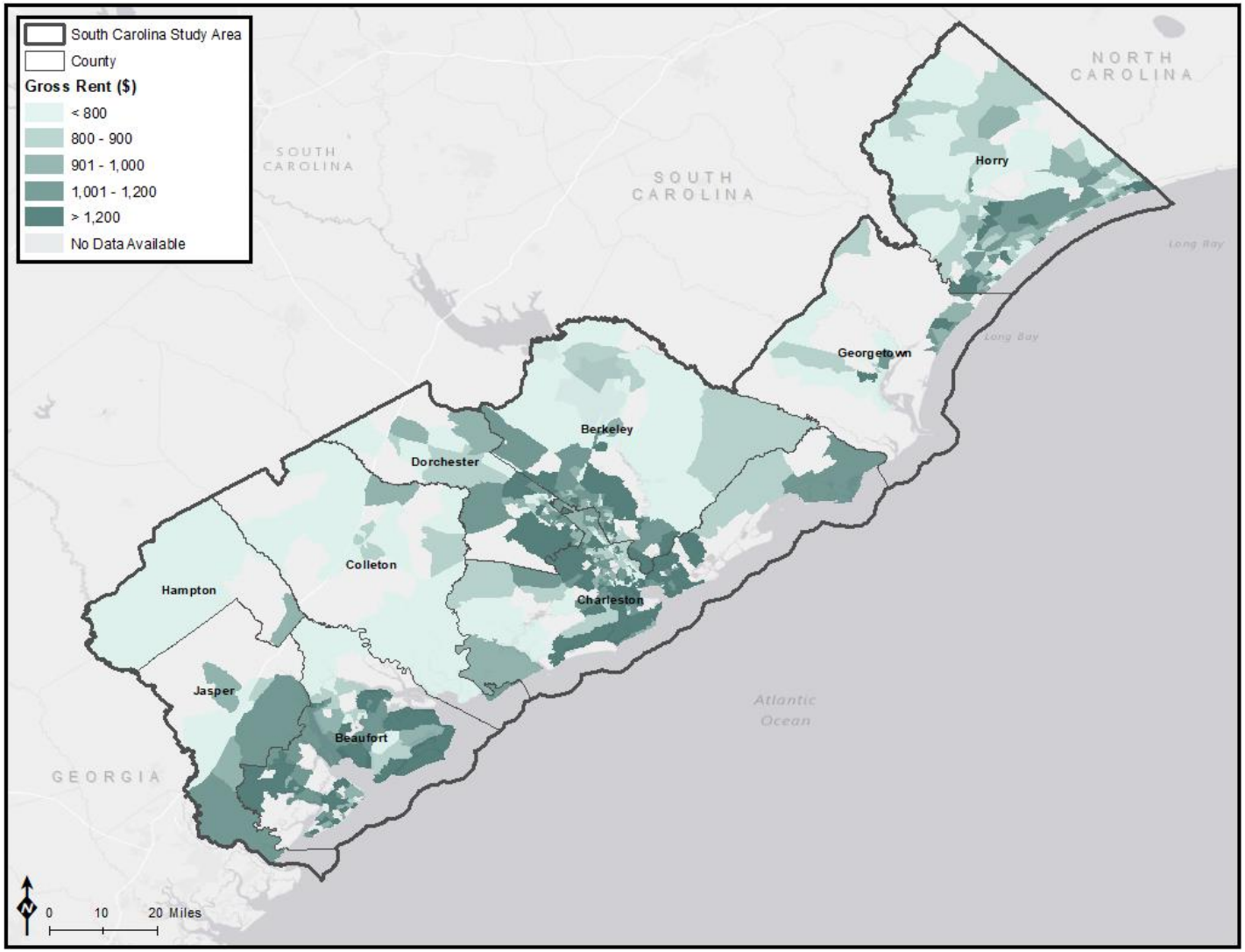
Source: USCB 2017r

Figure 15-26. Median Home Value in the South Carolina Study Area by Census Block Group

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they cannot afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

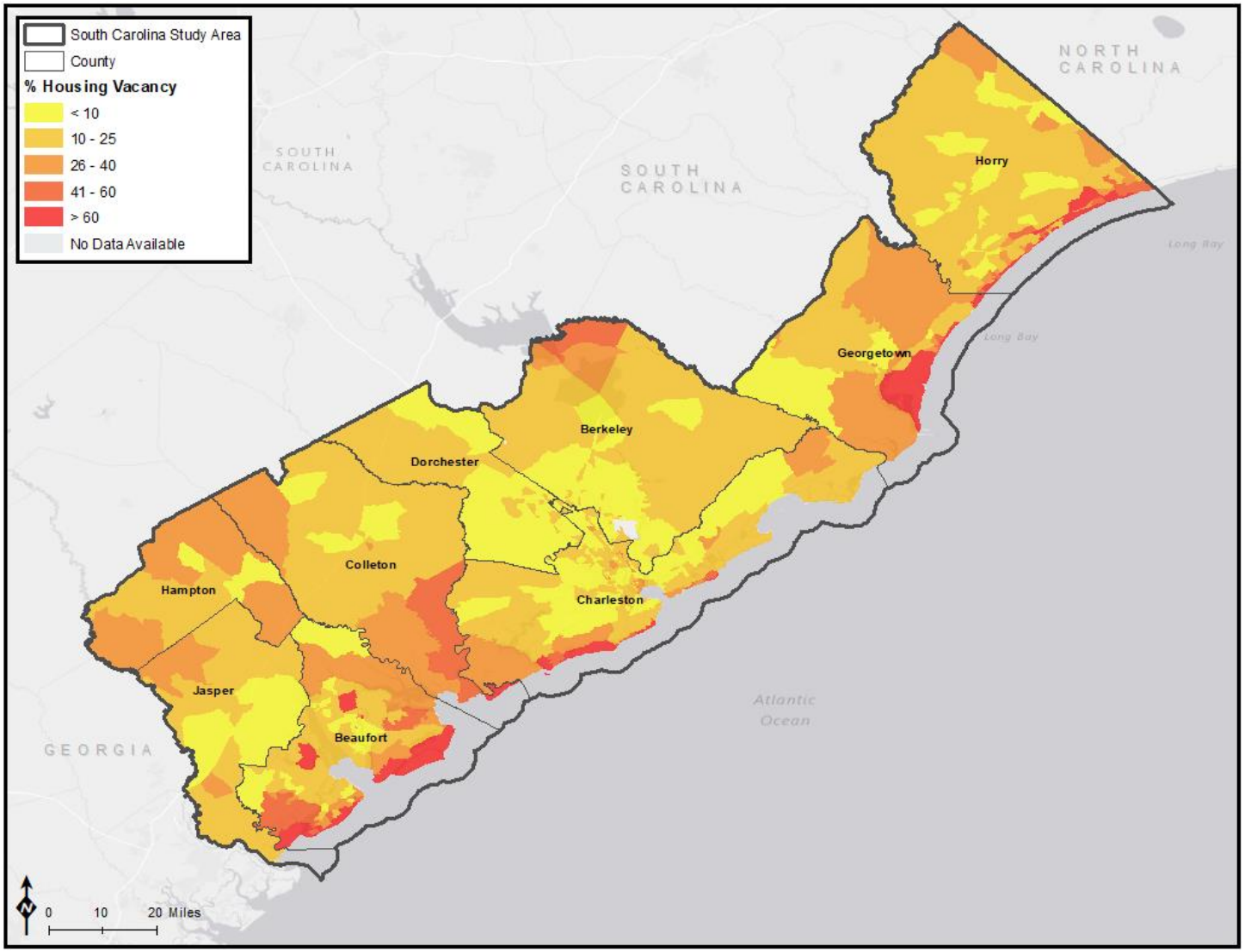
Figure 15-27 illustrates median gross rents in the Study Area. According to the National Low Income Housing Coalition, as of 2019, throughout South Carolina, fair market rent for a two-bedroom rental unit is $898. In these conditions, a minimum wage worker would have to work approximately 95 hours a week in order to afford a two-bedroom fair market rate home. South Carolina has a shortage of approximately 84,056 rental homes affordable and available to extremely low-income households. Approximately 161,742 (27%) of renter households in South Carolina are considered extremely low income; approximately 113,221 (70%) of those households are severely cost burdened, spending more than half of their income on housing. The largest demographic types within this category include persons in the labor force (45%), single caregivers (19%), and disabled (21%), a large portion of which are on a fixed income. These households are more likely than other renters to forego necessities (e.g., healthcare) and experience unstable housing situations like evictions (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

As shown in Table 15-11, home vacancy rates in the Study Area were 22.9, higher than the State (16.1%) and Nation (12.2%). Figure 15-28 shows vacancy rates in the Study Area by census block group. The figure illustrates the highest vacancy rates (36.9%) in Horry County and the lowest in Dorchester and Berkeley Counties (8.5% and 8.6%, respectively) (USCB 2017g). High vacancy rates are often indicative of properties defined as vacant by the USCB that are vacation homes and/or investment properties used as short-term rentals.



Source: USCB 2017r

Figure 15-27. Median Gross Rent in the South Carolina Study Area by Census Block Group



Source: USCB 2017r

Figure 15-28. Housing Vacancy Rates in the South Carolina Study Area by Census Block Group

15.4.4 Employment

15.4.4.1 Types of Employment

Employment data by industry sector are presented in Table 15-12. In 2017, the Study Area had a total employment of approximately 631,000 jobs, representing approximately 28.9% of the total jobs in South Carolina and 0.4% of the total jobs in the U.S. (USCB 2017p). South Carolina's 2018 annual gross domestic product was 233.9, which represented 1.1% of the Nation's gross domestic product (BEA 2019).

Table 15-12. Census Bureau Labor and Industry Statistics Employment Sectors for the United States, South Carolina, and the South Carolina Study Area (number of jobs)

Industry	United States	Percent (%)	South Carolina	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**2,181,046**		**631,311**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	21,892	1.0	4,966	0.8
Construction	9,564,541	6.4	142,044	6.5	50,255	8.0
Manufacturing	15,477,389	10.3	300,142	13.8	47,543	7.5
Wholesale trade	4,042,867	2.7	57,382	2.6	13,133	2.1
Retail trade	17,167,000	11.4	265,117	12.2	81,323	12.9
Transportation and warehousing, and utilities	7,681,579	5.1	104,786	4.8	27,454	4.3
Information	3,173,300	2.1	39,377	1.8	12,425	2.0
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	123,703	5.7	35,893	5.7
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	216,627	9.9	75,934	12.0
Educational services, and health care and social assistance	34,781,348	23.1	473,027	21.7	131,236	20.8
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	225,778	10.4	88,945	14.1
Other services, except public administration	7,371,226	4.9	111,227	5.1	32,383	5.1
Public administration	7,025,870	4.7	99,944	4.6	29,821	4.7

Source: USCB 2017p

Table 15-12 and Figure 15-29 show the number of jobs in each major industry sector for the U.S., the State, and the Study Area based on USCB data. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (20.8%); arts, entertainment, and recreation, and accommodation and food services (14.1%); retail trade (12.9%); professional, scientific, and management, and administrative and waste management (12.0%). Generally, the dominant employment

sectors in the Study Area are similar to those of the State. In the Study Area, 12.0% of people work in professional, scientific, and management, and administrative and waste management, more than the State (9.9%) and the Nation (11.3%). South Carolina has a higher percentage of manufacturing jobs (13.8%) as compared to the Nation (10.3%) and the Study Area (7.5%) (USCB 2017p).

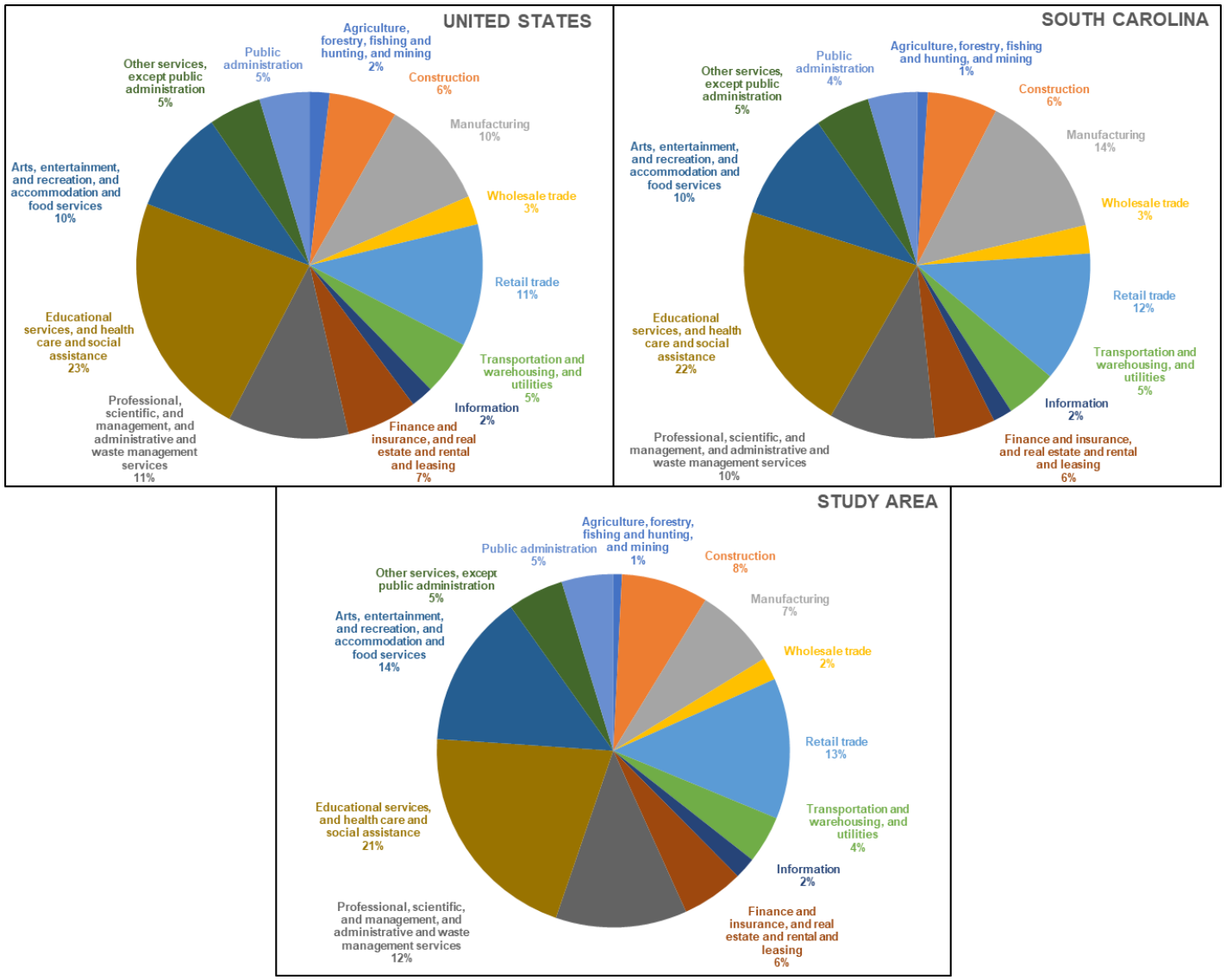
In 2017, the South Carolina Department of Employment and Workforce listed the industries with the highest employment numbers not including government workers as (1) trade, transportation, and utilities, (2) professional and business, (3) leisure and hospitality, (4) education and healthcare, and (5) manufacturing (SCDEW 2017). While these were the top industries by highest percentage of the workforce, several had a location quotient statistic greater than 1, which indicates that an industry has a higher concentration of workers than the Nation, and therefore has a competitive edge over its neighbors in the respective industry (BLS 2016). Industries in South Carolina with an location quotient over 1 are utilities, manufacturing, retail trade, administrative and waste services, and accommodation and food services (SCDEW 2017). These industries show South Carolina's strong economic foundation in tourism and manufacturing. Agribusiness, although not commonly included as industry, accounted for $26.8 billion dollars and contributed more to the South Carolina economy than any other key industry in the State (London & Associates 2015).

Figure 15-30 shows the location of jobs within the Study Area based on USCB data. The greater portion of jobs are located in Charleston County near the high-density MSA of the Charleston-North Charleston, South Carolina MSA. Population density increases the demand for all goods, services, space, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in Georgetown, Colleton, and Hampton Counties. Rural areas tend to have fewer locally available options and less economic development.

15.4.4.1.1 South Carolina's Ocean Economy

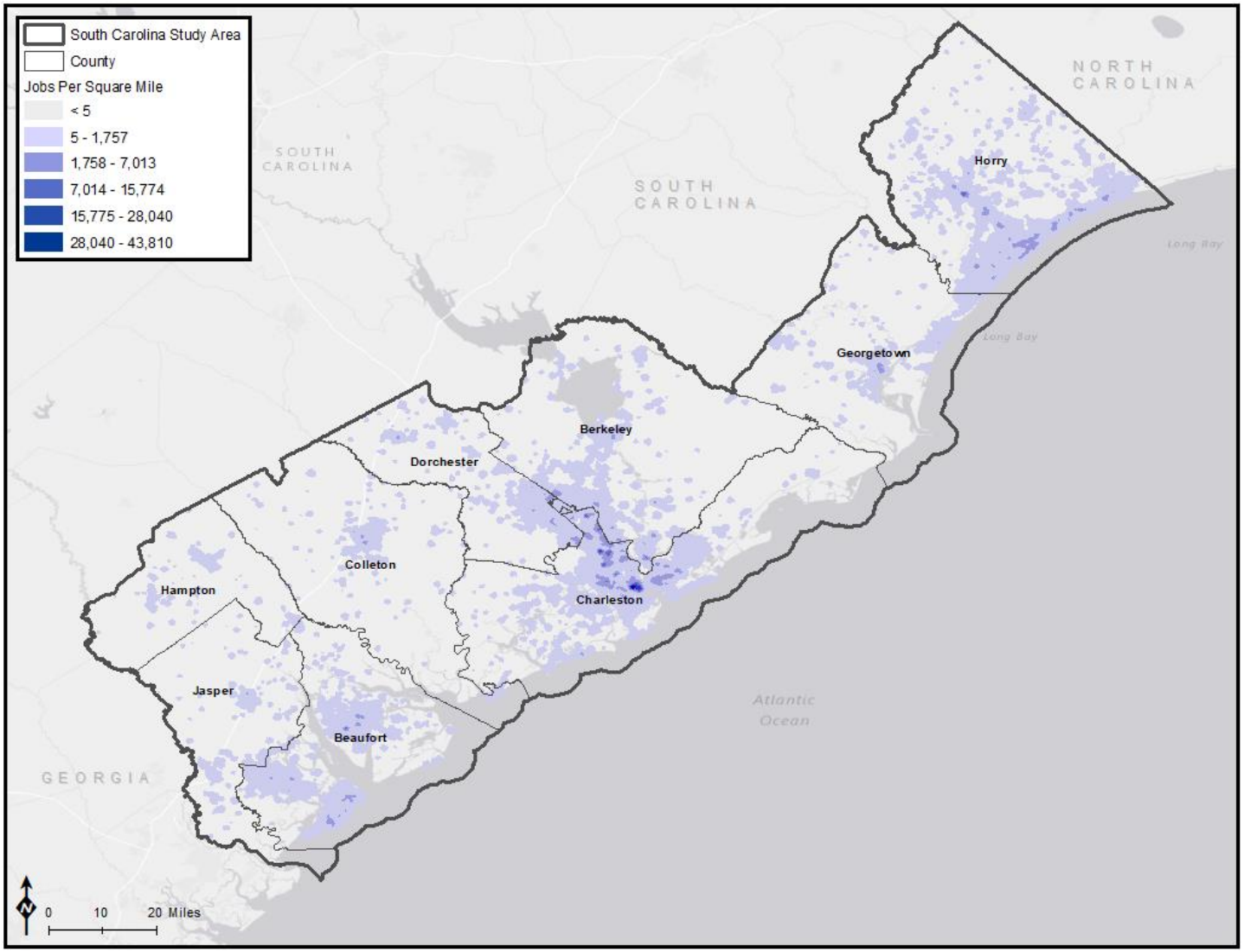
Overall, South Carolina's ocean economy ranked 13th in employment among the 30 states included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 15-13 South Carolina's ocean economy accounted for 80,178 maritime jobs in 2016, accounting for 4.0% of South Carolina's employment (NOAA 2016b, USCB 2017i). Within the State, tourism and recreation was the dominant sector, accounting for 89.1% (70,554) of maritime jobs. The tourism and recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2016b).

The Study Area had 78,068 maritime jobs, representing 97.4% of total maritime jobs in the State. Charleston County had the greatest number of maritime jobs (32,364), representing 41.5% of maritime jobs in the Study Area (USCB 2017i, NOAA 2016b). Figure 15-31 shows the percent of maritime-related jobs to total jobs in each county in the Study Area. The highest percentage of maritime jobs to overall county jobs were in Horry (21.3%), Beaufort (18.2%), and Georgetown (17.4%) (NOAA 2016b). The coastal counties have a higher percentage of maritime-related jobs, reflecting their proximity to the ocean and maritime employment opportunities.



Source: (USCB 2017p)

Figure 15-29. Number of Jobs by Industry Sector for the U.S., South Carolina, and the South Carolina Study Area



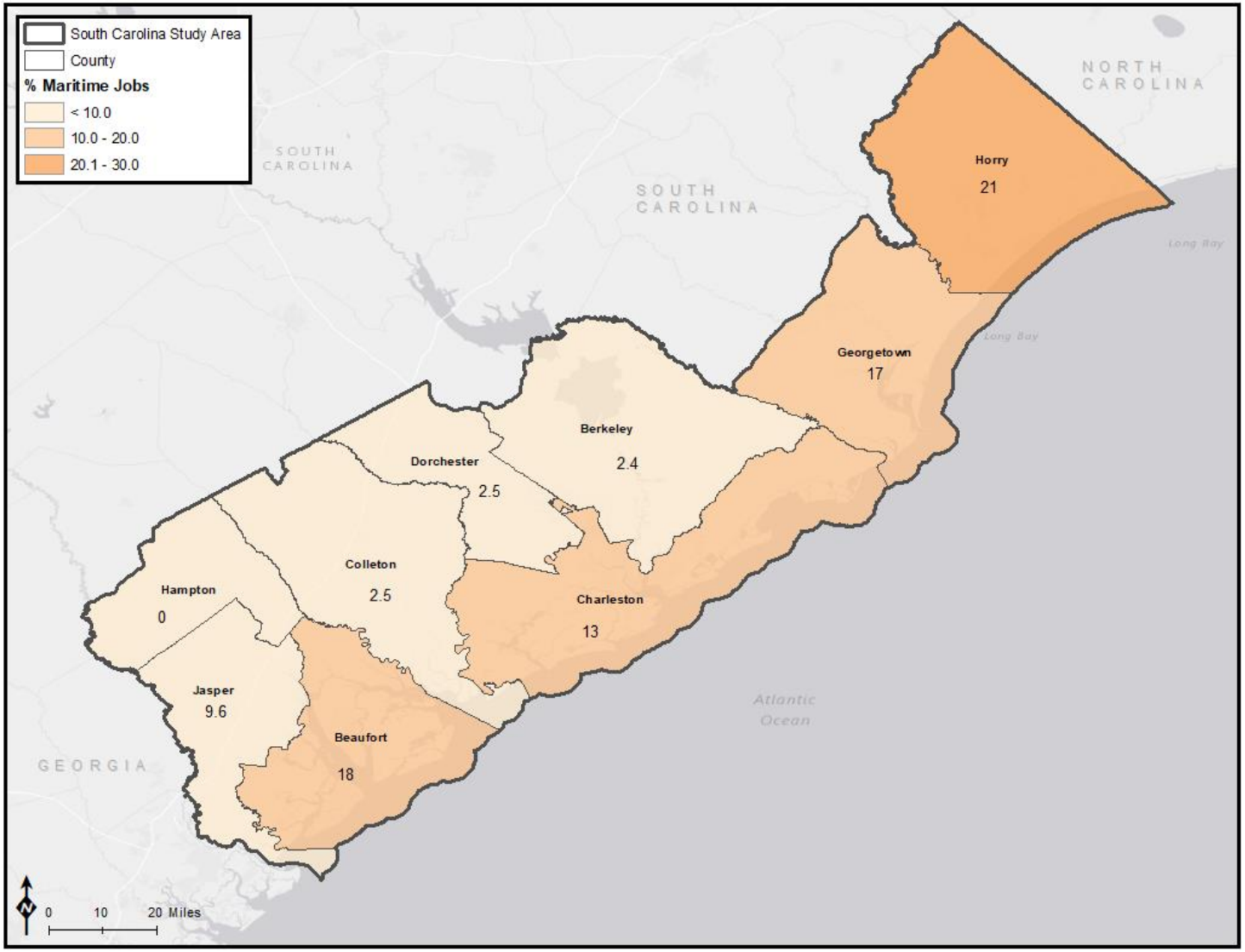
Source: USCB 2017r

Figure 15-30. Jobs Per Square Mile in the South Carolina Study Area by Census Block Group

Table 15-13. Employment Data in the South Carolina Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Geographic Unit	Total Labor Force (civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (civilian labor force)[1]	Unemployed (civilian labor force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Beaufort	85,236	79,158	74,171	4,987	6.3	62,246	11,349	18.2	$60,603	$34,966
Berkeley	103,990	99,470	93,092	6,378	6.4	56,103	1,360	2.4	$56,697	$27,010
Charleston	209,293	206,780	195,823	10,957	5.3	243,055	32,364	13.3	$57,882	$35,587
Colleton	17,398	17,287	15,638	1,649	9.5	10,794	271	2.5	$34,996	$21,059
Dorchester	76,159	75,164	70,522	4,642	6.2	35,513	896	2.5	$58,685	$27,317
Georgetown	26,747	26,712	24,152	2,560	9.6	21,982	3,816	17.4	$46,967	$28,748
Hampton	8,288	8,225	7,429	796	9.7	4,366	0	0.0	$32,147	$17,676
Horry	149,154	149,017	138,429	10,588	7.1	127,692	27,150	21.3	$46,475	$25,804
Jasper	13,559	13,492	12,055	1,437	10.7	8,997	862	9.6	$39,740	$20,067
Study Area Total	**689,824**	**675,305**	**631,311**	**43,994**	**6.5**	**570,748**	**78,068**	**13.7**	**$46,967**	**$26,470**
South Carolina	**2,381,900**	**2,351,303**	**2,181,046**	**170,257**	**7.2**	**2,017,500**	**80,178**	**4.0**	**$48,781**	**$26,645**
United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 15-31. Maritime Jobs in the South Carolina Study Area by County

15.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019).As shown in Table 15-13, in 2017 South Carolina had lower median household income and per capita income than the U.S. According to the USCB, the U.S. had a median income of $57,652 and a per capita income of $31,177 in 2017. During the same period, South Carolina had a median income of $48,781 (15.4% lower than the Nation's median income) and a per capita income of $26,645 (14.5% lower than the Nation's per capita income). Median and per capita income in the Study Area were slightly lower than the State at $46,967 and $26,470, respectively (USCB 2017k, USCB 2017n).

As shown in Table 15-13, in 2017 median household income ranged from $32,147 (Hampton County) to $60,603 (Beaufort County); per capita income ranged from $17,687 (Hampton County) to $34,966 (Beaufort County). Figure 15-32 shows median household income in the Study Area. Figure 15-33 shows per capita income in the Study Area (USCB 2017k, USCB 2017n).

15.4.4.3 Unemployment Rates

Figure 15-34 shows the 2017 unemployment rates in the Study Area by census block group. Table 15-13 presents unemployment rates for each county in the Study Area. The average unemployment rate in the Study Area was 6.5%, less than the State (7.2%) and the Nation (6.6%), reflecting the availability of jobs in the Charleston-North Charleston, SC and Myrtle Beach-Conway-North Myrtle Beach, SC-NC metropolitan areas. Within the Study Area, unemployment rates ranged from 5.3% in Charleston County to 10.7% in Jasper County in 2017 (USCB 2017h).

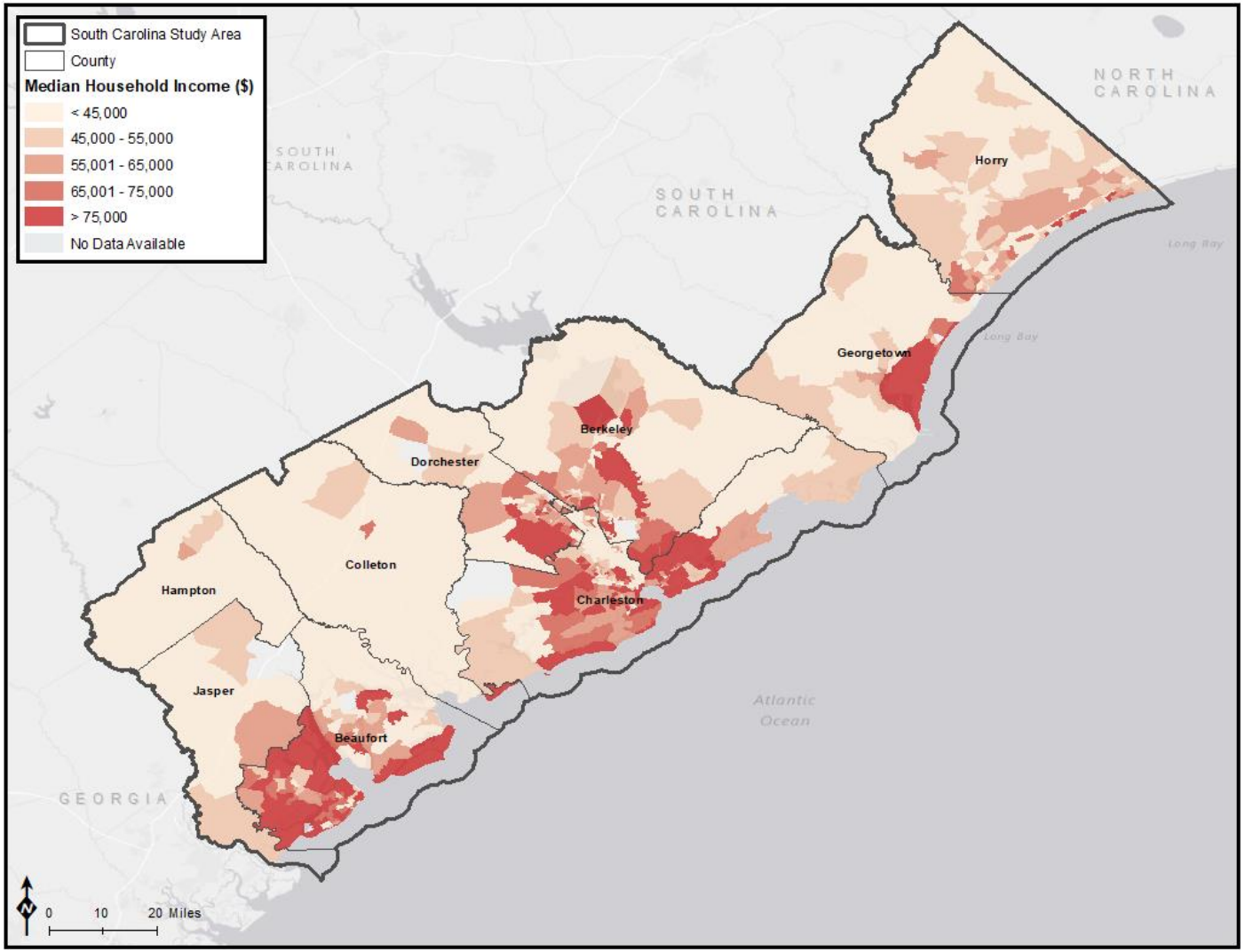
15.4.4.4 Educational Attainment

As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 15-14 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State, and the Nation (USCB 2017t).

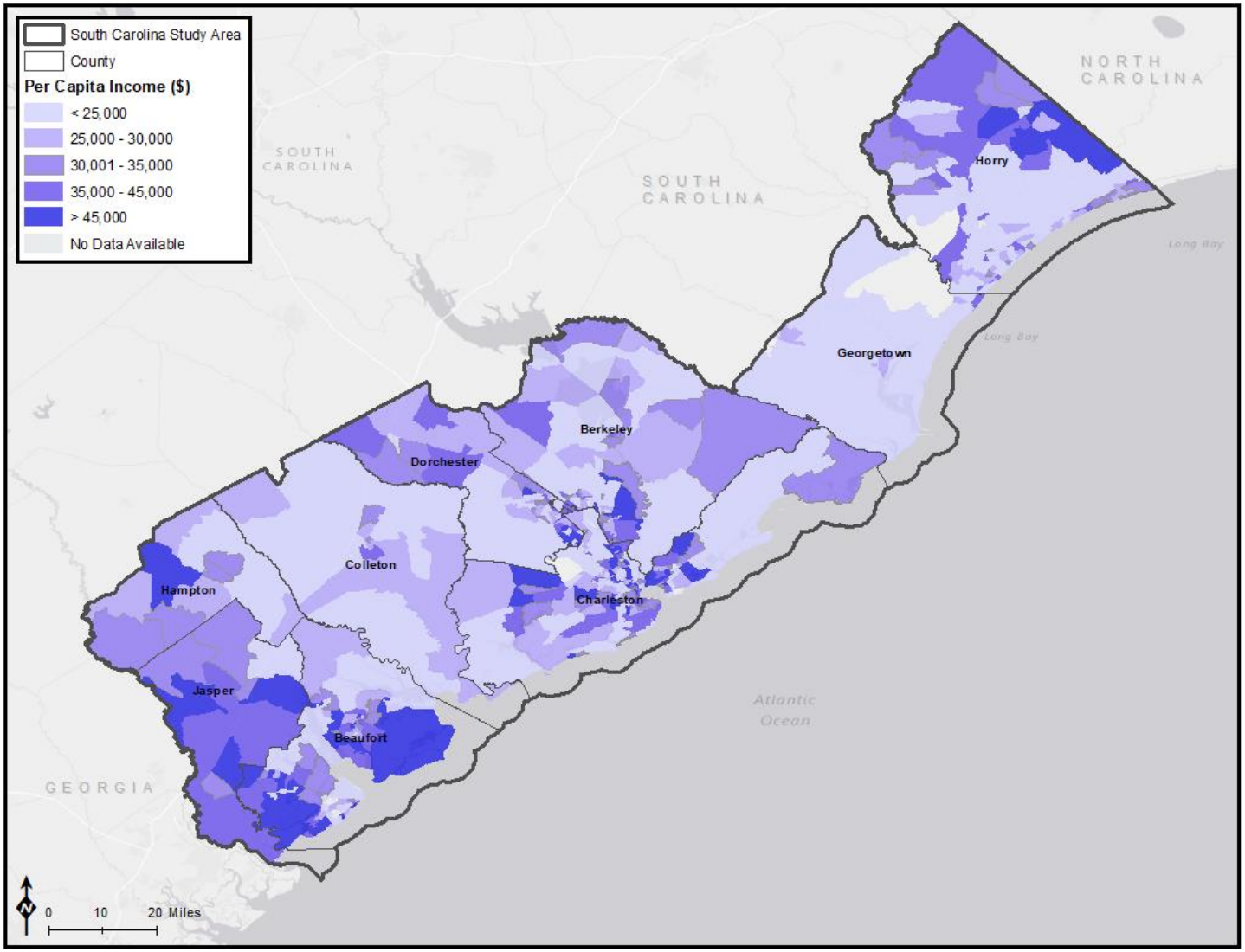
Figure 15-35 shows the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State, and the counties comprising the Study Area.

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In South Carolina, 30.0% of the working-age population earned only a high school diploma; 34.1% earned a college or advanced degree.
- In the Study Area, 28.4% of the working-age population earned only a high school diploma; 36.6% earned a college or advanced degree (USCB 2017q).



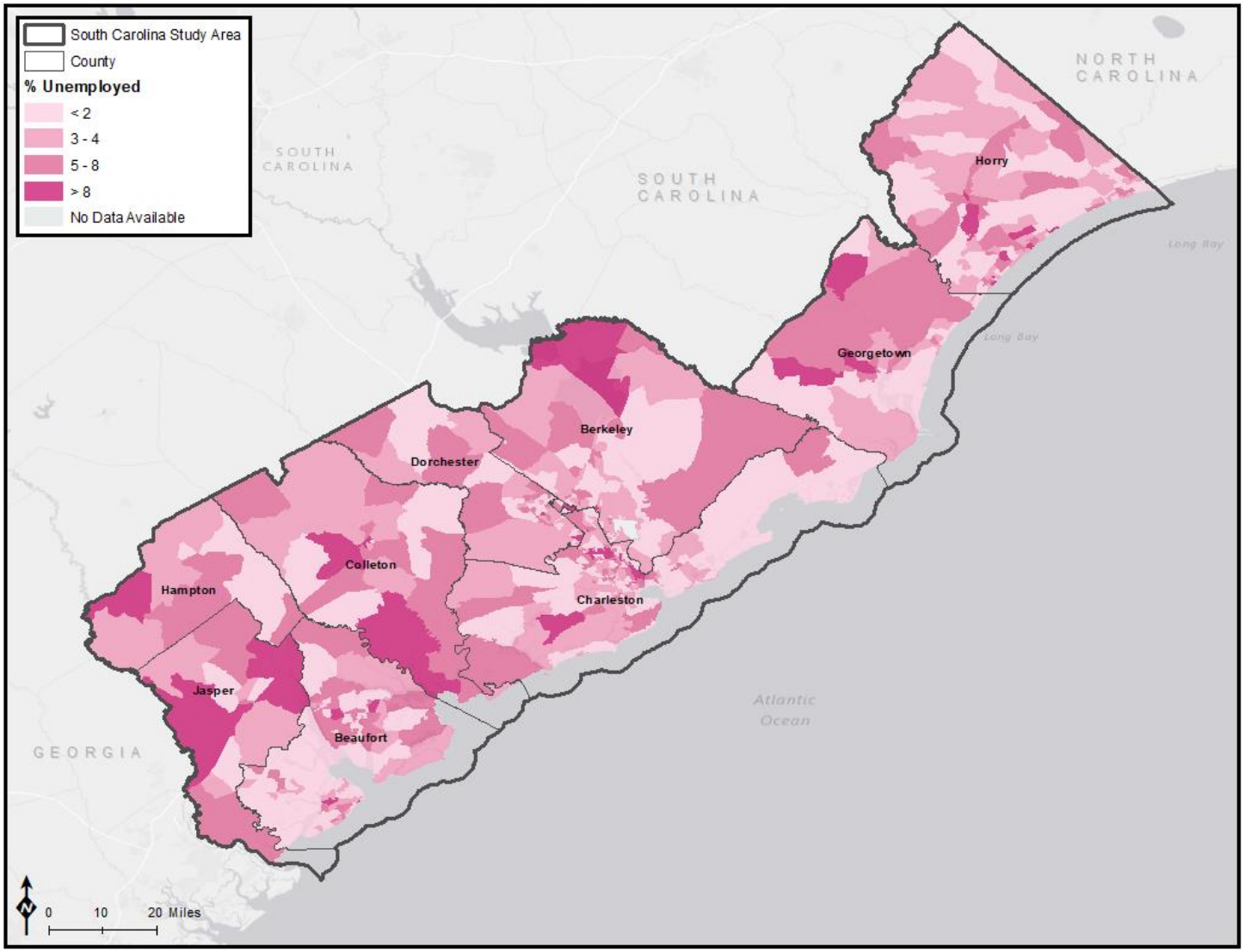
Source: USCB 2017r

Figure 15-32. Median Household Income in the South Carolina Study Area by Census Block Group



Source: USCB 2017r

Figure 15-33. Per Capita Income in the South Carolina Study Area by Census Block Group



Source: USCB 2017r

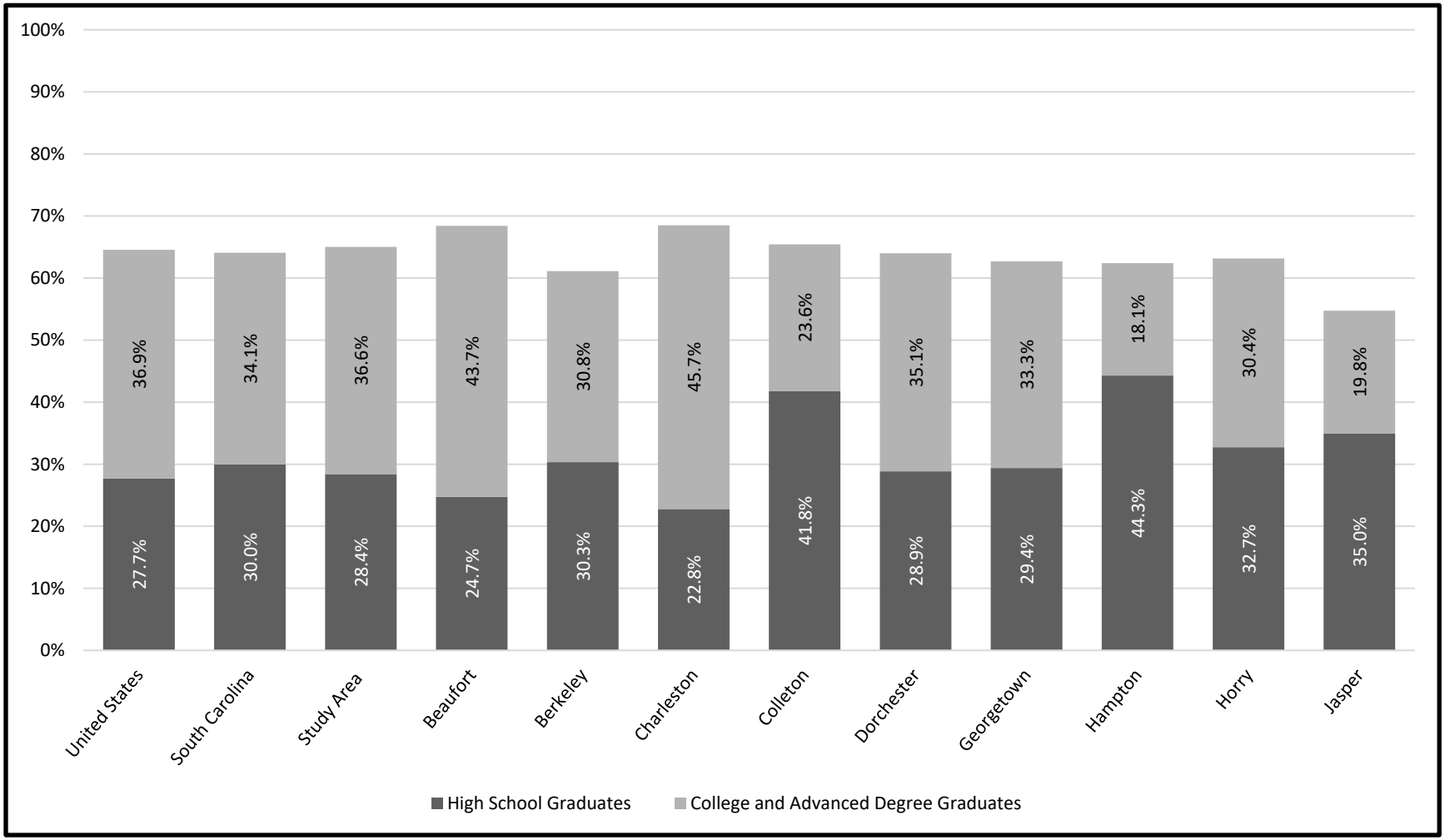
Figure 15-34. Unemployment Rates in the South Carolina Study Area by Census Block Group

Table 15-14. Educational Data for the South Carolina Study Area

Geographic Unit	Number							Total	Percent						
	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Beaufort	3,179	8,458	35,662	33,904	11,096	31,020	20,789	144,108	2.2%	5.9	24.7	23.5	7.7	21.5	14.4
Berkeley	4,777	13,823	46,991	41,680	14,543	22,696	10,458	154,968	3.1%	8.9	30.3	26.9	9.4	14.6	6.7
Charleston	7,762	20,549	70,623	69,397	21,715	78,539	41,548	310,133	2.5%	6.6	22.8	22.4	7.0	25.3	13.4
Colleton	1,120	3,052	12,116	5,849	2,732	2,820	1,300	28,989	3.9%	10.5	41.8	20.2	9.4	9.7	4.5
Dorchester	3,189	9,093	32,743	28,592	11,175	18,748	9,938	113,478	2.8%	8.0	28.9	25.2	9.8	16.5	8.8
Georgetown	1,878	4,849	14,428	11,598	4,050	7,640	4,657	49,100	3.8%	9.9	29.4	23.6	8.2	15.6	9.5
Hampton	671	2,214	6,903	2,975	1,166	1,100	556	15,585	4.3%	14.2	44.3	19.1	7.5	7.1	3.6
Horry	7,418	19,975	82,255	65,166	22,395	36,228	17,787	251,224	3.0%	8.0	32.7	25.9	8.9	14.4	7.1
Jasper	1,171	3,873	7,559	4,740	1,339	1,985	946	21,613	5.4%	17.9	35.0	21.9	6.2	9.2	4.4
Study Area Total	**31,165**	**85,886**	**309,280**	**263,901**	**90,211**	**200,776**	**107,979**	**1,089,198**	**2.9%**	**7.9**	**28.4**	**24.2**	**8.3**	**18.4**	**9.9**
South Carolina	**139,309**	**357,682**	**1,175,967**	**912,182**	**330,153**	**650,040**	**357,316**	**3,922,649**	**3.6%**	**9.1**	**30.0**	**23.3**	**8.4**	**16.6**	**9.1**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5%**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 15-35. High School, College, and Advanced Degree Graduate Rates in the South Carolina Study Area

Figure 15-36 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

15.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.

Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- Native tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

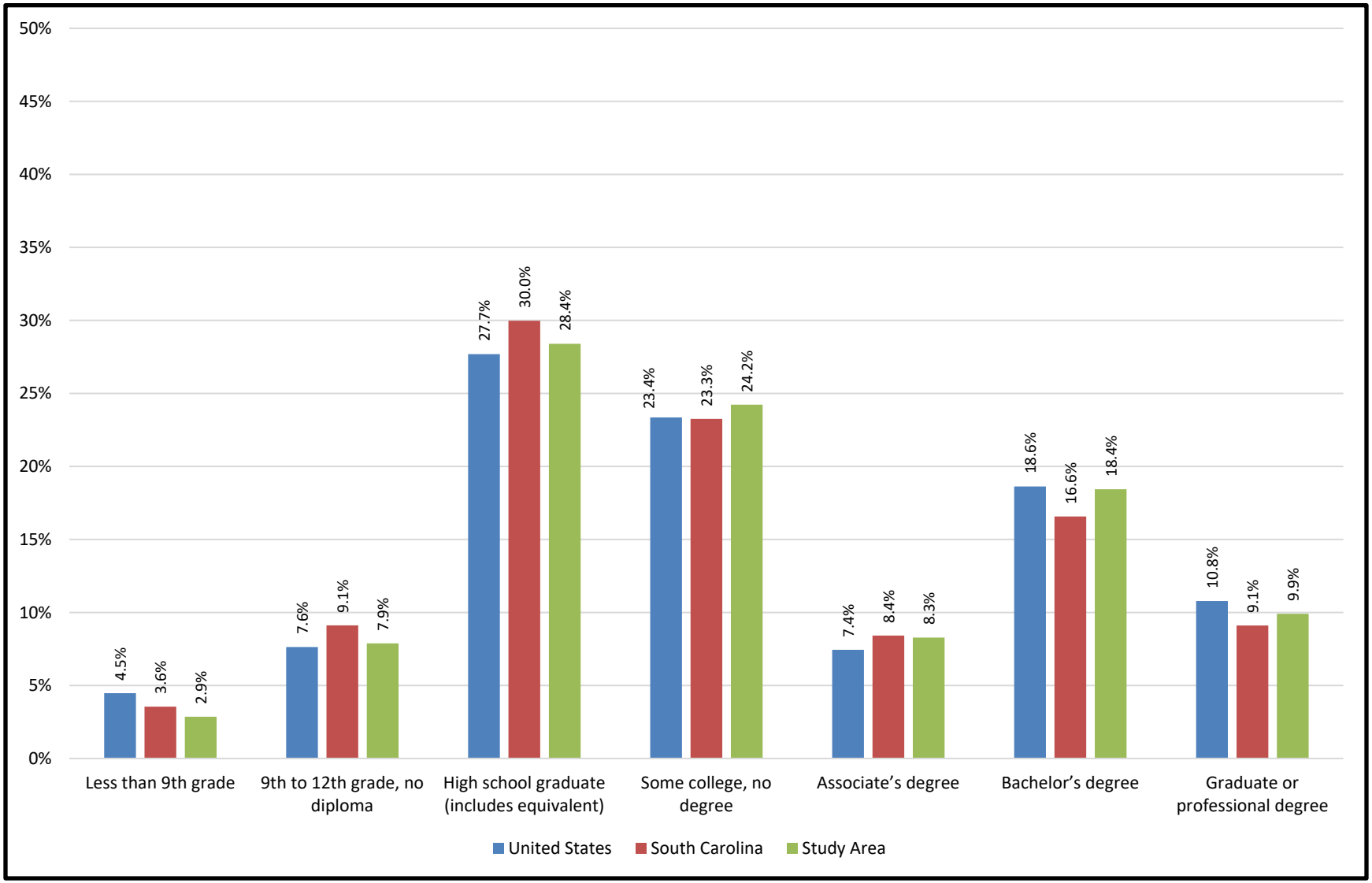
15.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898, under which Federal agencies are directed to identify and, as appropriate, address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 15-37 shows the location of census block groups within the Study Area that contain minority and low-income populations, which constitute potential environmental justice populations under EO 12898.

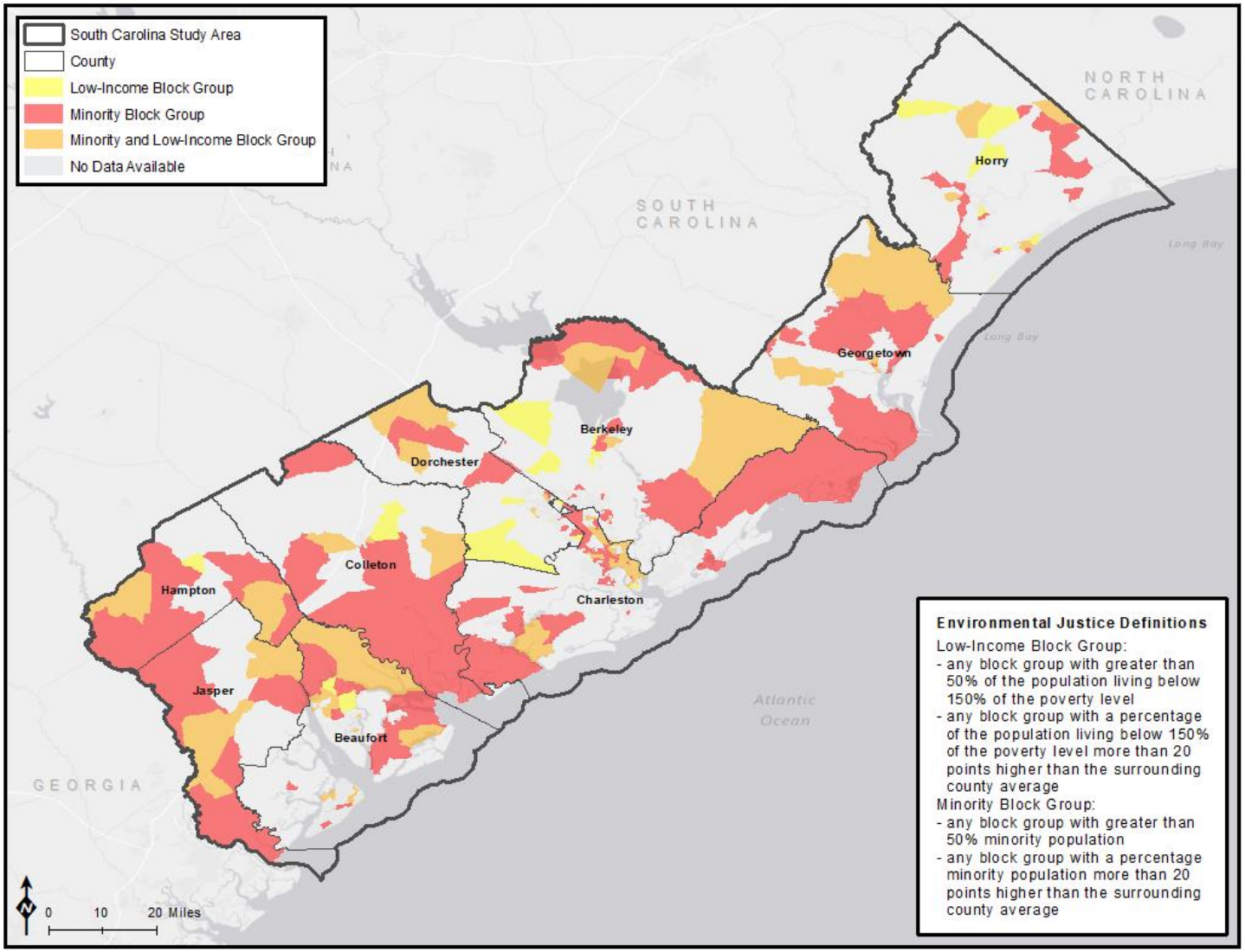
15.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 15-15 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 1,379,874 people living in the Study Area, approximately 463,667 (33.6%) are minority. This is slightly lower than the State (36.2%) and the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 772 block groups in the Study Area, approximately 27.3% (211 block groups) are considered minority populations (USCB 2017f).



Source: USCB 2017q

Figure 15-36. Educational Attainment in the South Carolina Study Area



Source: USCB 2017r

Figure 15-37. Minority and Low-Income Population in the South Carolina Study Area by Census Block Group

Table 15-15. Low-Income and Minority Populations in the South Carolina Study Area

Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent Low-Income Block Groups (%)	Number of Minority Block Groups	Percent Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Beaufort	179,316	120,827	58,489	32.6	112	14	12.5	23	20.5	173,968	35,878	20.6
Berkeley	204,632	130,979	73,653	36.0	100	11	11.0	23	23.0	200,835	43,297	21.6
Charleston	387,847	247,681	140,166	36.1	235	48	20.4	80	34.0	375,922	87,368	23.2
Colleton	37,581	21,158	16,423	43.7	31	5	16.1	13	41.9	36,820	14,632	39.7
Dorchester	151,716	98,031	53,685	35.4	67	10	14.9	17	25.4	149,368	29,684	19.9
Georgetown	61,065	38,666	22,399	36.7	46	9	19.6	16	34.8	60,418	17,915	29.7
Hampton	20,066	8,209	11,857	59.1	16	3	18.8	9	56.3	18,549	6,901	37.2
Horry	310,186	239,238	70,948	22.9	149	14	9.4	19	12.8	305,835	84,769	27.7
Jasper	27,465	11,418	16,047	58.4	16	5	31.3	11	68.8	26,926	10,978	40.8
Study Area Total	**1,379,874**	**916,207**	**463,667**	**33.6**	**772**	**119**	**15.4**	**211**	**27.3**	**1,348,641**	**331,422**	**24.6**
South Carolina	**4,893,444**	**3,119,676**	**1,773,768**	**36.2**						**4,751,345**	**1,281,632**	**27.0**
United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

Each of the demographic regions contain census block groups with minority populations. Table 15-15 provides detail of the high percentages of minority block groups in Study Area counties. The counties are: Jasper (68.8%), Hampton (56.3%), Colleton (41.9%), and Georgetown (34.8%) (USCB 2017f)

Within the Study Area the largest minority group is Black or African-American (23.5%) followed by Hispanic or Latino (0.2%) (USCB 2017f).

15.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 15-15 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 1,348,641 people for whom poverty status is determined living in the Study Area, approximately 331,422 (24.6%) have incomes less than 150 of the poverty level. This is lower than the State (27.0%) and slightly higher than the Nation (23.7%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 772 census block groups in the Study Area, approximately 15.4% (119 block groups) are considered low-income populations (USCB 2017o).

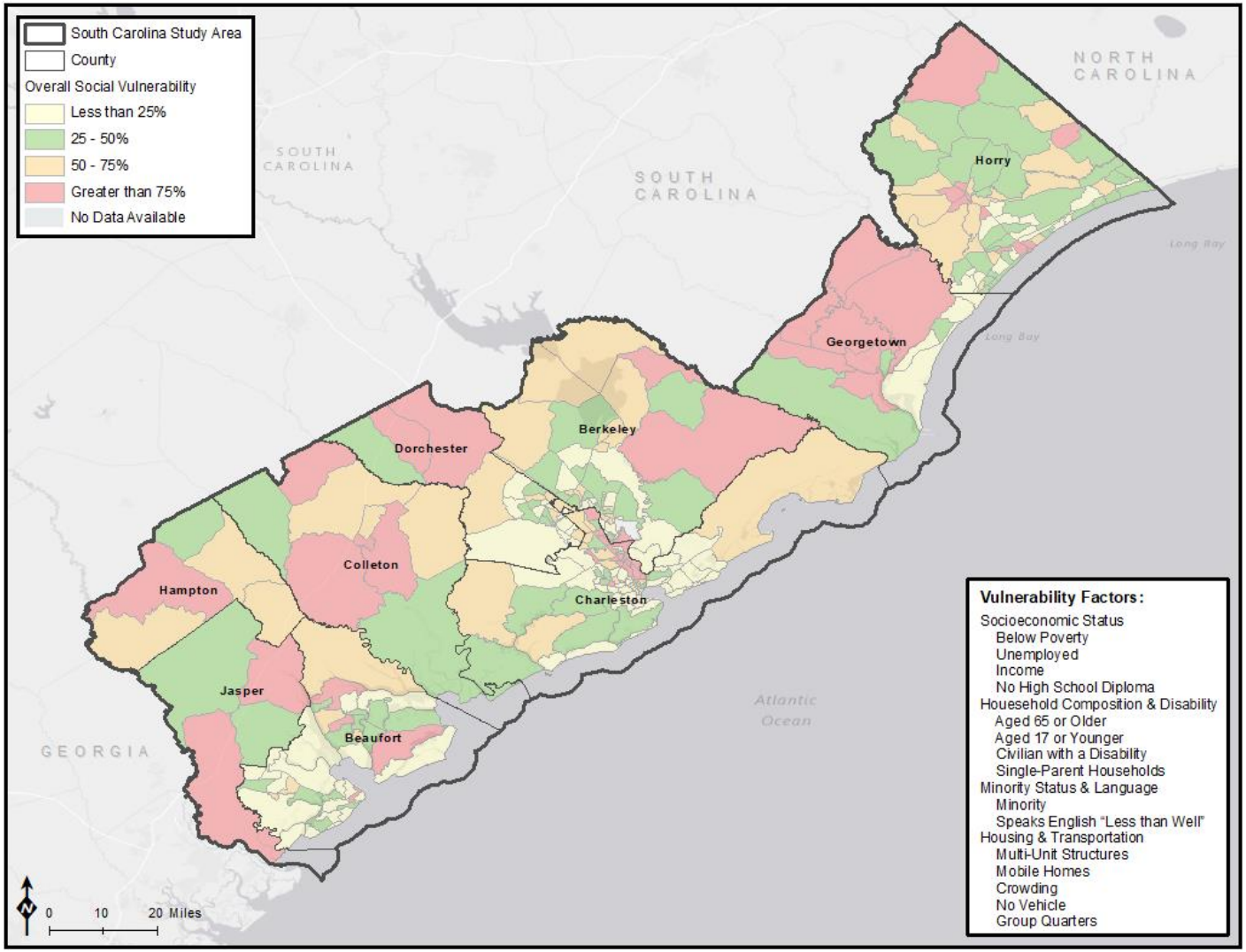
Each of the counties contain census block groups with percentages of low-income populations. As shown in Table 15-15 and Figure 15-37. Minority and Low-Income Population in the South Carolina Study Area, Jasper County has the highest percentage (31.3%, 5 block groups) and Horry County has the least percentage of low-income block groups (9.4%). The remainder of the counties range from 11.0% (Berkeley County) to 20.4% (Charleston County) (USCB 2017o).

15.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern, yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race, and ethnicity. Socioeconomic characteristics include education level, employment status, household income, and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical, and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation’s coasts and is discussed in detail in “Fishing Communities” (Chapter 15.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community’s overall social vulnerability, as illustrated by census tract in Figure 15-38 for the Study Area. As shown in Figure 15-38, all counties have some populations deemed vulnerable to varying degrees (CDC 2016). The following sections explore several of the vulnerability factors that factor into the SoVI ranking and present more detailed analysis discussing this figure.



Source: CDC 2016

Figure 15-38. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the South Carolina Study Area by Census Tract

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 15-39 combines the CDC SoVI (as shown in Figure 15-38) with minority and low-income populations (as shown in Figure 15-37) (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Charleston and Berkeley Counties (USCB 2017f, USCB 2017o).

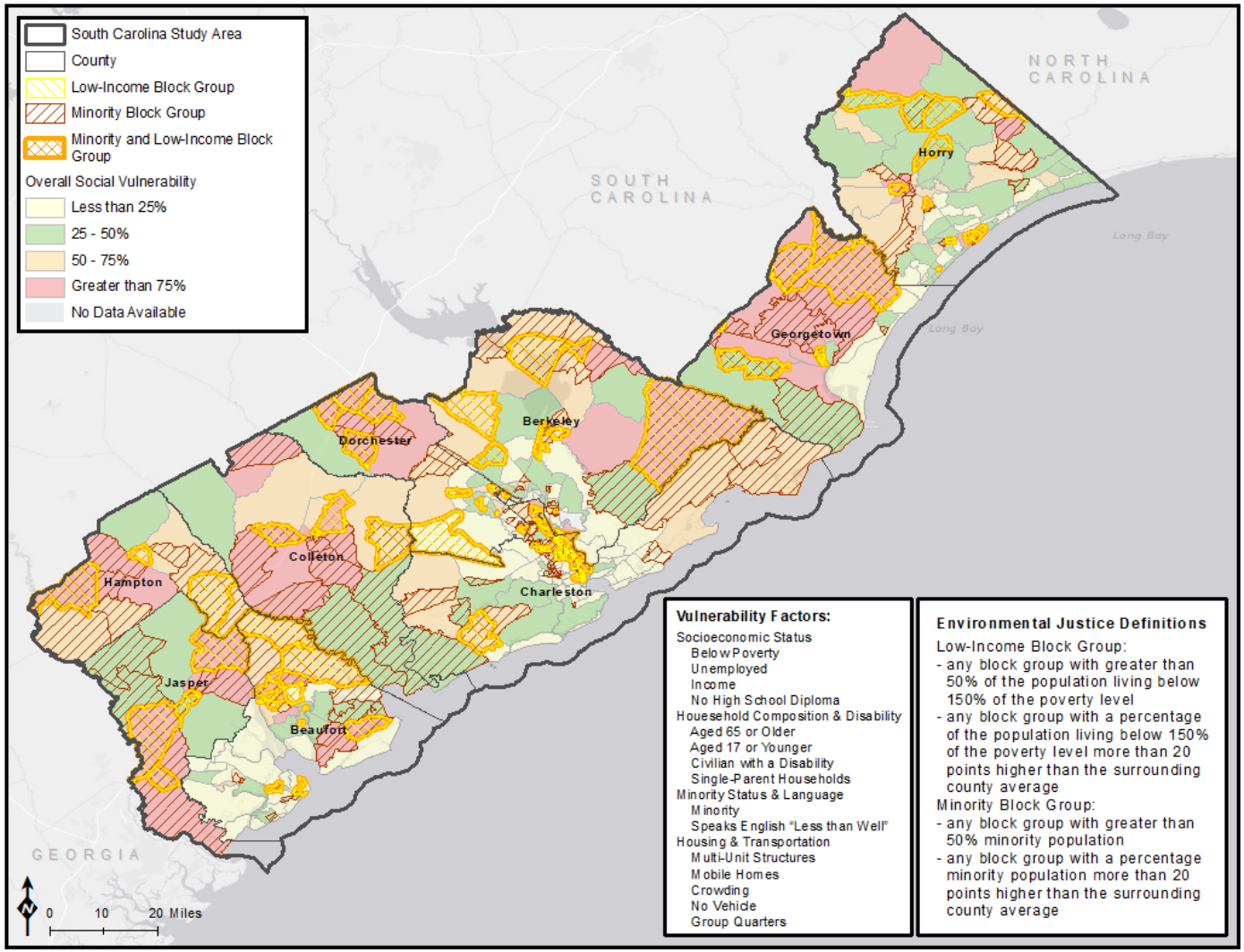
Figure 15-40 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 15-40 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 15.2.2.2 above), are risks associated with storm surge and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

As discussed in Chapter 15.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area and less densely populated inland areas (CDC 2016).

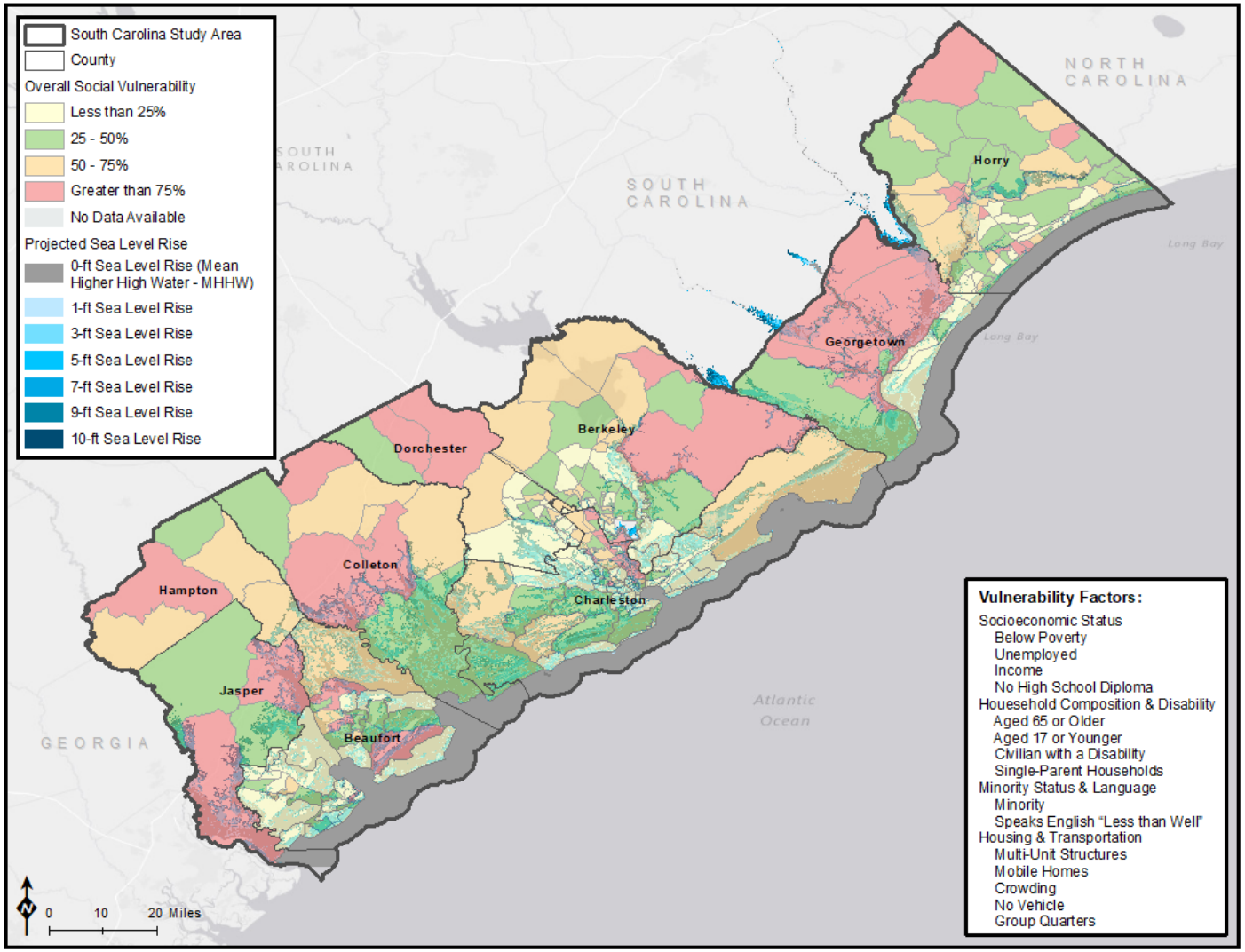
15.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations that have a heavier dependence on resources “from the land” rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.



Sources: CDC 2016, USCB 2017r

Figure 15-39. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the South Carolina Study Area



Sources: CDC 2016, NOAA 2018a

Figure 15-40. Overall Social Vulnerability using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the South Carolina Study Area by Census Tract

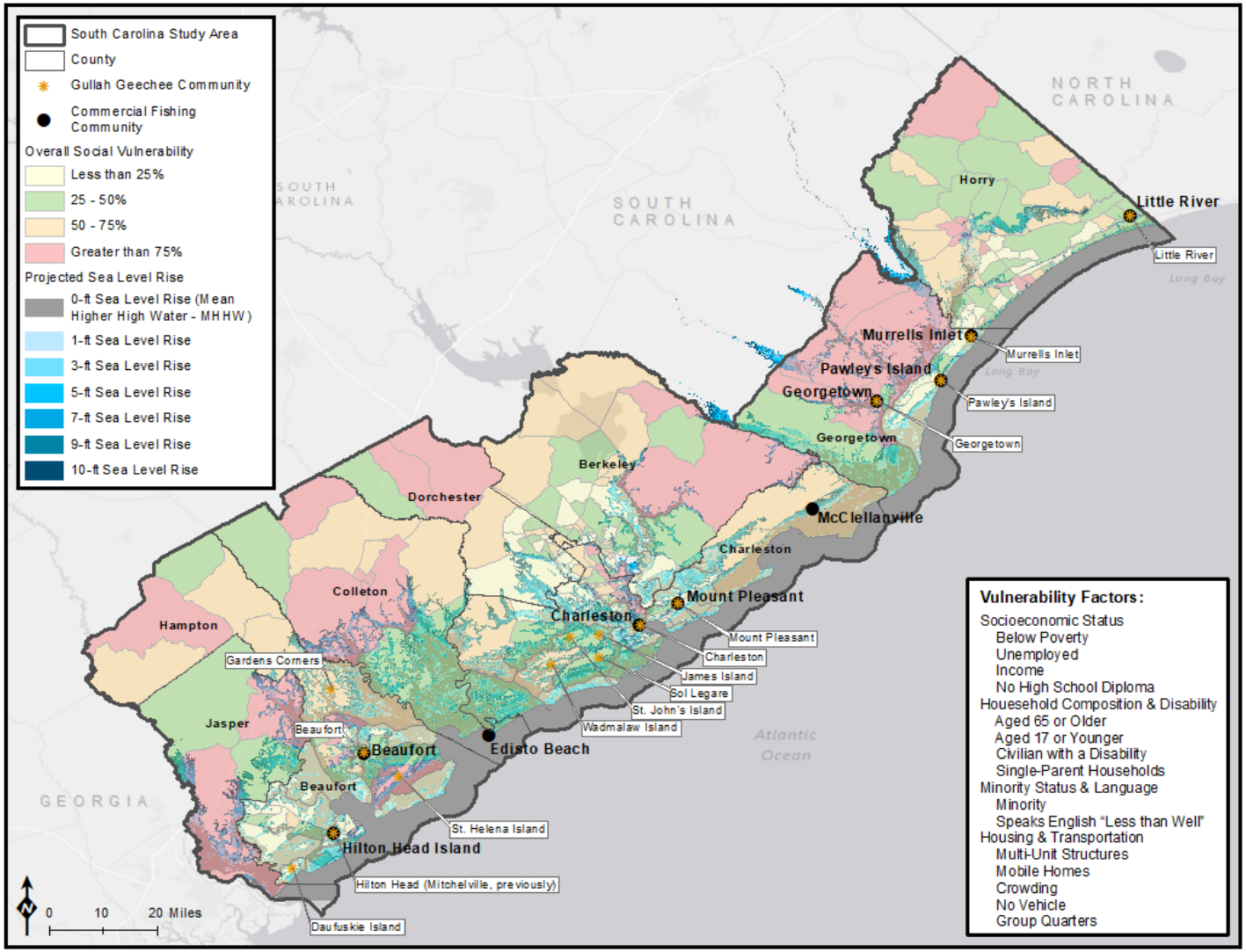
15.4.5.3.1 Fishing Communities

There are 10 fishing communities in the Study Area, as illustrated in Figure 15-41. The fishing communities located in the Study Area are (NOAA Fisheries 2019g):

- Beaufort, Beaufort County
- Charleston, Charleston County
- Edisto Beach, Colleton County
- Georgetown, Georgetown County
- Hilton Head Island, Beaufort County
- Little River, Horry County
- McClellanville, Charleston County
- Mount Pleasant, Charleston County
- Murrells Inlet, Georgetown County
- Pawleys Island, Georgetown County

As can be seen in Figure 15-41, all 10 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 15.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site-selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic, and community impacts. The profiles can be used for many purposes, including in the preparation of environmental impact statements required under NEPA. Fishing community profiles are available by region and may be accessed through the NOAA Fisheries website at https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles (NOAA Fisheries 2019d). Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

Fishing is a culturally significant activity for the Gullah Geechee communities. Therefore, it can be assumed these communities engage in some level of subsistence fishing.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 15-41. Potential Vulnerable Communities in the South Carolina Study Area by Census Tract

15.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe, or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general and in the Study Area (Figure 15-41). These fishing communities have already been identified as potentially vulnerable communities based on NOAA's vulnerability index and the potential risk associated with climate change, sea level change, and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

The Gullah/Geechee Heritage Corridor is home to Gullah Geechee people, who are descendants of enslaved Central and West Africans who worked the plantations of the Southeastern United States. Following the abolition of slavery and the American Civil War, the descendants of the Gullah Geechee settled in remote areas throughout the southern United States including many of the barrier islands stretching from North Carolina to Northeast Florida. Cultural and communal ties still remain in these areas today (Jaxson 2018). An estimated 200,000 people of Gullah and Geechee heritage live along the southeast coast according to an environmental impact statement published in 2005 (Otterbourg 2014). Because of the geographic isolation, segregation, and oppression that has continued to the present times, the Gullah and Geechee share similar linguistic, artistic, and societal traits that represent the many ways these peoples maintained their homeland roots while simultaneously assimilating aspects of other cultures they encountered during and after enslavement (NPS 2017).

Also because of the geographic isolation of these communities on islands with no connected infrastructure, subsistence lifestyles were necessary and still persist in the culture. From the 1600s to present-day, Gullah/Geechees depend heavily on resources from both land and the waterways. They have historically harvested from the Intracoastal Waterway in the manner that their indigenous American and African ancestors did (Gonsalves et al. 2015). Direct access to the area's marshes and waterways is important as many Gullah Geechee residents are still heavily dependent on land and water resources (i.e., grasses for the sweetgrass baskets, food from hunting and fishing). Therefore, healthy, functioning ecosystems are critical to maintaining the quality and way of life of Gullah Geechee people (GGCHCC 2012).

The Gullah Geechee Cultural Heritage Corridor, which extends from Wilmington, North Carolina in the north to Jacksonville, Florida, in the south crosses the Georgia Study Area (NPS 2017). The Gullah/Geechee Cultural Heritage Corridor, shown in Figure 16-42, was created to achieve several objectives. The Corridor was created to endorse the important contributions of Gullah Geechee to American culture and history. Additionally, the Corridor assists local governments and entities in and

preserving Gullah Geechee folklore, arts, crafts, and music. The Corridor also assists in identifying and preserving sites, historical data, artifacts, and objects associated with Gullah Geechee culture for the benefit and education of the public (GGCHCC 2012).

In South Carolina, the Gullah Geechee Cultural Heritage Corridor includes 3,503,835 acres in parts of Berkeley, Colleton, Dorchester, Horry, Jasper, Marion, and Williamsburg Counties and all of Beaufort, Charleston, and Georgetown Counties (GGCHCC 2012). Gullah Geechee communities have been identified in the following communities, although there are likely many other Gullah Geechee living elsewhere in these Counties. In Beaufort County Gullah Geechee communities include Daufuskie Island, Hilton Head (previously Mitchelville), Beaufort, St. Helena Island, and Gardens Corners. In Charleston County Gullah Geechee communities include Wadmalaw Island, St. John's Island, Sol Legare, James Island, Charleston, and Mount Pleasant. In Georgetown County Gullah Geechee communities include Georgetown, Pawley's Island, and Murrells Inlet. Little River is the only Gullah Geechee community in Horry County (GGCHCC 2012, Hiller 2019, NPS 2005). Impacts to Gullah Geechee communities should be considered for OCS-related project site selection, keeping in mind that these communities may not attend public forums for comment and prefer to be contacted directly.

The fisheries that support the Gullah/Geechee people face a multitude of threats largely derived such as urban, industrial, and agricultural development within coastal watersheds, overfishing, conflict with State agencies for harvesting in their historically traditional manner, competition with commercial fisheries, climate change, sea level rise, ocean acidification, hurricanes, and environmental pollutants (GGCHCC 2012, Gonsalves et al. 2015). The largest threat to Gullah Geechee communities is coastal development adjacent to subsistence waterways, which simultaneously have led to steadily increasing property values and taxes and physically cut off these communities from the marsh and water that is their livelihood (NPS 2005, Vargas 2019). These threats have caused declines in blue crabs, oysters, shrimp, catfish, mullet, spot, croakers, etc., which are staples of the Gullah/Geechee fishing industry and diet (Gonsalves et al. 2015).

Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site-selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups, and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations. Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

15.4.5.4 Tribes

South Carolina has six federally recognized tribes and 10 State-recognized tribes that have historical ties to the State. None of the federally recognized tribes reside within the Study Area, but there are three State-recognized tribes that live within the Study Area (Waccamaw Indian People, Wassamasaw Tribe of Varnertown Indians, and Edisto Natchez Kusso Tribe of South Carolina). There are many other tribes, interest groups, and organizations that are recognized by the State who have historical ties to the land within the Study Area. For example, there are three State-recognized American Indian Groups located outside of the Study Area and two State-recognized Native American Indian Special Interest Organizations in South Carolina, of which one is located within the Study Area (Dorchester County) (NCSL 2019, HUD 2019b, SCCMA 2020, SCDAH 2020).

Table 15-16 lists the federally and State-recognized tribes in South Carolina, along with their geographic unit, as well as special organizations and groups with interests in the Study Area. Federally recognized tribal lands are shown in Figure 15-41.

Table 15-16. Federally and State-Recognized Tribes with Historical Ties to South Carolina

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Resident Tribes within the Study Area			
Edisto Natchez Kusso Tribe of South Carolina (aka Edisto Indian Organization)	State	Yes	Tribal members in South Carolina currently in Dorchester and Colleton Counties.
Waccamaw Indian People	State	Yes	Tribal members in South Carolina currently reside in Horry County.
Wassamasaw Tribe of Varnertown Indians	State	Yes	Tribal members in South Carolina currently reside in Berkeley County.
Federally and State-Recognized Tribes Outside the Study Area			
Alabama-Quassarte Tribal Town	Federal	Yes	Tribal members reside outside of South Carolina primarily in Oklahoma, but have historical ties and an interest in Beaufort, Colleton, and Jasper Counties.
Beaver Creek Indians	State	No	Tribal members reside outside of the Study Area in Orangeburg County.
Catawba Indian Nation (Catawba Tribe of South Carolina)	Federal and State	Yes	Tribal members reside outside of the Study Area, but have historical ties and an interest in Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Hampton, Horry, and Jasper Counties.
Eastern Band of Cherokee Indians	Federal	Yes	Tribal members reside outside of South Carolina in eastern North Carolina, but have historical ties and interests in Beaufort, Berkeley, and Charleston Counties.
Eastern Shawnee Tribe of Oklahoma	Federal	No	Tribal members reside outside of South Carolina, primarily in Oklahoma.
Muscogee (Creek) Nation	Federal	Yes	Tribal members reside outside of South Carolina in Oklahoma but have historical ties and an interest in Beaufort, Berkeley, Charleston, Georgetown, Hampton, and Jasper Counties.
Pee Dee Indian Nation of Upper South Carolina	State	No	Tribal members reside outside the Study Area primarily in Dillon County.
Pee Dee Indian Tribe	State	No	Tribal members reside outside the Study Area primarily in Marlboro County.
Piedmont American Indian Association Lower Eastern Cherokee Nation	State	No	Tribal members reside outside the Study Area primarily in Laurens County.
The Santee Indian Organization	State	No	Tribal members reside outside the Study Area primarily in Orangeburg County.
Tuscarora Nation	Federal	No	Tribal members reside outside of South Carolina (primarily in New York) but have historical ties and interest in Beaufort County.
Sumter Tribe of Cheraw Indians	State	No	Tribal members reside outside the Study Area primarily in Sumter County.
Special Interest Organizations and Groups			
American Indian Chamber of Commerce South Carolina	State	Yes	State-wide organization located in Dorchester County.
Chaloklowa Chickasaw Indian People	State	No	Members reside outside the Study Area primarily in Williamsburg County.

Table 15-16. Federally and State-Recognized Tribes with Historical Ties to South Carolina

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Unit(s)
Eastern Cherokee, Southern Iroquois and United Tribes of South Carolina	State	No	Members reside outside the Study Area primarily in Richland, Oconee, Greenville, Newberry, Pickens, and Anderson Counties
Little Horse Creek American Indian Cultural Center	State	No	Organization is located in Aiken County.
Natchez Tribe of South Carolina	State	No	Traditional interests in Colleton and Dorchester Counties and locations in Richland and Fairfield Counties. The Tribal Office is headquartered outside of the Study Area, in Richland County.
Pee Dee Indian Nation of Beaver Creek	State	No	Members reside outside the Study Area primarily in Orangeburg County
Pine Hill Indian Community Development Initiative	State	No	Nonprofit organization outside the Study Area in Orangeburg County

Sources: HUD 2019b, NCSL 2019

There are three tribes that reside in the Study Area: Edisto Natchez Kusso Tribe of South Carolina (or the Edisto Indian Organization), Waccamaw Indian People, and Wassamasaw Tribe of Varnertown Indians. At the time of English colonization, the Edisto Indians were a tribe living between the Savannah and Edisto Rivers. The Edisto Natchez Kusso Tribe of South Carolina gained State recognition in 2008 and has 400 members living in Dorchester and Colleton Counties (Morris 2017, NCSL 2019, HUD 2019b). The Waccamaw Indian People of Conway (Horry County) are the descendants of a group of people who lived and farmed in the area of South Carolina now known as Dog Bluff. The Waccamaw Indian People obtained official recognition from the State on February 17, 2005. Currently, there are 400 members of the tribe living in various parts of the State (Waccamaw Indian People n.d.). The Wassamasaw Tribe of Varnertown Indians is a community with descendants from various native tribes and nations that once inhabited the low country in what was known as St. James Parish Goose Creek (Berkeley County) and St. John's Parish (Berkeley County). The majority of the community is currently located in the area around the towns of Summerville and Moncks Corner near Carn's (now Carnes) Crossroads. An historical Cherokee Path to Charleston passed through the Varnertown Indian Community near Moncks Corner (Wassamasaw Tribe Of Varnertown Indians 2016). Varner Town (or Varnertown) is a distinct American Indian community including descendants of the Etiwan, Catawba, Cherokee, Edisto, and other area tribes. The Wassamasaw Indians of Varnertown gained State recognition in 2005 (Wassamasaw Tribe of Varnertown Indians 2016).

As of 1600, there were an estimated 15,000-20,000 American Indians present in South Carolina. As such, the majority of the federally and State-recognized tribes have historic tribal lands within the Study Area (Secretary of the Commonwealth 2019). However, members of these tribes either no longer reside in South Carolina or reside outside of the Study Area. The Catawba Indian Nation are the only federally recognized tribe living in South Carolina, and they are primarily located in northwestern South Carolina outside of the Study Area. The Catawba people were primarily living in what is now known as South Carolina and North Carolina, but they were living in areas as far north as Virginia during the time of European arrival (Catawba Indian Nation 2020). Periodic conflict with neighboring tribes such as the Iroquois occasionally led to Catawba warriors chasing the Iroquois all the way to Pennsylvania (Tribalpedia Native American Indians 2020). The Catawba tribe gained Federal recognition in 1993, along with a 700-acre reservation held in trust for the Nation located outside of the Study Area near Rock Hill, North Carolina (Catawba Indian Nation 2020a, NCSL 2019, McCulloch 2017).

Pursuant to SC Code of Laws Section 1-31-40(A)(10) and SC Code of Regulations Chapter 139, the State of South Carolina recognizes three categories of Native American Indian entities in South Carolina: Native American Indian Tribes, Native American Indian Groups, and Native American Indian Special Interest Organizations (SCDAH 2020).

All these tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community. The communities in which these tribal populations reside could be classified as socially vulnerable populations based on the CDC social vulnerability index, as shown in Figure 15-40. Overall social vulnerability for Colleton County and Dorchester County range from 25% to greater than 75%. Overall social vulnerability for Horry and Berkeley County is mixed and ranges from less than 25% to greater than 75% (CDC 2016). Also shown in Figure 15-40 is NOAA sea level rise data, indicating that Berkeley County, Colleton County, Horry County in which tribal populations are present are subject to some level of potential sea level rise vulnerability including inundation risk.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally-recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

15.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 15-17 provides an analysis of people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 7.5% of the population do not speak English at home. Spanish is the language spoken by the majority (62,874 people or 4.8%) of non-English speakers at home within the Study Area population. Indo European languages are spoken at home by 17,512 people (1.3%) of the Study Area population (USCB 2017e).

Table 15-17. People who Speak a Language Other than English at Home in the South Carolina Study Area by Census Block Group

Geographic Unit	Total Population Over Age 5	Total Population Who Speak A Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
				Spanish	Indo European	Asian or Pacific Island	Other
Beaufort	169,182	19,521	11.5	15,008	2,411	1,465	637
Berkeley	191,032	14,721	7.7	9,187	2,309	2,865	360
Charleston	364,362	24,297	6.7	14,410	5,457	3,231	1,199
Colleton	35,421	1,346	3.8	1,082	56	204	4
Dorchester	142,294	8,886	6.2	4,805	1,974	1,896	211
Georgetown	58,137	2,008	3.5	1,425	400	183	0
Hampton	18,964	951	5.0	689	189	38	35
Horry	294,436	22,014	7.5	13,346	4,666	2,537	1,465
Jasper	25,814	3,258	12.6	2,922	50	218	68
Study Area Total	**1,299,642**	**97,002**	**7.5**	**62,874**	**17,512**	**12,637**	**3,979**
South Carolina	**4,603,480**	**319,834**	**6.9**	**205,469**	**59,822**	**42,471**	**12,072**
United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e

Figure 15-42 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Jasper (12.6%) and Beaufort (11.5%). Jasper to a limited extent and all of Beaufort Counties are subject to sea level rise and associated storm surge thus increasing the vulnerability of these communities. The counties with the smallest percentage on non-English speaking households were Georgetown (3.5%) and Colleton (3.8%) (USCB 2017e). Each of these counties is also vulnerable to sea level changes and storm surge.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or Internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

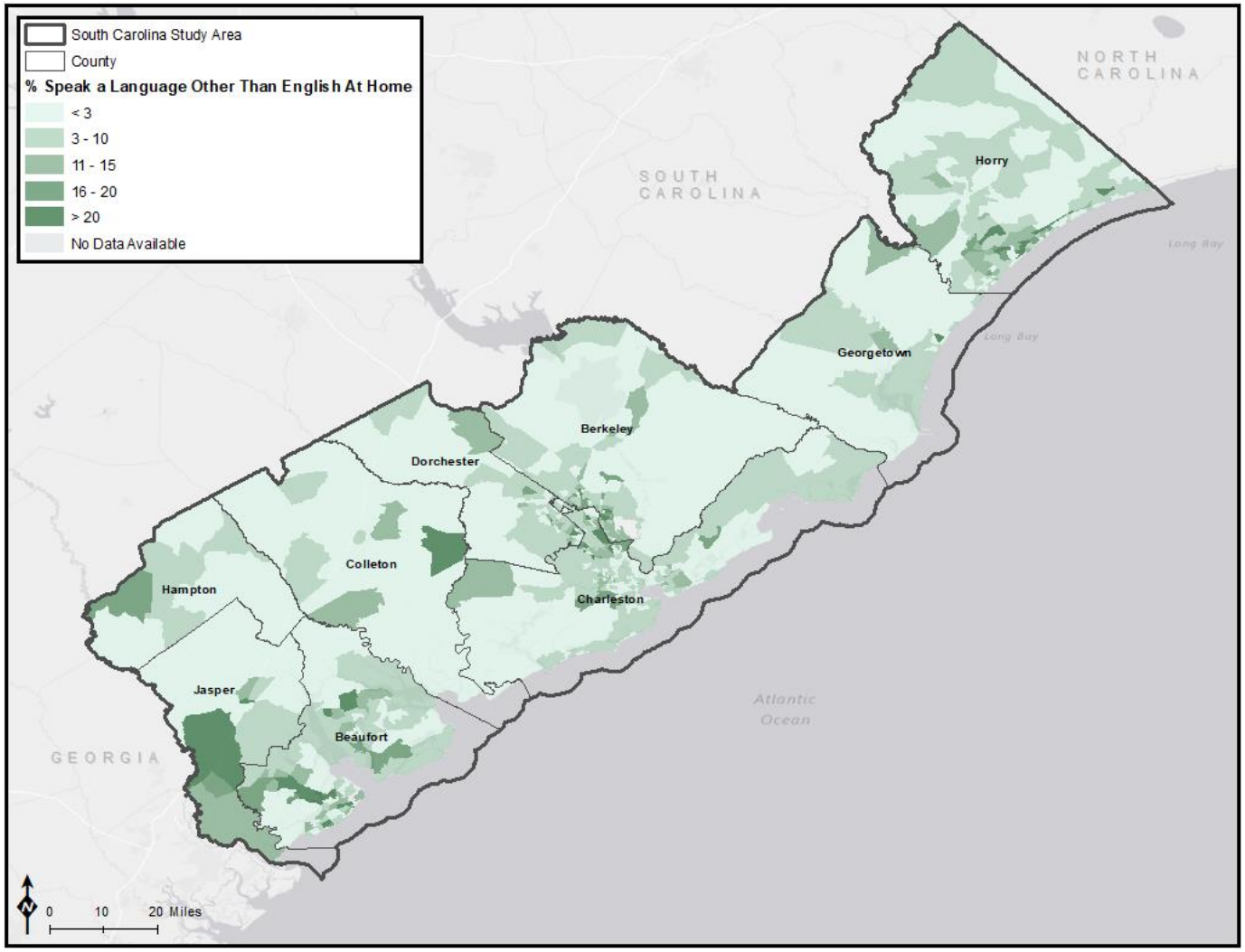
Information about the location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

15.4.6 Summary – Demographics and Socioeconomics

South Carolina's population is increasing at a rate faster than the Nation. Population grew 5.8% since the 2010 Census, having added approximately 268,080 people. During the same period, the population of the U.S. grew just 4.0% (USCB 2017a, USCB 2017d). While South Carolina is affected by the nationwide trend of aging population, the State still gains population from natural increase. However, most of the State's growth is from domestic migration.

The Study Area represented 28.2% (1.4 million residents) of the overall State population of 4.9 million. Overall, the population of the Study Area grew 11.2%, faster than the State (5.8%) and the Nation (4.0%). Between 2010 and 2017, seven out of nine counties gained population, while two rural counties lost population. Counties gaining population are located in or near metropolitan areas; counties losing population are rural, indicating an urban-rural divide. Retirement destination counties (Horry, Dorchester, and Beaufort) posted strong growth between 2010 and 2017. Horry County posted the strongest growth (15.2%). The rural counties of Colleton and Hampton decreased 3.4% and 4.9%, respectively, during the same period. There are four metropolitan areas in the Study Area: Savannah, GA; Hilton Head Island-Bluffton-Beaufort, SC; Charleston-North Charleston, SC; and Myrtle Beach-Conway-North Myrtle Beach, SC-NC (USCB 2017a, USCB 2017d, USDA 2013).

Population density of the Study Area was 186 persons per square mile in 2017, greater than the State (162 persons per square mile) and the Nation (90 persons per square mile), signifying that the coastal counties are slightly more densely populated than the State and significantly more than the Nation. Density was highest near major urban areas, ranging from 35 persons per square mile in the rural counties of Colleton and Hampton to 422 persons per square mile in Charleston County (containing the populous Charleston-North Charleston metropolitan area) (USCB 2017d, USCB 2017c, USDA 2013).



Sources: USCB 2017r, USCB 2017e

Figure 15-42. Percent of People Who Speak a Language Other than English at Home in the South Carolina Study Area by Census Block Group

Population in the Study Area is projected to grow 23.7% (1.7 million residents) by 2040, more than the Nation (16.4%) but less than the State (29.8%). Projected growth by county ranges from Dorchester (39.4%) to Hampton (3.7%). No counties are projected to experience a population decrease (USCB 2017d, USCB 2018b, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c).

The State and the Study Area are aging. Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.9% in South Carolina and 5.8% in the Study Area. While the number of young children is projected to rise in the U.S., the percentage of this group, in comparison to the overall population, is projected to decline. Consequently, declining natural increase (the difference between births and deaths) suppresses population growth, resulting in the aging of the general population. Projections by the year 2040 indicate this group's decline to 5.7% in the Nation, but no change in the Study Area, which is expected to remain at 5.9%. Projections are not available on the county level. The elderly represented 14.9% of the U.S. population; 16.3% in South Carolina and 17.7% in the Study Area. The number and proportion of elderly to the overall population are projected to rise, fueled by aging baby boomers. By 2040, the population of elderly Americans is projected to increase to 21.6% and 20.1% in the Nation and State, respectively, but decline to 13.2% in the Study Area. Sparsely populated Georgetown County had the largest percentage (25.5%) of elderly in 2017; a decline to 18.8% is projected by 2040 (USCB 2017b, USCB 2018b, SCDOT 2014a, SCDOT 2014b, SCDOT 2014c).

Homeownership in South Carolina was 68.6%, higher than the Nation (63.8%) and the Study Area (67.9%). Renters comprised approximately 31.4% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was slightly higher (32.1%) (USCB 2017m).

Median home values were higher in the Study Area ($152,550) than the State ($148,600) but lower than the Nation ($193,500). In 2017, Beaufort County, located in the Hilton Head Island-Bluffton-Beaufort SC metropolitan area, had the highest median home value ($283,800); Hampton County had the lowest ($75,400) (USCB 2017l). Housing affordability for low- and moderate-income workers is a problem in South Carolina. A large proportion of the State (27%) is considered extremely low income, and of these households, 70% have a severe cost burden due to housing costs (National Low Income Housing Coalition 2018).

In 2018, home values increased in the State (4.2%) as well as the metropolitan areas within the Study Area. Home vacancy rates in the Study Area (22.9%) were higher than the State (16.1%) and Nation (12.2), which may be attributed to vacation homes and/or investment properties used as short-term rentals in popular summer tourist destinations (USCB 2017g).

The Study Area has a total employment of approximately 631,000 jobs, representing approximately 28.9% of the total jobs in South Carolina and 0.4% of the total jobs in the U.S. The dominant employment sectors in the Study Area are educational services, and health care and social assistance (20.8%); arts, entertainment, and recreation, and accommodation and food services (14.1%); retail trade (12.9%); and professional, scientific, and management, and administrative and waste management (12.0%). The Study Area had less manufacturing jobs (7.5%) than the State (13.9%) and the Nation (10.3%) (USCB 2017p). The greater portion of jobs are located in Charleston County near the high-density MSA of Charleston-North Charleston, South Carolina MSA.

South Carolina's ocean economy ranked 13th in employment among the 30 states included in the U.S. Ocean and Great Lakes economy. The Study Area had 78,068 maritime jobs comprising most (97.4%) of the maritime jobs in the State. The highest percentage of maritime jobs to overall county jobs were in Horry (21.3%), Beaufort (18.2%), and Georgetown (17.4%) (NOAA 2016b, USCB 2017i).

In 2017, median and per capita income in the Study Area were slightly lower than the State at $46,967 and $26,470, respectively. During the same period, median household income ranged from $32,147 (Hampton County) to $60,603 (Beaufort County); per capita income ranged from $17,687 (Hampton County) to $34,966 (Beaufort County). Median and per capita incomes were higher near the high-paying jobs in metropolitan areas and nearby suburbs(USCB 2017k, USCB 2017n).

The average unemployment rate in the Study Area was 6.5%, less than the State (7.2%) and the Nation (6.6%). Within the Study Area, unemployment rates ranged from 5.3% in Charleston County to 10.7% in Jasper County in 2017 (USCB 2017h).

In the Study Area, 28.4% of the working-age population hold only a high school diploma; 36.6% hold a college or advanced degree. These rates are similar to the national rates with 27.7% of the working-age population holding only a high school diploma and 36.9% holding a college or advanced degree rate of 36.9 (USCB 2017t).

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Of the 1,379,874 people living in the Study Area, approximately 463,667 (33.6%) are minority. Of the 772 block groups in the Study Area, approximately 27.3% (211 block groups) are considered minority populations. Each of the demographic regions contain census block groups with minority populations. Counties with high percentages of minority block groups are: Jasper (68.8%), Hampton (56.3%), Colleton (41.9%), and Georgetown (34.8%). Within the Study Area, the largest minority group is Black or African-American (23.5%) followed by Hispanic or Latino (0.2%) (USCB 2017o).

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Of the population of 1,348,641 people for whom poverty status is determined living in the Study Area, approximately 331,422 (24.6%) live 150% below the poverty level. Of the 772 census block groups in the Study Area, approximately 15.4% (119 block groups) are considered low-income populations. Each of the counties contain census block groups with percentages of low-income populations. Jasper County has the highest percentage (31.3%, 5 block groups). Horry County has the least percentage of low-income block groups (9.4%). The remainder of the counties range from 11.0% (Berkeley County) to 20.4% (Charleston County) (USCB 2017o).

Resource-dependent populations include 10 fishing communities and subsistence populations in the Study Area ((NOAA Fisheries 2019g). The Gullah Geechee Cultural Heritage Corridor space the South Carolina coast and includes several Gullah Geechee communities which are heavily dependent on plant and fish species from the local ecosystem for subsistence and to support their economy through the creation of traditional sweetgrass baskets. Both the fishing communities and the Gullah Geechee communities are located in areas vulnerable to rising sea level and associated storm surge impacts. South Carolina has no federally recognized and three State-recognized tribes within the Study Area as well as several American Indian organizations.

The output of the CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area and less densely populated inland areas. Areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent, particularly notable in Charleston and Berkeley Counties. Many communities along the coast are at risk for sea level rise and other coastal hazards (CDC 2016, USCB 2017f, USCB 2017o).

Populations that speak a language other than English are present within the Study Area. In the Study Area, 7.5% of the population do not speak English at home. Spanish is the language spoken by the majority (62,874 people or 4.8%) of non-English speakers at home within the Study Area population.

Indo European languages are spoken at home by 17,512 people (1.3%) of the Study Area population (USCB 2017e). Counties with the highest percentages of these populations were Jasper (12.6%) and Beaufort (11.5%). The counties with the smallest percentage on non-English speaking households were Georgetown (3.5%) and Colleton (3.8%) (USCB 2017e). Populations that do not have English as their primary language can be more vulnerable during emergencies and have more difficulty understanding laws and regulations, as well as navigating and interacting with the general population. Additionally, challenges with respect to health care and personal emergencies may be present. As limited-English populations are considered socially vulnerable populations, knowing the locations of these populations will be useful to potential future project developers during their site planning process, particularly if a new project would impact factors such as sea level rise, storm surge, or community emergency response planning and implementation (Siegel et al. 2001).

15.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

15.5.1 Regional Observations

Rivers, lakes, floodplains, and wetlands are all essential water resources throughout the Study Area. Critical habitat is present within the Study Area for the frosted flatwoods salamander, piping plover, loggerhead sea turtle, and Atlantic sturgeon. The offshore area along the entire coastline of South Carolina is critical habitat for the North Atlantic right whale.

Sea level rise and subsidence are issues in the Study Area. Subsidence is particularly problematic in Charleston, where river delta sediments are naturally compressing. Nuisance flooding in Charleston has been steadily increasing over time and this trend is expected to continue. Storm surge can also contribute to flooding issues in the area. Beaufort, Georgetown, and Colleton Counties are predicted to lose the most land area as a result of sea level rise (SCEMD 2018).

Beaches along the South Carolina coast erode and accrete at starkly different rates of change. At Kiawah Island, beaches are steadily accreting, while at Hunting Island, beaches are eroding at alarming rates (Sea Grant Consortium and Tibbetts 2009); the island is currently protected by regular beach nourishment (CSE 2014, Fastenau 2019, Petersen 2019).

As a result of the effects of sea level rise South Carolina is already experiencing, the State has established several proactive regulations and organizations to anticipate and adjust for increasing sea level rise including the Beachfront Management Act of 1988 (SCDHEC 2010, SCDHEC 2019) and implementation of proactive regulations that limit development and hard stabilization of the shoreline in South Carolina based on 2009 Shoreline Change Advisory Committee recommendations (SCDHEC 2019).

Throughout the Study Area, land cover is predominantly forest and wetlands; Horry County is the exception where the predominant land cover type is wetlands. The prevalence of wetlands, particularly along the coastal counties, also appears to influence and control land cover change over time. Counties with more urban development have a higher density of land use and more industrial properties. Examples in the Study Area are Charleston, Dorchester, and Berkeley Counties, which are part of the tri-county area surrounding the city of Charleston, Beaufort County and include Hilton Head, Bluffton, and Beaufort. Horry County is another example due to Murrell's Inlet, Myrtle Beach, and North Myrtle Beach. There is also a small area of denser land use immediately surrounding Georgetown in Georgetown County. Local governments guidelines for land use planning in South Carolina are defined by the South Carolina Local Government Comprehensive Planning Enabling Act (SCAC 2017).

South Carolina is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. South Carolina has designated 25% of qualifying census tracts as Opportunity Zones, based on the 2011-2015 American Community Survey. Goals of the program in South Carolina are to promote economic vitality in less prosperous areas of the State, funding workforce and affordable housing development, funding new infrastructure, investing in startup businesses, and capital improvement investments (OpportunitySC 2020).

South Carolina has a wide variety of programs, grants, and tax credits to incentivize business and industrial growth in the State. These industrial incentives focus on developing the infrastructure or workforce skills within more rural counties and making industrial and urban centers, such as the city of Charleston, more competitive against other business markets. Development incentive opportunities included in the Study Area include the Job Tax Credit, the Economic Impact Zone Investment Credit, the Corporate Headquarters Credit, the Port Volume Increase Credit, the Rural Infrastructure Fund, the Economic Development Set-Aside Program, and the Job Development Credit.

15.5.2 Additional Considerations

Based on the results of the analysis of coastal land use and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- The counties of Beaufort, Charleston, Georgetown, and Horry do not have digital floodplain data available for mapping at this scale at this time. It is evident that floodplains from surrounding counties do extend into these four counties. Future project analysis will need to consider updated floodplain data to determine the potential for impacts to floodplains.
- Sea level rise and subsidence are an issue in the Study Area. Subsidence is particularly problematic in Charleston. Nuisance flooding is an increasingly significant issue, particularly in Charleston. The State has established several proactive regulations and organizations to anticipate and adjust for increasing sea level rise and flooding impacts which will need to be factored into any future project analysis. Some of these measures limit development and hard stabilization of the shoreline in South Carolina.
- Beaches along the South Carolina coast erode and accrete at starkly different rates of change. At Kiawah Island, beaches are steadily accreting, while at Hunting Island, beaches are eroding at significant rates. Future project analysis will need to consider potential impacts to the beaches and islands.
- South Carolina regulates coastal wetlands under the South Carolina Coastal Management Act. This means that the South Carolina Coastal Council regulates any activities pertaining to the filling, removing, dredging, draining, constructing, or in any way altering any critical area within the nine coastal counties that are under its jurisdiction. “Under the Coastal Council regulations, dredging and filling wetlands is undertaken only if the activity is water dependent and no feasible alternatives exist. Applications are denied for purposes other than access, navigation, mining, or drainage unless an overriding public interest can be demonstrated” (USFWS 1991). Future project analysis will need to consider potential impacts to wetlands under the South Carolina Coastal Management Act once site-specific information is known.
- Analysis of potential future projects will need to consider compliance with Study Area regulations and plans that have been enacted to address the effects of sea level rise, such as the Beachfront Management Act of 1988 and the proactive regulations that limit development and hard stabilization of the shoreline in South Carolina based on 2009 Shoreline Change Advisory Committee recommendations.

- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- All 10 fishing communities in the Study Area are located in areas vulnerable to sea level rise and associated storm surge impacts. This must be considered when conducting future project analysis.
- South Carolina is one of only four states with a Gullah Geechee community. The Gullah/Geechee Heritage Corridor spans the South Carolina coast throughout the Study Area. This community is heavily dependent on certain plant species (both for consumption and development of their traditional sweetgrass baskets) and fish species (for consumption). Therefore, a healthy and functioning ecosystem is critical to maintaining the quality and way of life of Gullah Geechee people. Additionally, these communities are frequently located in areas vulnerable to sea level rise and the associated storm surge impacts. Analysis of future projects should carefully consider potential impacts to Gullah Geechee communities and the ecosystems upon which they depend. It is also important to note that these communities may not attend public forums for comment and prefer to be contacted directly.
- Cultural resource surveys may be required once site-specific information is known.
- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the State Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 16

GEORGIA

16 Georgia

16.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Georgia to support development of future BOEM environmental impact assessments related to prospective development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, National, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Georgia is located near the South Atlantic Planning Area (Figure 1-1 in Chapter 1.1). A total of 11 counties are located within the Georgia Study Area (Study Area) along the Georgia coastline. Counties range in population size from around 14,061 in McIntosh County to 285,506 in Chatham County. There is only one city in the Study Area with a population over 100,000; it is Savannah with a population of 148,650. The next most populous city in the Study Area is Hinesville, Liberty County with a population of 34,324 (ESRI 2019a). Georgia cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Georgia's location in the South has geographical commonalities with many of the other Atlantic States with open coastlines protected by barrier islands. The Georgia coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast.

The Study Area includes 11 counties located within the State of Georgia. As described in Chapter 1.1, the counties selected for this study are coastal zone management counties and the NOAA's designated coastal shoreline counties located along the Atlantic coastal area. The counties with coastline (i.e., polygons that extend into the water and provide complete land coverage from the USCB) were used to define the Study Area. The Study Area is shown in Figure 16-1 and Figure 16-2 and includes the following counties:

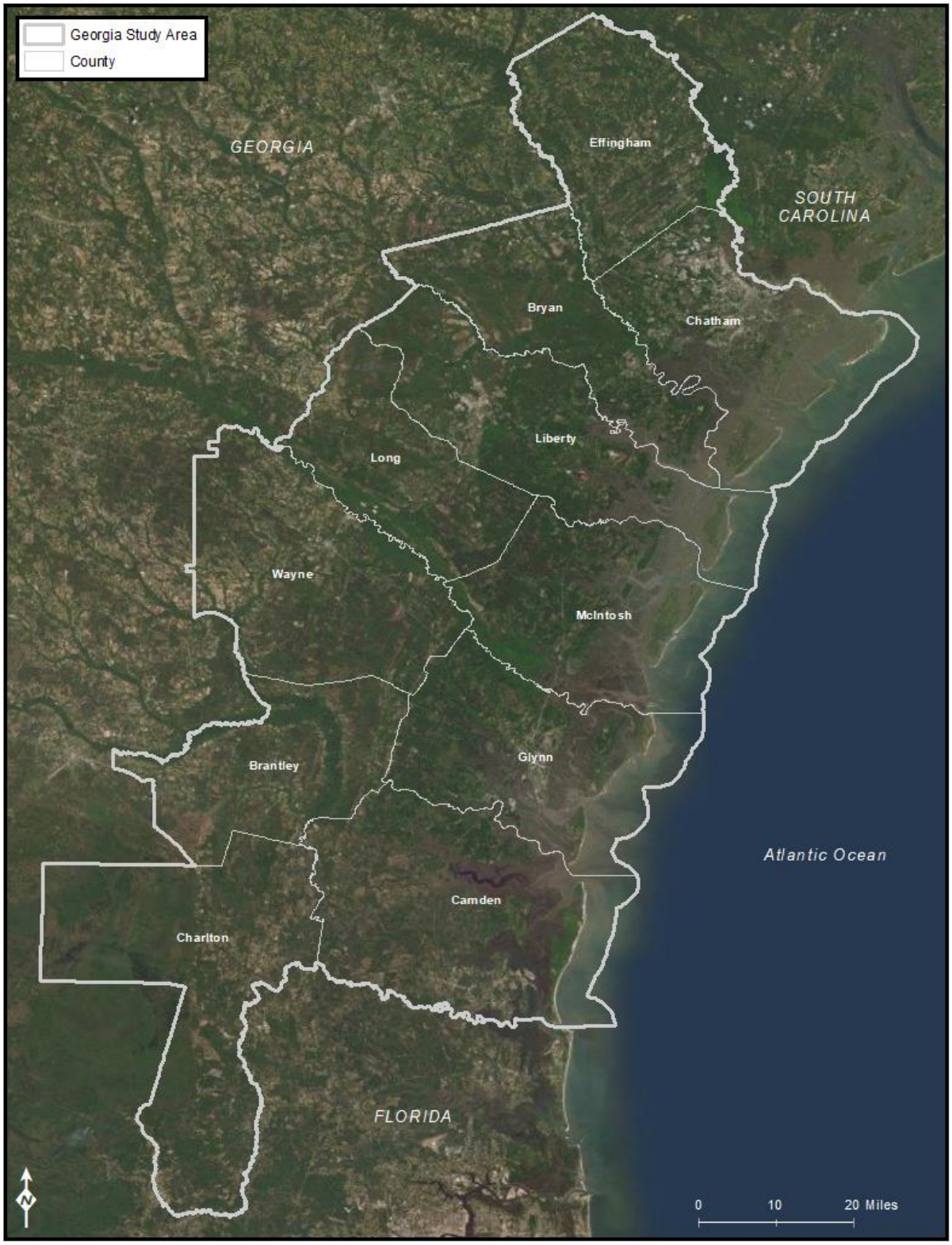
- Brantley
- Bryan
- Camden
- Charlton
- Chatham
- Effingham
- Glynn
- Liberty
- Long
- McIntosh
- Wayne

16.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Georgia are described below.

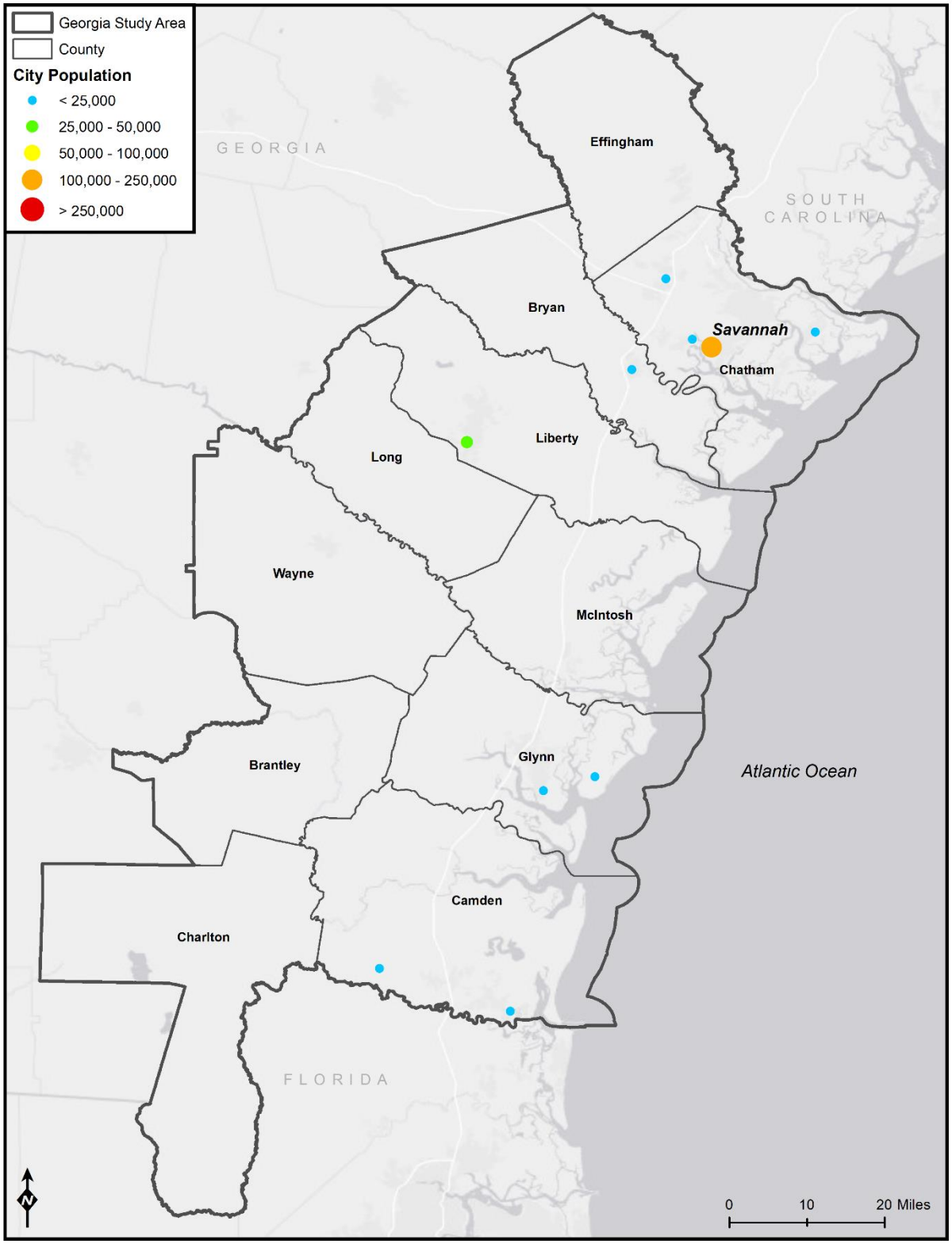
After canvasing all Nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as

- Georgia Governor's Office of Planning and Budget
- Georgia Geographic Information System Clearinghouse
- Rails-to-Trails Conservancy
- MapCruzin



Source: ESRI 2019a

Figure 16-1. State of Georgia Study Area



Source: ESRI 2019a

Figure 16-2. Cities in the Georgia Study Area

Data from county or local data sources such as information from county GIS, planning, assessors, or other departments was not collected. However, examination of such data would be helpful once site-specific planning and analyses are in progress.

The Metadata database for Georgia specific State, county, and local data sources is included in Appendix A.

16.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

16.2.1 Water Resources

Georgia's water resources include the Georgia coast, rivers, floodplains, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area.

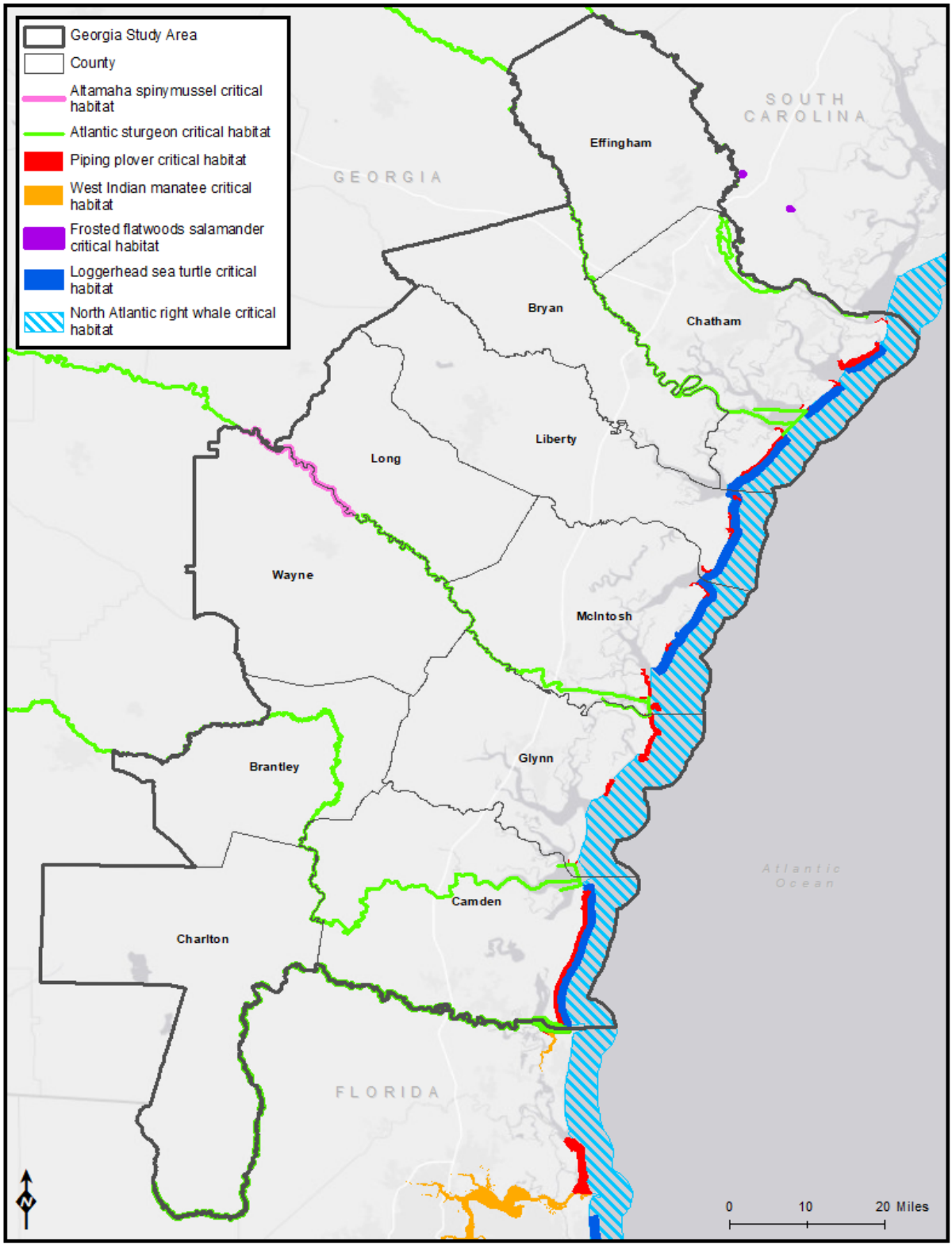
16.2.1.1 Georgia Coast

The Georgia Coast, shown in Figure 16-3, stretches 100 miles along the Atlantic, and is filled with rivers, streams, wetlands, estuaries, sounds, and barrier islands. Rivers deliver sediment and nutrients to the marshes and estuaries where fresh and tidal waters mix. Coastal barrier islands separated from the mainland by large bodies of water called sounds, protect estuaries and the mainland from the full force of the sea and coastal storms. Sediment transport in the alongshore current is primarily from the north towards the south creating a dynamic relationship between the islands. From the north to the south, Georgia's Barrier islands include Tybee, Little Tybee, Wassaw, Ossabaw, St. Catherines, Blackbeard, Sapelo, Wolf, Little St. Simons, Sea, St. Simons, Jekyll, and Cumberland Islands. Barrier islands are separated from the mainland by the Atlantic Intracoastal Waterway. With only Tybee, St. Simons, Sea, and Jekyll Islands accessible by roadway, and with much of the islands at or near mean sea level, the majority of the islands are salt marshes, tidal creeks, and dunes. Wave energy from the ocean is diminished by the broad, shallow continental shelf reducing waves to 2-4 feet; thus making the primary force the 6- to 10-foot tides. Near-shore waters are forced into and out of the sounds through narrow inlets creating wide, short barrier islands. Marshes on the mainland and on the barrier islands absorb the tidal waters; helping to buffer storms and pollutants (NGE 2013, NGE 2018, NGE 2019a).

The Savannah Coastal Refuge Complex is a grouping of wildlife refuges spanning a 100-mile stretch of coastline from Pinckney Island NWR near Hilton Head, South Carolina to Wolf Island NWR near Darien, Georgia. Totaling over 57,000 acres, refuges in the complex also include Savannah NWR, Wassaw NWR, Tybee NWR, Harris Neck NWR, and Blackbeard NWR. Located along the Atlantic Flyway, this complex of coastal refuges provides habitat for migratory birds (USFWS 2019n).

As shown in Figure 16-3, the coastal areas of Georgia in the Study Area include designated critical habitat for the piping plover, Altamaha spiny mussel, loggerhead sea turtle, South Atlantic distinct population segment of the Atlantic sturgeon, and North Atlantic right whale (southeastern U.S. calving area) Figure 16-3.

The piping plover is found regularly on the Georgia coastline during migration and wintering. It prefers the remote sandy beaches, tidal flats, and inlets along Georgia's barrier islands (Georgia DNR 2019b).



Sources: USFWS 2019i, USFWS 2019j

Figure 16-3. Critical Habitat within the Georgia Study Area

The loggerhead sea turtle can be found in open ocean near Georgia as well as at bays, coastal rivers and beaches. The loggerhead nests on sandy beaches, depositing on average 120 eggs at night above the hightide mark. Conservation lands with loggerhead nesting grounds include Wassaw NWR, Blackbeard Island NWR, and Wolf Island (Georgia DNR 2011).

The Atlantic sturgeon is an endangered species that lives the majority of its life at sea and returns to freshwater rivers to spawn. It forages at the bottom for amphipods, worms, and other invertebrates and can live up to 60 years, growing up to 14 feet and 800 pounds. In Georgia, the designated critical habitats for the Atlantic sturgeon are in the Savannah, Ogeechee, Altamaha, Satilla, and St. Marys Rivers (NOAA 2017c, NOAA 2019l, NOAA Fisheries 2020a, USFWS 2019i, USFWS 2019j).

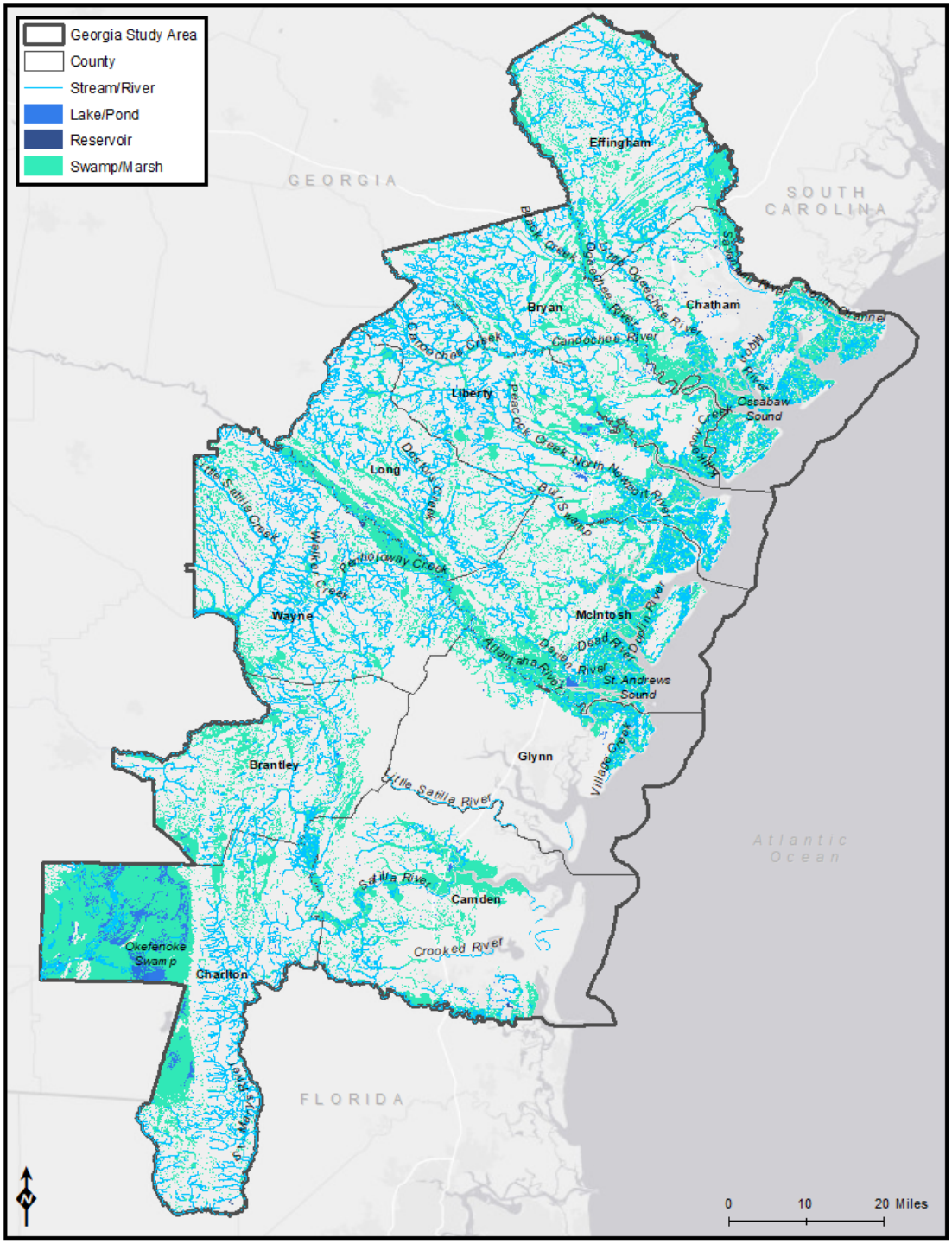
The Altamaha spiny mussel is a freshwater mollusk found only in the Altamaha River basin in Georgia. It is most often found in the coarse-to-fine sand of sandbars islands within swiftly flowing water. This mussel is found only in the Altamaha River drainage of southeastern Georgia (76 FR 62927). One of the most endangered whale species, the North Atlantic right whale occurs primarily close to the continental shelf, though it may also be found in deeper waters. The North Atlantic right whale is typically found in New England or Canadian waters in the spring, summer, and fall. The right whale typically winters in the shallow waters from Cape Fear, North Carolina to southern Florida; calves are generally born in the winter in these waters, which have been designated as critical habitat (NOAA Fisheries 2020e).

16.2.1.2 Rivers

Georgia has over 70,000 miles of rivers and streams. Within the Study Area, the major drainage basins include the Savannah, the Ogeechee, the Altamaha, the Satilla, and St. Marys Rivers; these basins all flow into the Atlantic Ocean. Figure 16-4 shows the major surface water bodies within the Study Area (Georgia River Network 2019).

The Savannah River marks much of the border between Georgia and South Carolina. The Savannah River is the most northerly of the major rivers in the Study Area. The headwaters of the Savannah are in Hart County in eastern Georgia where the Seneca River joins with the Tugaloo River forming the USACE Lake Hartwell Reservoir. The Savannah watershed includes parts of North Carolina and South Carolina along with 27 counties in Georgia. From its headwaters in the Piedmont, the Savannah River flows 313 miles through high bluffs, forests, agricultural lands, and swamps, transporting nourishment and sediment to the Atlantic Coast 15 miles downstream of Savannah, Georgia. Averaging 12,040 cubic feet of water per second, the Savannah supplies water to Augusta City, Savannah City, and Plant Vogtle in Georgia while also supplying Beaufort City, Hilton Head City, and the Savannah River Site in South Carolina. In addition to Lake Hartwell (bordering Georgia and South Carolina), the USACE generates power and regulates flow of the Savannah with the Richard B. Russell and Clarks Hill (also called J. Strom Thurmond) Reservoirs (both straddling the border between Georgia and South Carolina). Leaving the Clarks Hill Dam, the Savannah traverses a series of shoals, crossing from the Piedmont into the Coastal Plain of Georgia and South Carolina. South of the Fall Line in Burke County, Georgia, a 100-foot, chalky white, vertical bluff of weathered limestone with giant fossilized oyster shells (Shell Bluff) marks a 50 million years ago coastline. Once in the Coastal Plain, the Savannah meanders across its floodplain. The Savannah becomes tidal about 28 miles upstream from the coast, in both Georgia and South Carolina, building a braid of blackwater tributaries, tidal creeks, freshwater marshes, and salt marshes, including the Savannah NWR. At the City of Savannah, Georgia, the Savannah River has a tidal range sometimes exceeding 7 feet. Regular USACE dredging of the Savannah River Estuary is required to maintain a 42-foot depth at the Port of Savannah, where the Savannah River serves as the shipping channel (Georgia River Network 2019, NGE 2019c, NPS 2019d). Future concerns for the Savannah River include insuring proper management of the River as a water source for both Georgia and South Carolina.

Another concern for the future is the probability of the Savannah River also becoming a water source for Atlanta (150 miles to the west) when current resources reach capacity in 2030 (NGE 2019c).



Source: USGS 2019e

Figure 16-4. Hydrography in the Georgia Study Area

South of the Savannah River, the Ogeechee flows southeasterly from the Piedmont near Lake Oconee towards the Atlantic. The Ogeechee is a blackwater river; a variable flow, meandering, acidic stream, rich in tannins. Its major tributary, the Canooche River, with headwaters in the Coastal Plain of Emanuel County, flows southeasterly, joining the Ogeechee in Bryan County before reaching the Atlantic Ocean at Ossabaw Sound. The Ogeechee River breaks through the terraces, the series of parallel sand ridges formed from ancient seas, stair-stepping down to the coast (Georgia River Network 2019, NGE 2018).

South of the Ogeechee, the Altamaha River flows southeasterly to the Atlantic. Fed from the Blue Ridge province north of Lake Sidney Lanier, traveling through the Piedmont and Lake Oconee and Lake Sinclair, the Oconee River joins the Oconee in the Coastal Plain. West of the Oconee, the Ocmulgee River flows through Lake Jackson and the Piedmont, swinging northeasterly to join the Oconee. The Altamaha River begins at this confluence. It then turns east, to be joined by the Ohoopee River and flow southeast to Altamaha Sound on the Atlantic Coast near Darien, Georgia. Like the Ogeechee River, the Altamaha breaks through the ancient terrace steps on its journey to the coast. The Altamaha feeds a relatively undegraded, 16,640-acre estuary in Glynn and McIntosh counties (NGE 2017b, Georgia River Network 2019, NGE 2018).

South of the Altamaha River, the Satilla River begins in Ben Hill County, meandering through 15- to 50-foot bluffs, the Satilla crosses the Coastal Plain to join the Atlantic at St. Andrews Sound. Joined by the Little Satilla River and Turtle River, the Satilla River is another blackwater river. Unlike the Ogeechee and the Altamaha Rivers breaking through the ancient terraces to flow directly to the coast, the Satilla becomes trapped between some of the terraces, arching out a twenty-mile dogleg before breaking through the confining terraces on its journey to the coast (NGE 2018, Georgia River Network 2019, NPS 2019d).

At the southern edge of Georgia, the St. Marys River meanders through the Coastal Plain, ascribing part of the border with Florida before flowing into the Atlantic Ocean. Like the Satilla River, St. Marys River becomes trapped by confining terraces, flowing south, east, north, and then east, creating poorly drained areas in Charlton and Ware Counties, before escaping to the coast. With headwaters in the Okefenokee Swamp, this blackwater river joins the Atlantic at Cumberland Sound between St Marys, Georgia and Fernandina Beach, Florida (NGE 2018, Georgia River Network 2019, NPS 2019d).

Connecting the rivers of Georgia is the Atlantic Intracoastal Waterway. The Savannah District of the USACE manages 161 miles of shallow draft channel from Port Royal Sound, SC to Cumberland Sound, FL. Although depths of the channel are permitted to depths of 12 feet, there are nine major shoaling areas reducing channel depths along the Georgia portion of the Atlantic Intracoastal Waterway, resulting in increased safety risks due to groundings and possible environmental impacts to natural resources. At low tide, depths in these areas may only reach three feet. Maintenance dredging of the channel has been held up by sufficient funding, lack of dredge disposal areas, and environmental concerns (USACE 2019f). The Atlantic Intracoastal Waterway is shown in Figure 16-18 in Chapter 16.3.2.8.

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq.*) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. Although the State of Georgia has over 70,000 miles of rivers and streams, only 49.2 miles of one river, the Chattooga River, is designated as wild and scenic. The Chattooga River is located outside the Study Area (USFWS 2019m).

16.2.1.3 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a

0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). As seen in Figure 16-5, floodplains are a large part of the land area of many counties in the Study Area. Within the Study Area, 4.6% of land is in the 100-year flood zone and an additional 0.012% is within the 500-year flood zone. Table 16-1 details the flood zone acreage within the Study Area. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

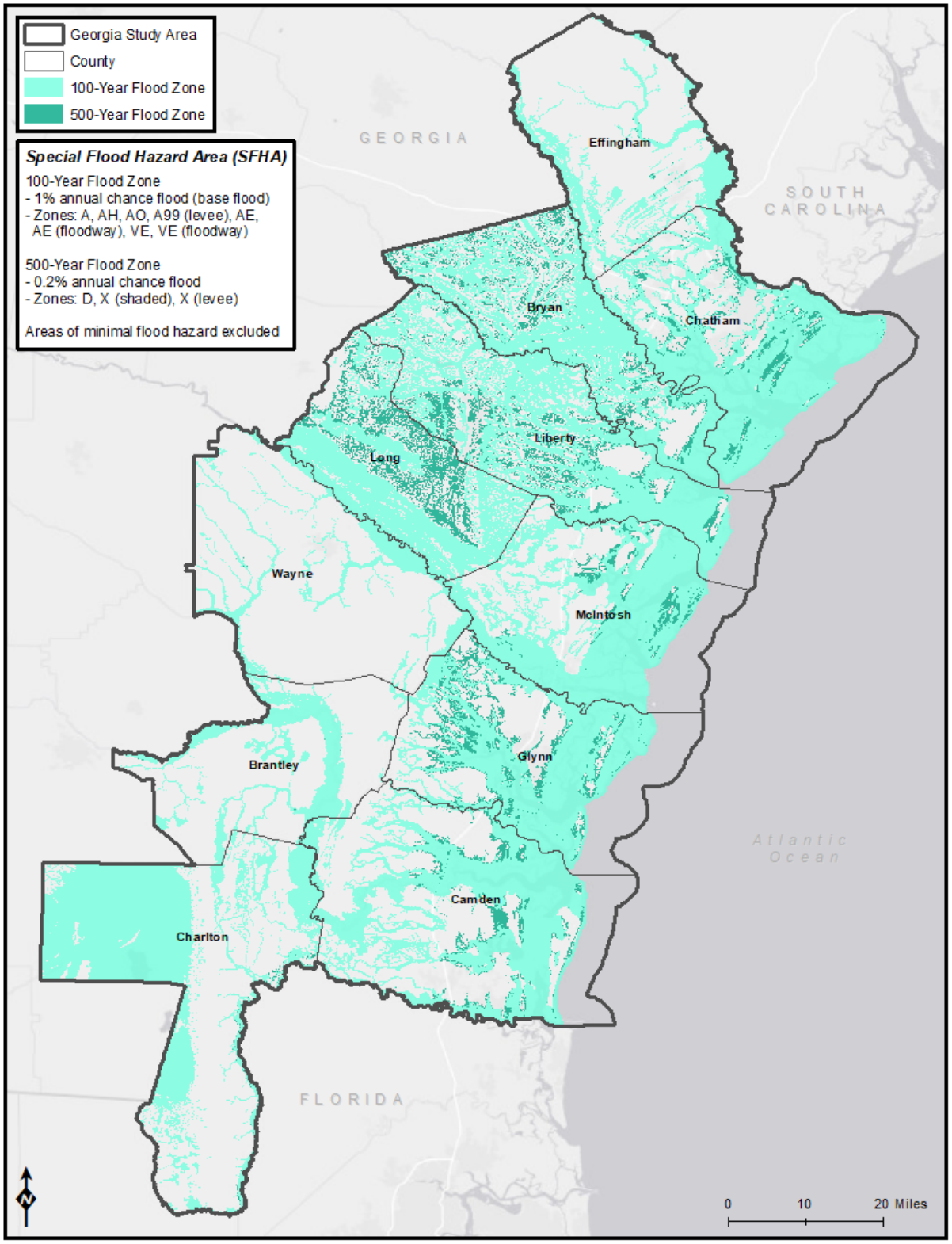
Table 16-1. Floodplains in the Georgia Study Area

Geographic Unit	Floodplains (100-year) (acres)	Floodplains (100-year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Brantley	74,700	26.3	106	0.0
Bryan	165,885	59.2	30,690	11.0
Camden	213,272	52.9	19,175	4.8
Charlton	249,153	49.9	1,218	0.2
Chatham	217,273	78.4	21,099	7.6
Effingham	73,887	24.1	947	0.3
Glynn	166,419	62.0	33,263	12.4
Liberty	206,523	62.5	38,434	11.6
Long	132,646	51.8	48,895	19.1
McIntosh	196,442	71.2	11,951	4.3
Wayne	58,790	14.3	71	0.0
Study Area Total	1,499,758	51.6	193,826	6.7

Source: FEMA 2019b
Note: Due to the vast quantity of data involved, floodplain calculations are not provided at the State or National level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.

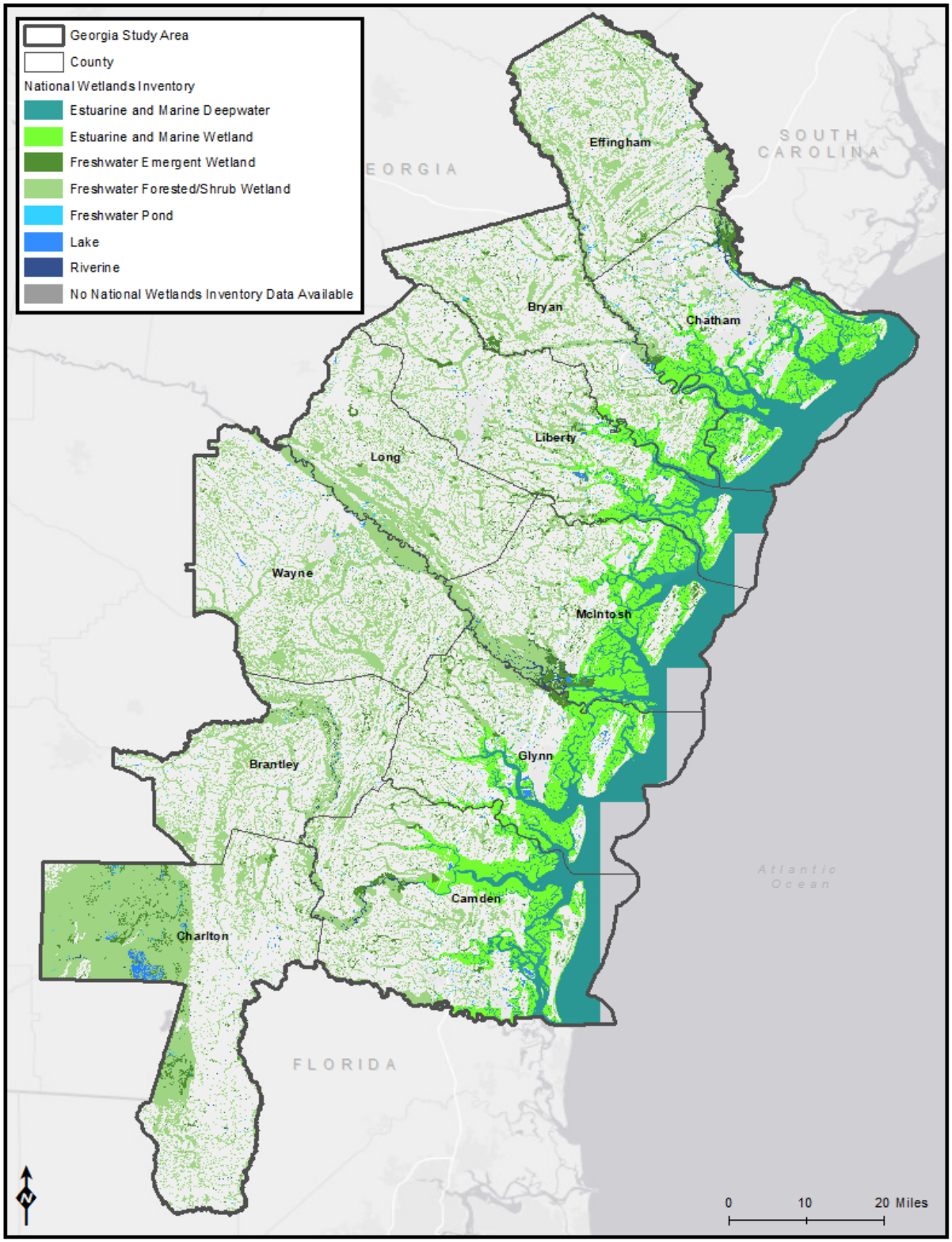
16.2.1.4 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agency responsibilities related to wetlands under these regulations. Wetlands or wetland fringe areas are frequently found along edges of natural and constructed waterways and impounded waters. In addition to providing habitat for many aquatic species, healthy wetlands located in coastal or riverine floodplains can help temper flood impacts by acting as a holding area for excess water. Wetlands also trap and filter many pollutants, helping to improve water quality and providing erosion control. Wetlands also provide opportunities for recreation. As seen in Figure 16-6, wetlands are a large part of the land area in many of the Study Area counties.



Source: FEMA 2019b

Figure 16-5. Floodplains of the Georgia Study Area



Source: USFWS 2018a

Figure 16-6. Wetlands in the Georgia Study Area

As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland-specific species), and soil (hydric soils being most common in wetlands). Table 16-2 details the wetland acreage in the Study Area along with other water resources. Estuarine and marine wetlands are tidal habitats, open to the ocean, with a mix of fresh and salt waters. Freshwater emergent wetlands, sometimes called marshes or wet meadows, are characterized by perennial, upright plants during most of the growing season. Freshwater forest and shrub wetlands are described as forested swamps or shrubby bogs. Wetlands are part of estuarine systems. Estuarine and marine deepwater systems have deep tidal habitats with partly obstructed or occasional access to the ocean and occasional influence from freshwater. Lakes are deepwater bodies, whereas freshwater ponds are shallow water bodies, possibly with marshy bottoms. Riverine systems are river or stream beds and channels (USFWS 2018a, FGDC 2013).

Table 16-2. Wetlands in Georgia Study Area

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Brantley	102,159	0	3,319	96,298	0	99	763	1,681
Bryan	114,904	20,756	5,624	76,187	9,374	379	1,045	1,541
Camden	250,616	75,172	9,523	84,144	76,184	1,187	1,878	2,527
Charlton	249,340	0	16,526	224,645	0	4,635	1,415	2,119
Chatham	260,980	88,806	8,519	34,808	122,081	1,163	2,743	2,861
Effingham	116,832	0	2,791	109,810	0	460	1,348	2,423
Glynn	192,330	69,059	7,365	42,926	68,936	1,333	1,790	923
Liberty	171,991	42,486	7,652	74,698	44,036	992	1,439	689
Long	99,731	0	3,970	93,685	0	159	578	1,341
McIntosh	219,035	70,496	11,698	58,415	73,658	388	745	3,634
Wayne	142,191	0	2,630	135,179	0	568	1,567	2,246
Study Area Total	**1,558,884**	**296,278**	**65,288**	**837,200**	**320,611**	**10,406**	**12,997**	**16,105**

Source: USFWS 2018a
Note: Due to the vast quantity of data involved, wetland calculations are not provided at the State or National level.

Okefenokee Swamp, part of the Okefenokee NWR straddling Georgia and Florida, is a remnant of an ancient ocean estuary. Located in Georgia's Charlton, Clinch, and Ware Counties and in Florida's Baker County, the Okefenokee Swamp is up to 25 miles wide by 38 miles long; encompassing 438,000 acres of peat-filled bog, complete with 370,000 acres of wetland. The swamp contains over 25,000 acres of islands with 70 islands larger than 20 acres and one, Cowhouse Island, occupying 8,200 acres. In addition, untimbered marshes and ponds cover 60,500 acres and 60 named lakes cover 500 acres. Although a small southwestern part is drained by the St. Marys River to the Atlantic, primary drainage is 280 feet on the Suwanee River to the GOM. While one inch of peat accumulates from 50 years of vegetative decomposition in water, Okefenokee is about 7,000 years old and the entire swamp is covered with peat beds up to 15 feet thick (Georgia DNR 2012a, Georgia DNR 2012b, NGE 2018, USFWS 2019c). As such, this is an irreplaceable National treasure.

The Study Area includes a wealth of wetland features including estuarine and freshwater habitats as well as the Okefenokee NWR. Recognizing that wetlands provide habitat, reduce flood impacts, and improve

water quality, counties in the Study Area are taking an active role to promote and protect these wetlands. Potential future project locations will likely be shaped to a certain extent by the locations of wetlands or will need to account for potential impacts to wetlands.

16.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate and assist with planning and future decision making.

16.2.2.1 Sea Level Rise

Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019).

Much of the sea level rise research for the coast of Georgia has occurred on Tybee Island, the barrier island seaward of Savannah, Georgia. The research is primarily based on long-term data from the NOAA tide gauge at Fort Pulaski, located across the Savannah River from Tybee Island. The Fort Pulaski tide gauge is the nearest gauge to the Port of Savannah. Because the Port of Savannah is the most likely port to experience significant growth or to support major projects/development, much of the discussion on sea level rise in this section will focus on the area surrounding the Port of Savannah, including Tybee Island, Fort Pulaski, and the Port's Garden City Terminal.

Based on results from Fort Pulaski, Tybee Island has experienced 10 inches of local sea level rise since 1935, or about 12 inches if averaged over a 100-year period (0.12 inch/year) (Evans et al. 2016). As such, current rates of sea level rise in Georgia (0.12 inch/year) were comparable to current global rates (0.125 inch/year). According to NOAA measurements of relative sea level trends using tide gauges throughout the U.S., the average linear relative mean sea level rate for the Study Area is 0.13 inches/year (NOAA 2019b). A Georgia Conservancy sea level rise study using the same Fort Pulaski tidal gauge data indicates that by 2110, the water level along Georgia's coast will be one meter above today's levels, undeveloped dry land on the coast could be reduced by 8%, and open water could increase by 10% (Georgia Conservancy 2019). The predicted rates for Fort Pulaski correspond to 0.43 inches of sea level rise per year, which is over three times the current global rate. Compounding sea level rise at Fort Pulaski is land subsidence, or local sinking of the land surface. Geologists have identified subsidence as the most likely cause for the higher rate of sea level rise observed at Fort Pulaski as compared to the recent global average (Evans et al. 2016).

Even with modest sea level rise, the impacts on the State's coastal population, industries, transportation infrastructure, and historic communities will be significant (Georgia Conservancy 2019). Currently, Tybee Island experiences chronic beach erosion, frequent nuisance flooding, and tidal backup of stormwater drainage systems. Due to nuisance flooding, there are frequent closures of the sole access road (US Highway 80) to the island. Sea level rise will not only increase the frequency of tidal flooding events but will also increase both the height and duration of high tides (Evans et al. 2016). In fishing communities such as the City of Darien, sea level rise could impact fish and ocean invertebrate habitats, from changing the salinity levels (Georgia Conservancy 2019).

At the Port of Savannah, sea level rise may increase storm-induced flooding at the Garden City Terminal, resulting in port disruptions and impacting local and State economies. Sea level rise may negatively

impact the Garden City Terminal by infrastructure corrosion from increasing river salinity and decreasing vertical clearance for ships entering the port (Georgia Conservancy 2013).

Figure 16-7 shows the NOAA results for projected sea level rise in the Study Area. Sea level rise is projected to impact areas in Georgia primarily in counties with shoreline and along the border of Charlton and Camden County where the Satilla River and St. Marys River approach each other. With 10 feet of sea level rise, most of Chatham, McIntosh, Glynn, and Camden Counties would be inundated, and the seaward half of Liberty and Bryan Counties would be inundated (NOAA 2018a). These sea level rise data depict the potential inundation of the coastal areas as a result of 0-10 foot rise in sea level above current mean higher high water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels.

16.2.2.2 Storm Surge

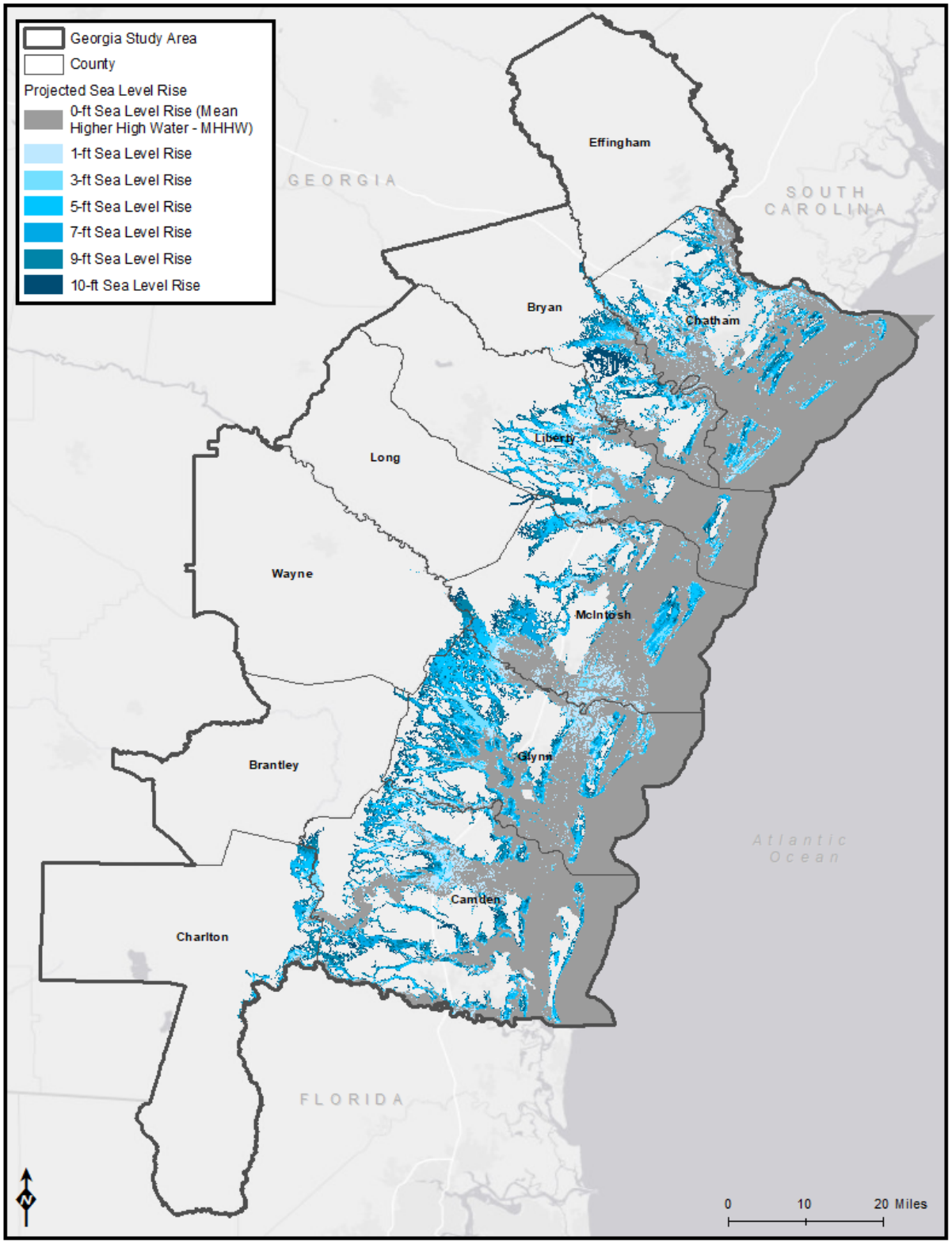
The amplitude of the surge depends in part on the topography and orientation of the coastline; the intensity, size, and speed of the storm; and the local bathymetry (NOAA 2018b).

Because Georgia has not experienced a direct landfall from a major hurricane in over a century, there is public complacency for the risk of hurricanes (Georgia DNR 2019c). Future hurricanes, including very powerful and destructive storms, can and should be expected to affect the region (Evans et al. 2016). A future hurricane would be significantly more damaging than past storms because rates of residential and infrastructure development along coastal Georgia's waterways have increased significantly since the last landfall, resulting in more persons and property at risk (Georgia DNR 2019d).

In response, the Georgia Coastal Management Program and local municipalities are creating long-term plans for disaster resilient communities, incorporating planning for natural disasters into State and local management processes. Disaster Recovery and Redevelopment Plans have been completed for Chatham County, Brantley County, and Glynn County and they are in process for other coastal counties (Georgia DNR 2019c). Within Chatham County, the City of Tybee Island developed a sea level rise adaptation plan to address the relationship between coastal flooding risks and sea level rise (Evans et al. 2016).

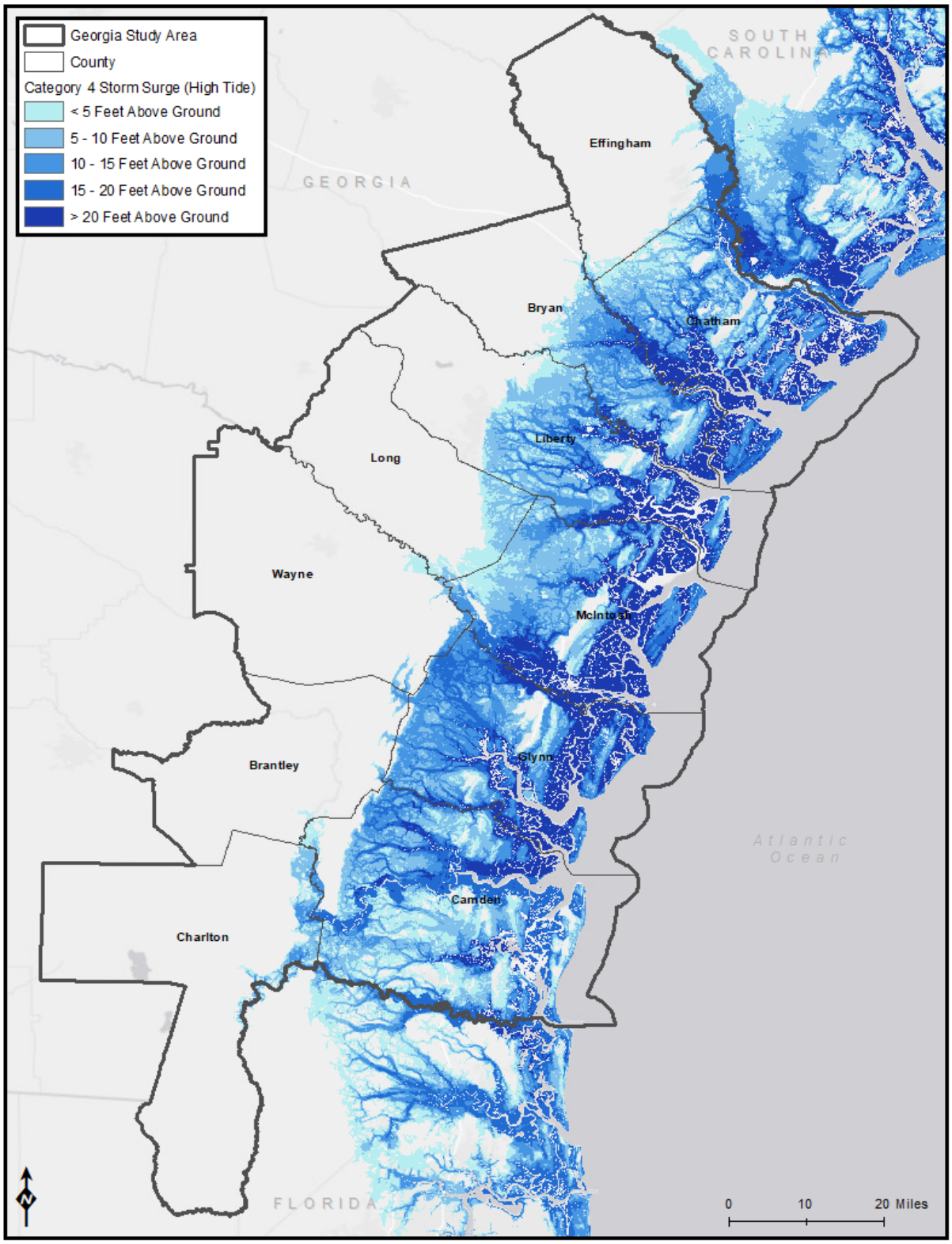
The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (FDEM 2018). Figure 16-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This Figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Georgia coastline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario. Storm surge is projected to impact areas in Georgia similar to those affected by sea level rise, but will produce impacts farther inland.

The Georgia Conservancy's has conducted analysis of the impacts of sea level rise and storm surge on working waterfronts in Georgia. According to their research, the Port of Savannah's Garden City Terminal would flood more than 25 feet above terminal ground with a Category 5 storm surge, even without accounting for changes in sea level rise. The economic impacts from Port closure and damage from hurricanes would be devastating to Georgia's economy, reducing output by between $1,099,371,223 (Category 1) and $13,500,278,613 (Category 5) (Georgia Conservancy 2013).



Source: NOAA 2018a

Figure 16-7. Protected Sea Level Rise throughout the Georgia Study Area



Source: NOAA 2020a

Figure 16-8. Projected Storm Surge throughout the Georgia Study Area for a Category 4 Hurricane

16.2.3 Summary – Physical Characteristics

The physical characteristics of the Study Area have helped shaped the land use, development of cities and towns, and the locations of various cultural, historic, and natural areas. In particular, the location of major rivers and barrier islands, the shape of the shoreline, and the expanse of floodplains and wetlands along the Coastal Plain have all influenced where settlements and transportation routes were established. Rivers and marshes in Georgia provide a vital food source and transportation route; making them prime focal areas for cities. The locations of other cities and towns may have been selected based on certain topographic or geologic features such as beachside communities and flatlands appropriate for agriculture. Those same features may have helped the towns prosper and grow both by providing natural resources for exploitation and also by providing natural attractions that may draw in additional businesses and tourists thus influencing the economics and growth of the community.

The Savannah, Altamaha, St. Marys Rivers, and Atlantic Intracoastal Waterway provide wild habitat and important fisheries for the region. The Savannah River is also a primary water source for Georgia and South Carolina. As such, surface water sources for industrial process water is likely to be limited in the future. Groundwater extraction as a source for process water may also be problematic within the Study Area. Subsidence has already been shown to exacerbate sea level rise near Savannah, so projects requiring a water source for operations should consider the source of water extraction and its implications. Any projects potentially using the Atlantic Intracoastal Waterway as a transportation route will need to account for problems arising from reduced channel depths, such as shipping routes being available only under certain tidal conditions.

Natural resources in the Study Area are generally associated with water resources and protected by various regulations and laws; they include the Savannah Coastal Refuge Complex, floodplains, , and a coastline of wildlife management and recreational refuges. Protected coastal areas also provide critical habitat for the piping plover, loggerhead sea turtle, Atlantic sturgeon, and North Atlantic right whale. The Altamaha spiny mussel is endemic to a single river basin within the Study Area. These natural resources are prevalent across the Study Area and are factors which should be considered during evaluation of potential future OCS-related projects in the Atlantic OCS planning area. Future projects will need to take into account current regulatory requirements associated with construction (in-water work, runoff, etc.) and any operational discharge.

The physical characteristics of the Study Area clearly have historically shaped existing land use considerations and will continue to do so in the future. Physical characteristics may influence zoning decisions, can contribute to identification of protected areas, and may be a component of cultural and historic and recreational resource use and preservation. Additionally, the physical characteristics of the area can influence transportation routes and facilities and population distribution and density. This in turn affects, housing and business distribution which influences employment trends, and may influence vulnerable populations. The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Current rates of sea level rise in north Georgia (0.12 inches/year) are comparable to current global rate (0.125 inches/year), but projections indicate rates could increase to 0.43 inches per year averaged over the next 100 years. A hurricane storm surge would be significantly more damaging than past storms because of increased residential and infrastructure development at the coast. Developers of potential future OCS-related projects within these areas will need to be cognizant of the projected changes in sea level and storm surge. Potential future projects could exacerbate impacts if built in areas projected to experience sea level rise and increased storm surge if these expected changes are not taken into account during planning and design stages. Early consideration of projected future changes is beneficial to the project as well to avoid potential future expenditures for costly repairs or relocations should sea level rise and/or storm surge affect project facilities and/or equipment.

In summary, physical characteristics of the Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region.

16.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

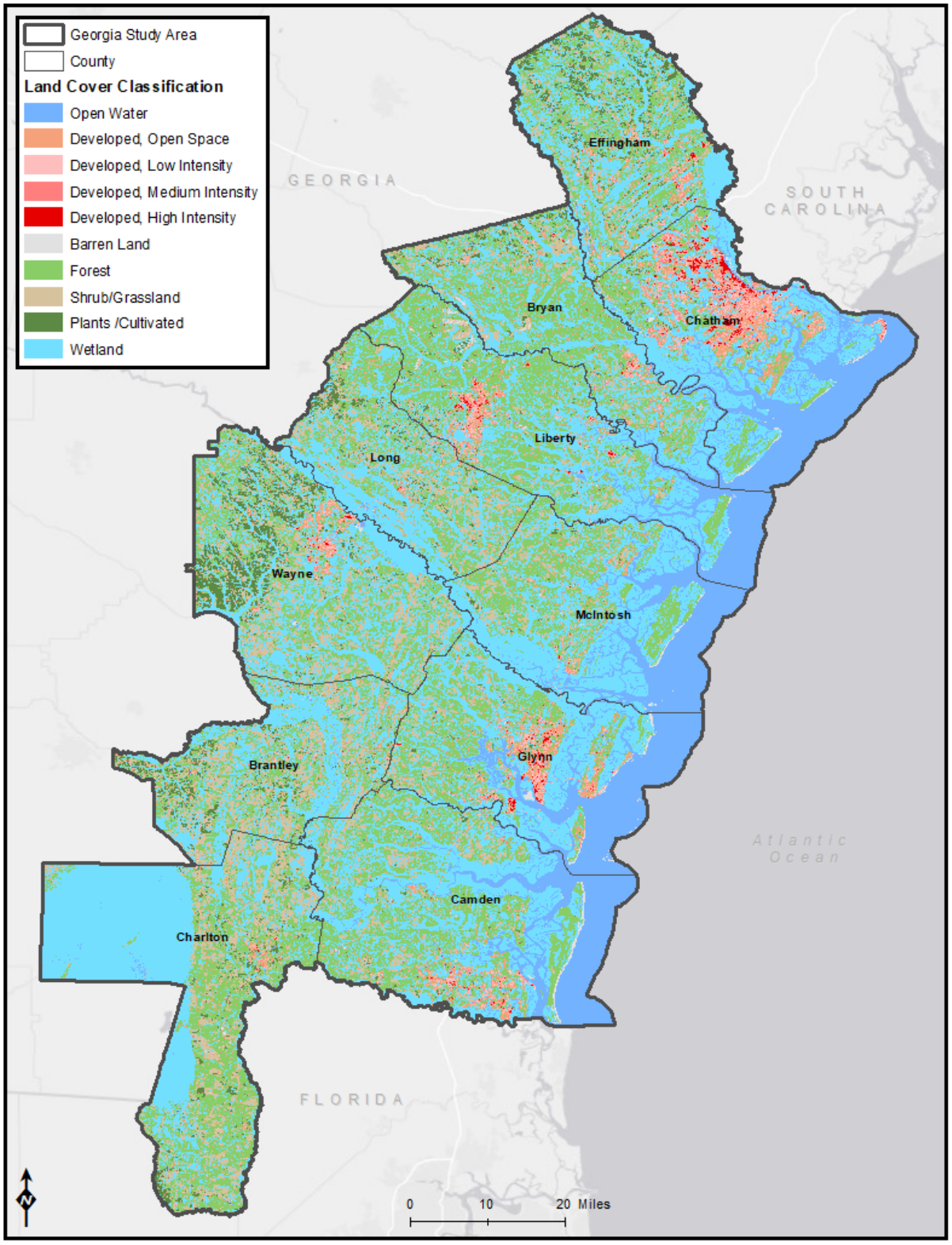
16.3.1 Land Cover

Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The 2016 NLCD is a comprehensive dataset based on decadal Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a National dataset, the NLCD allows for consistent analysis across broad areas of the United States, including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

Figure 16-9 displays the NLCD data for the Study Area. Table 16-3 presents the NLCD data for each of the 11 counties within the Study Area by acreage. Table 16-3 presents the NLCD data for each county within the Study Area by percentage and presents a summary of the overall land cover for each geographic unit. Although Table 16-3 includes data for open water land use, open water was ignored in Table 16-4 because this land cover would not be considered for future industrial development. Each county was then categorized based on its land cover characterizations as shown in Table 16-4 and Figure 16-9. The following section discusses the key findings of this analysis.

Table 16-4 presents an assessment of the general land cover for each of the 11 counties in the Study Area based on the majority of the land cover within that geographic unit. Based on this assessment presented in Table 16-4, Figure 16-9 shows the majority land cover type within each county in the Study Area.

As shown in Table 16-4, all of the eleven counties in the Study Area are predominantly wetland, which makes up an average of 41.5%, and forest, which makes up an average of 29.6% of the landcover. Georgia is one of the leading States in total wetland acreage. About 5.3 million acres, or 13% of Georgia's total land area is covered with wetlands (ASWM 2015). Also, all counties in the Study Area, with exception to Chatham County, remain largely forested, which makes up an average of 26.52% of the landcover. Only a very small portion of select counties in the Study Area appear to contain developed areas; Chatham County has the highest percent total developed area of 25.84%, which indicates a future potential for growth and development. Urban land cover is concentrated near the City of Savannah. Glynn County also has a large area of development in its central region. Urban areas in Glynn County are attributed to the College of Coastal Georgia, schools, a detention center, and a variety of shopping and dining areas in the City of Brunswick. Charlton County has the lowest percent total developed area at 2.73% and has one of the highest percent wetland cover out of the eleven counties at 52.32%, a significant portion of this is the Okefenokee Swamp. This indicates that it may not be advantageous to pursue development within Charlton County due to the abundance of natural resources and lack of supporting infrastructure. Overall, three of the eleven counties in the Study Area have significant concentrated urban development, based in Figure 16-9. They are Chatham County (Savannah), Glynn County (Brunswick), and Liberty County (Hinesville).



Source: NLCD 2016a

Figure 16-9. National Land Cover in the Georgia Study Area

Table 16-3. Acres of Land Cover by NLCD Classifications in Georgia Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (acres)	Developed, Low Intensity (acres)	Developed, Medium Intensity (acres)	Developed, High Intensity (acres)	Total Developed (acres)	Barren Land (acres)	Forest (acres)	Shrub/ Grassland (acres)	Planted/ Cultivated (acres)	Wetland (acres)	Open Water (acres)
Brantley	286,209	10,923	3,187	343	59	14,512	437	72,785	62,970	16,677	117,568	1,260
Bryan	290,852	13,461	4,321	1,162	255	19,199	1,080	106,935	25,388	7,815	119,716	10,719
Camden	500,360	16,527	6,886	2,313	582	26,309	3,958	137,544	31,684	2,231	202,109	96,525
Charlton	500,729	9,786	3,287	471	82	13,627	501	138,219	73,006	12,485	260,951	1,940
Chatham	403,183	27,759	22,486	12,061	7,224	69,530	3,827	47,749	5,638	2,073	140,232	134,134
Effingham	309,066	14,648	6,159	1,753	672	23,231	642	91,315	29,850	26,920	133,778	3,330
Glynn	374,543	19,434	9,883	3,705	2,031	35,053	3,408	76,450	15,768	1,427	133,428	109,009
Liberty	385,612	14,565	7,072	3,325	1,300	26,262	3,331	126,376	17,940	3,702	150,663	57,339
Long	258,440	9,978	2,072	449	45	12,544	324	80,215	38,617	9,984	114,930	1,826
McIntosh	367,286	8,550	1,700	271	77	10,598	1,702	80,655	20,223	1,574	158,359	94,174
Wayne	415,230	19,482	6,641	1,544	450	28,116	686	111,913	65,141	40,862	165,193	3,320
Study Area Total	**3,308,993**	**137,081**	**65,354**	**25,582**	**12,251**	**278,982**	**17,508**	**877,587**	**300,861**	**83,314**	**1,373,375**	**416,082**

Source: NLCD 2016a

Table 16-4. Percentage of Land Cover by NLCD Classification (Excluding Open Waters) and Predominant Classification for Counties in the Georgia Study Area

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Brantley	3.83	1.12	0.12	0.02	5.09	0.15	25.54	22.10	5.85	41.26	Forest/Shrub and Grassland/Wetland
Bryan	4.81	1.54	0.41	0.09	6.85	0.39	38.17	9.06	2.79	42.74	Forest/Wetland
Camden	4.09	1.71	0.57	0.14	6.51	0.98	34.06	7.85	0.55	50.05	Forest/Wetland
Charlton	1.96	0.66	0.09	0.02	2.73	0.10	27.71	14.64	2.50	52.32	Forest/Wetland
Chatham	10.32	8.36	4.48	2.69	25.84	1.42	17.75	2.10	0.77	52.12	Urban/Wetland
Effingham	4.79	2.01	0.57	0.22	7.60	0.21	29.87	9.76	8.81	43.76	Forest/Wetland
Glynn	7.32	3.72	1.40	0.76	13.20	1.28	28.79	5.94	0.54	50.25	Forest/Wetland
Liberty	4.44	2.15	1.01	0.40	8.00	1.01	38.50	5.46	1.13	45.90	Forest/Wetland
Long	3.89	0.81	0.17	0.02	4.89	0.13	31.26	15.05	3.89	44.79	Forest/Wetland
McIntosh	3.13	0.62	0.10	0.03	3.88	0.62	29.53	7.40	0.58	57.98	Forest/Wetland
Wayne	4.73	1.61	0.37	0.11	6.83	0.17	27.17	15.81	9.92	40.10	Forest/Wetland
Study Area Total	4.74	1.98	0.77	0.37	9.64	0.53	26.52	9.09	2.52	41.50	Forest/Wetland

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a

The NLCD 2016 documents land cover change in the Lower 48 States from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once. In Georgia, 18.1% of the land cover in the Study Area changed at least once. Figure 16-10 and Table 16-5 show the land cover change within the Study Area from 2001 to 2016. Brantley County experienced the most significant land cover change at 30.8% closely followed by Charlton County at 29.4%, Wayne and Long Counties were also fairly significant at 26.5% and 24.8%, respectively. Most of the change is from or to one of the three forest classes or from or to Herbaceous or Woody Wetlands. Chatham County experienced the least land cover change at 7.4%. Most of this change was from or to one of the developed classes.

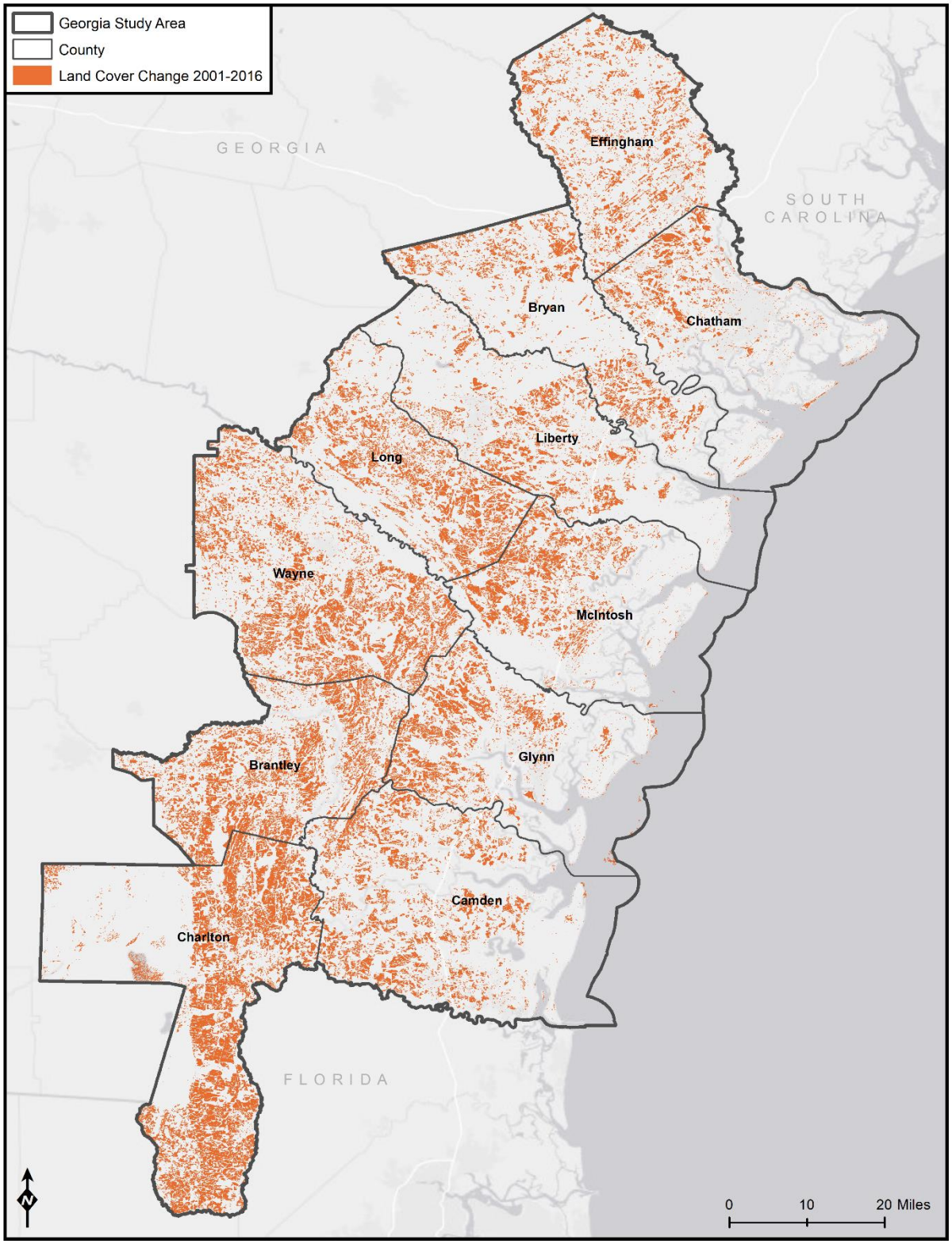
Table 16-5. Land Cover Change in the Georgia Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Brantley	286,209	88,149	30.8
Bryan	290,852	40,873	14.1
Camden	500,385	71,285	14.2
Charlton	500,729	147,062	29.4
Chatham	403,184	29,693	7.4
Effingham	309,066	49,783	16.1
Glynn	374,559	49,402	13.2
Liberty	385,617	43,368	11.2
Long	258,440	64,057	24.8
McIntosh	367,292	46,676	12.7
Wayne	415,230	109,974	26.5
Study Area Total	**4,091,563**	**740,323**	**18.1**

Source: NLCD 2001-2016

It is likely that future industrial development activities will be concentrated in the counties that have higher proportions of urban development as compared to other land use types. Counties with more urban development would have a larger percentage of areas that have been previously disturbed by other activities, which will help to minimize potential environmental impacts. Additionally, counties with more urban development will have more existing utilities, public services, and transportation resources to support development of industrial projects, thus potentially reducing project costs and facilitating shorter timelines for development. Overall, the primary land cover in the Study Area is wetland, but it is important to note that the secondary land cover is forest. Overall urban development is low in most of the Study Area with exception of Chatham County. Chatham County has the highest percent developed at 25.84%, due to the City of Savannah. However, the remainder of Chatham County is predominantly wetland at 52.12%. It is likely that future industrial development would want to avoid a majority of the counties in the Study Area which contain fewer impervious land and have a larger proportion of agricultural and wetland land covers.

Based on an analysis of the general land cover within the Study Area, it seems most likely that Chatham County, containing Savannah, and Glynn County, containing Brunswick, would be the most suitable counties to accommodate future industrial coastal projects.



Source: NLCD 2001-2016

Figure 16-10. Land Cover Change in the Georgia Study Area

16.3.2 Land Use

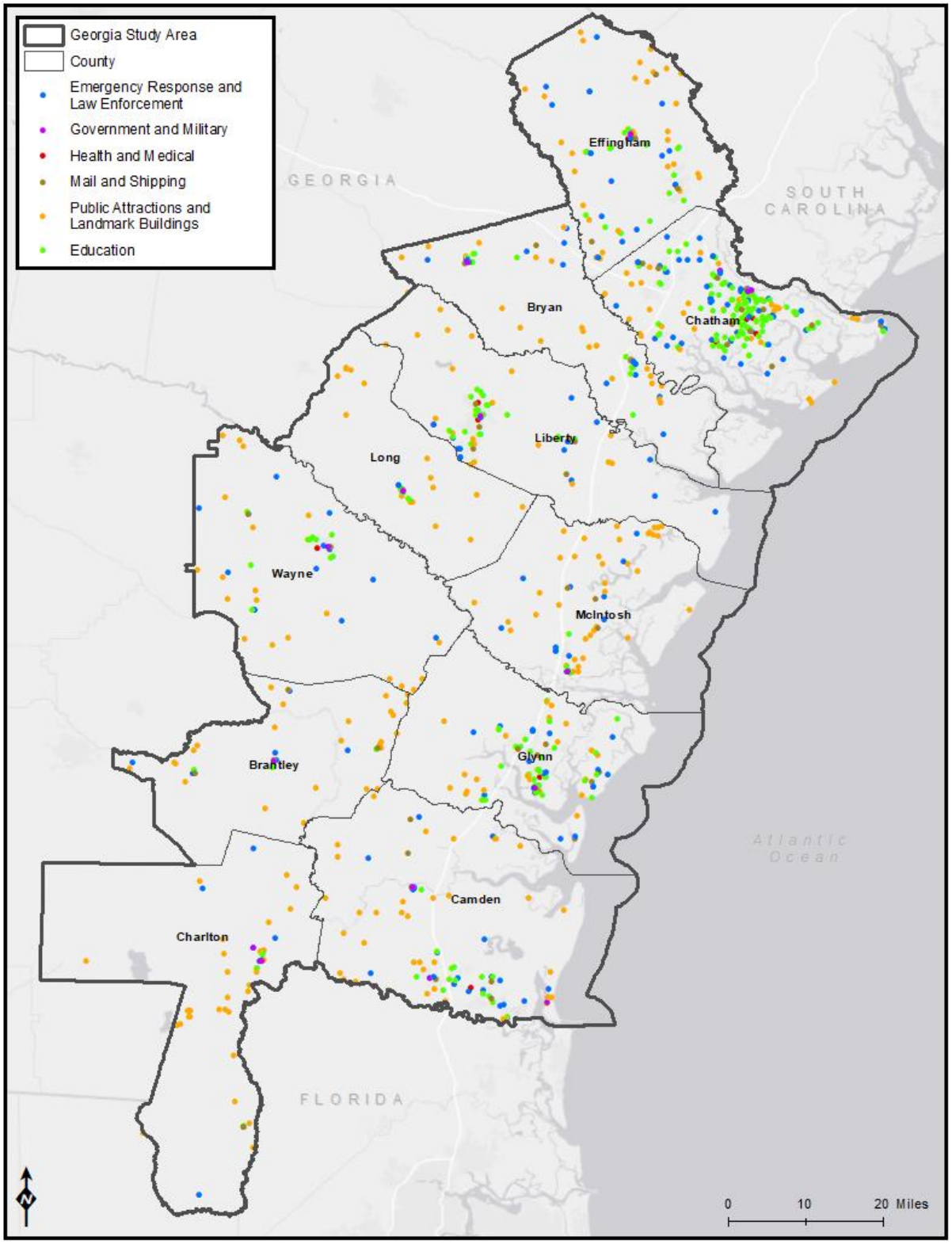
Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.

16.3.2.1 Existing and Future Land Use

The land cover data provides an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 16-11 presents locations of infrastructures at the broad scale of the Study Area. Figure 16-12 shows impervious areas across the Study Area. These Figures show the relationship between land cover analysis which identified developed areas in Chapter 16.3.1 and the specific identified infrastructures and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.

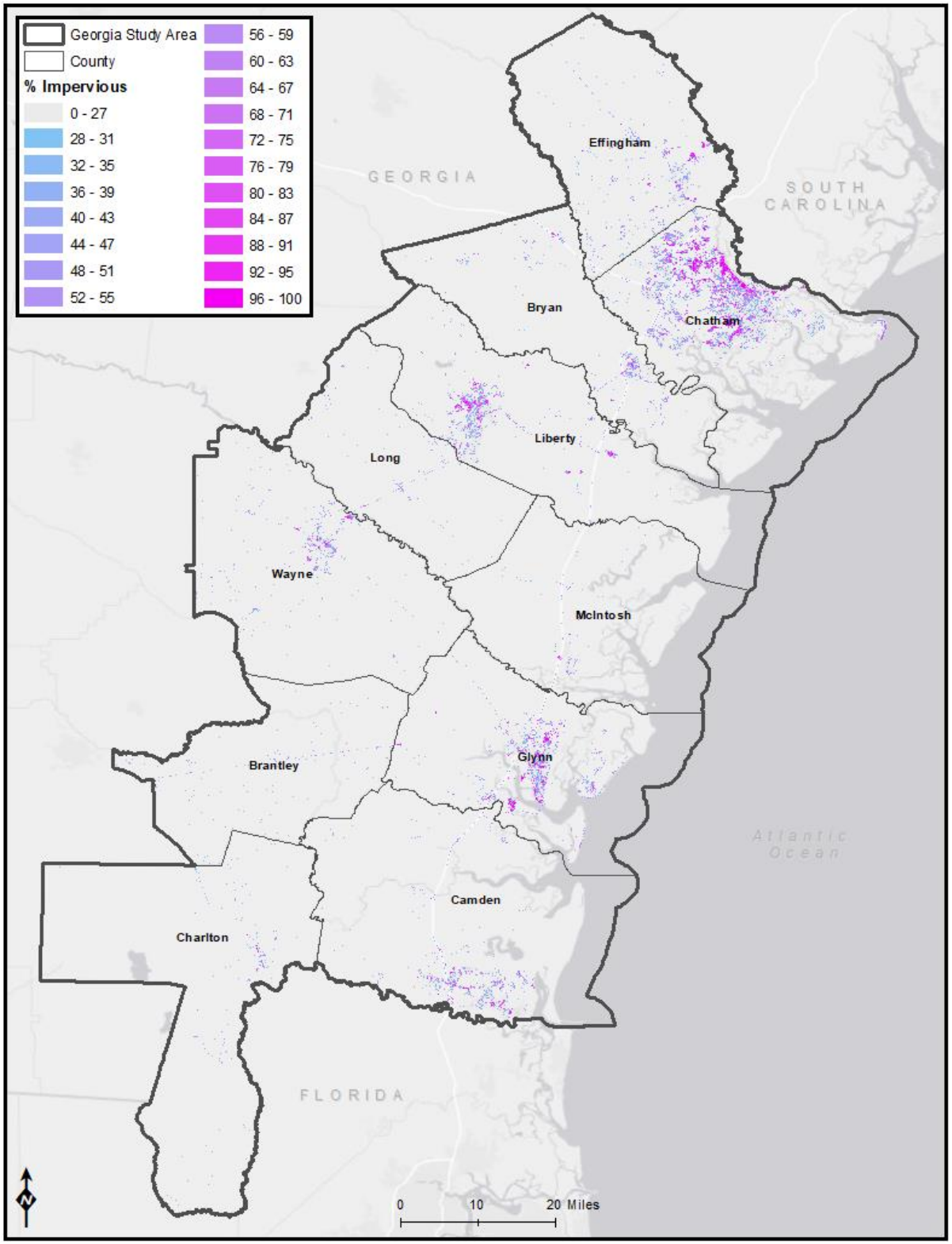
As determined in the land cover analysis in Chapter 16.3.1, most of the land cover in the Study Area is wetland. The land use maps in Figure 16-11 and Figure 16-12 indicate that public attractions and landmark buildings, as well as education, make up a large portion of land use in the Study Area, and that impervious surfaces are highly correlated with where most of the population lives. The land use data show the influence of the regional population density (discussed in Chapter 16.4.1) on the distribution and concentration of various land uses.

The existing land use maps for the Study Area indicate that impervious surfaces are associated with urban land use and transportation corridors, but public attractions and landmark buildings are not associated with urban land use or impervious surfaces. Existing land use data shows that the density of public attractions and buildings is generally even throughout the Study Area. Although there are limited urbanization and impervious surfaces in the Study Area, regions with higher population densities tend to coincide with the more concentrated land uses, which is consistent with the economic development regions that host larger transportation networks, more industries, and greater recreational resources. Population centers of note are Savannah, Brunswick, and Hinesville. Education is clustered in Chatham County and lightly scattered down to the southern portion of the Study Area. Public attractions and landmark buildings are distributed evenly throughout each county. It is important to note that impervious surfaces do not necessarily correlate with public attractions or recreation because most of the Study Area’s activities have to do with the local and State parks, National parks, or wildlife refuges. These recreational attractions are discussed further in Chapter 16.3.2.7.



Source: USGS 2017

Figure 16-11. Select Existing Land Uses within the Georgia Study Area



Source: NLCD 2016b

Figure 16-12. Impervious Surfaces within the Georgia Study Area

Each county within the Study Area has developed a comprehensive plan, strategic plan, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of five to ten or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as school, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase future changes in land use. Some, though not all, of these include publicly available GIS data that supports the plan. Given the scale of these maps, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents.

Future developers of onshore components associated with OCS-related projects will wish to consult the comprehensive plan (or equivalent) of the particular county within which they are interested in developing a new project. Counties are more likely to support projects that fit within planned future land uses identified in their respective planning documents. Early examination of such planning documents also will assist the Project Developers in identifying any need for exceptions to the planning document as the process for approval of such exceptions may require additional steps or time.

16.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

The only identified zoning information directly applicable to OCS-related project development was a moratorium on OCS-related development activities imposed in Chatham County. That moratorium expired in August 2017 (Chatham County 2015).

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other types of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

16.3.2.3 Industrial Incentives

The State of Georgia offers tax credits and incentives to promote industry development and job creation in the State, however, the primary focus of these incentives include research and development, manufacturing, warehousing, distribution and logistics, software development, data centers, contact centers, and telecommunication. The following are the statewide incentive programs in Georgia (GDED 2019a).

Companies may receive Quality Jobs Tax Credits (QJTC) if they create and maintain net new jobs that pay at least 110% of the county's average wage. Companies in Rural Counties in Tiers 1 and 2 must create a minimum of 10 and 25 qualifying jobs, respectively, within a 12-month period to claim QJTC. Companies in the remaining counties of Tiers 1 and 2, as well as Tiers 3 and 4, must create at least 50 qualifying jobs within a 24-month period to claim QJTC. After qualifying, a company can earn additional QJTC over the next seven years by creating and maintaining additional qualifying jobs. New jobs created after the 7-year period ends do not earn QJTC credits unless the project creates the required minimum net new qualifying jobs in a 12- or 24-month period again to begin another seven-year cycle. Georgia companies that invest a minimum $2.5 million in a new facility (as defined by law) while they are earning credits within an established QJTC seven-year window can open a second 7-year window before the end of the one already established. McIntosh County is the only Tier 1 county in the Study Area. All other counties are Tiers 3 and 4.

The Mega Project Tax Credit is for companies that hire at least 1,800 net new full-time employees; either invest a minimum of $450 million or have a minimum annual payroll of $150 million; and pay an average wage above specified minimums or show high growth potential. Companies can have up to 10 years to meet the job creation threshold depending on the amount of qualified investment.

Georgia is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. Georgia's Opportunity Zones were designated by census tracts based upon income, unemployment rate, property values, geographic distribution, access to transit, and the value of existing investments. There are 260 census tracts in the State with designated Opportunity Zones, several of which are located in the Study Area. A map of opportunity zones is located at https://georgia-dca.maps.arcgis.com/apps/webappviewer/index.html?id=3e0a3b024d844437bd88d8069d7182a3 (Georgia.gov 2020).

16.3.2.4 Industry

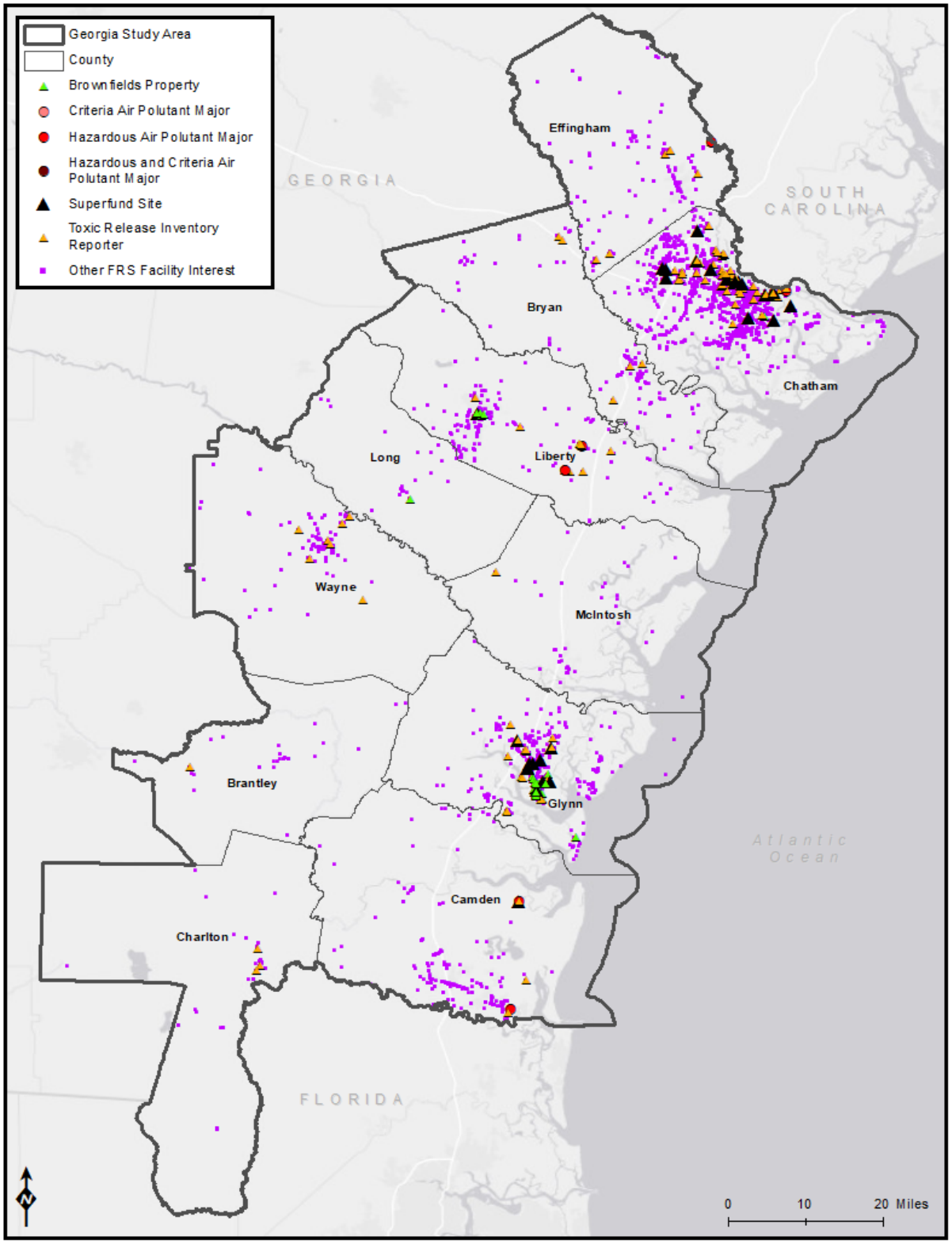
The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 16-13 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this Figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this Figure include

- *Brownfields Properties:* A hazardous substance, pollutant, or contaminant may be present, which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major:* Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major:* Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major:* Facility emits both hazardous and criteria air pollutants.

- *Toxic Release Inventory Reporter:* Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site:* Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility:* Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 16-13, the largest concentration of industry is located in the areas of Pooler, Port Wentworth, Garden City and Savannah in Chatman County and Brunswick, Sterling Station and Pennick in Glynn County.

As described previously, industrial sites are frequently concentrated in industrial zones or near other industrial properties. When purchasing property, particularly existing industrial property, developers will frequently conduct a Phase I Environmental Site Assessment to research the current and historical uses of a property and determine if the current or historic uses of the property may have impacted or pose a threat to the environment and/or human health. Potential future developers would likely consider project placement within identified industrial zones, potentially near other industrial properties that may be similar in nature or that may provide services relevant to the new site. Such evaluations typically require Phase I site survey. Chapter 16.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.



Source: USEPA 2018a

Figure 16-13. USEPA Facility Register Service Record for the Georgia Study Area

16.3.2.5 Protected Areas

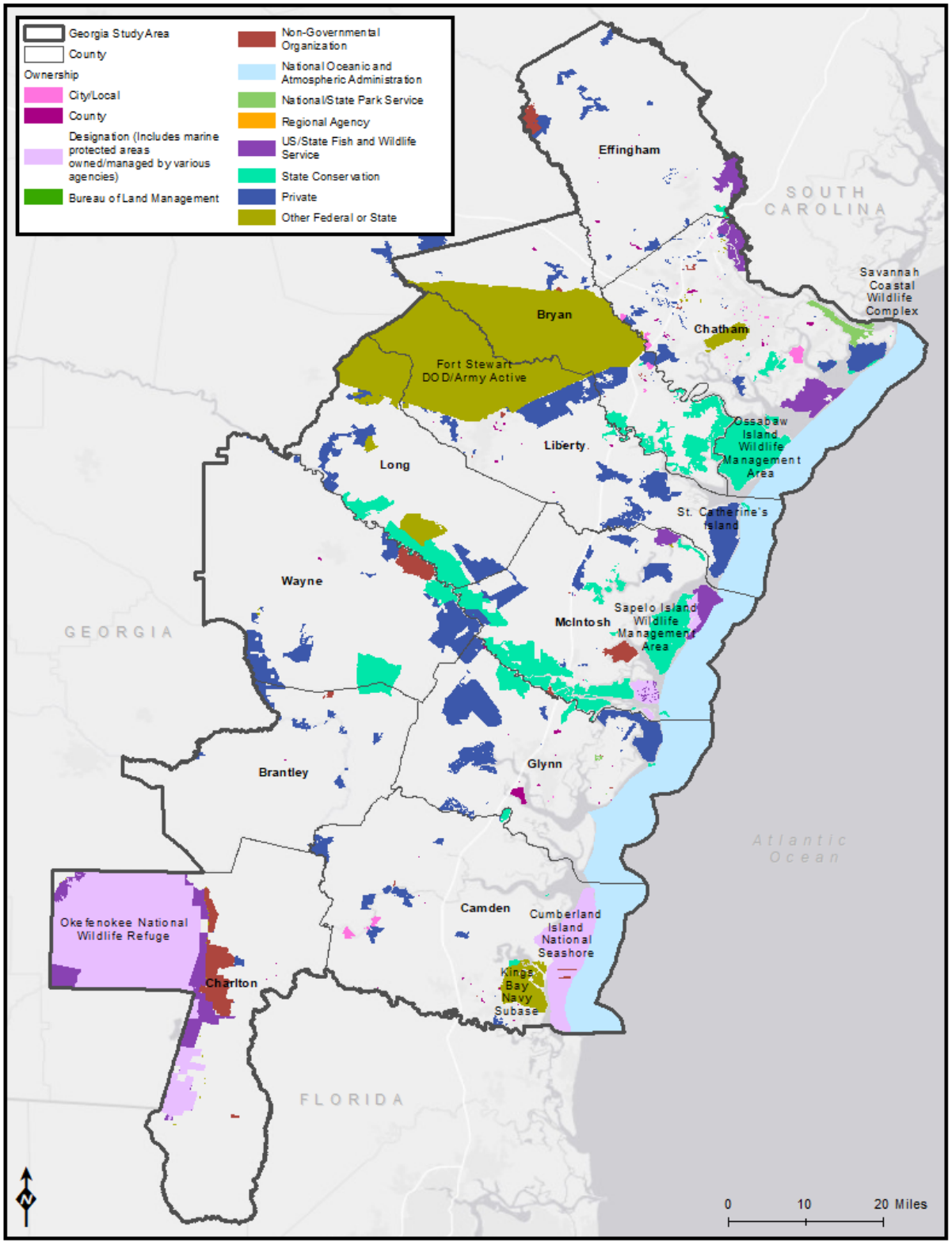
The PAD-US produced by the USGS is the official National inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of fauna and flora within the ecosystem, as well as recreational activities and any other use of the land through "legal or other effective means." The purpose of the PAD-US database is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands (USGS 2019f). The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time. Figure 16-14 presents the protected areas within the Study Area. The "designation" category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, USFWS, and the NPS.

Protected lands in the Study Area include those owned and/or managed by the Federal government, State, non-government agencies, or private individuals. Protected lands of note include Sapelo Island Wildlife Management Area, Okefenokee NWR, Cumberland Island National Seashore, Ossabaw Island Wildlife Management Area, Fort Steward Department of Defense/Army base, among many other State parks, wetlands, ponds, lakes, beaches, conservation easements, conservation areas and islands.

The Okefenokee Swamp stretches approximately 700 square miles, almost all of which is located in Georgia. It has functioned as a wilderness, an area abundant with cultural and natural resources open to the public, and a refuge. For the last 83 years, most of the Okefenokee has been a NWR. It was designated a National Wilderness Area in 1974 (NGE 2019e).

Cumberland Island was designated as a National Seashore in 1972, Congress stated that "no development of the project or plan for the convenience of visitors shall be undertaken which would be incompatible with the preservation of the unique flora and fauna" (Wild Cumberland 2019). Therefore, although Cumberland Island is open to the public year-round, a limit of 300 visitors per day was set by the National Parks Service when they initiated the ferry service to the island (Jackson 2016).

Ossabaw Island is uniquely protected in Georgia by its status as a heritage preserve. Many areas owned by the State have the heritage preserve designation, but are called Wildlife Management Areas, parks, or natural areas. The Georgia Heritage Trust Act of 1975 (O.C.G.A. 12-3-70) was established to "preserve certain real property…that exhibits unique natural characteristics, special historical significance, or particular recreational value." Under this act, certain properties are designated as heritage preserves (Ossabaw Island Foundation 2019a).



Sources: Georgia GIS Clearinghouse 2019, USGS 2019f

Figure 16-14. Protected Areas within the Georgia Study Area

As mentioned in Chapter 16.2.1.1, the Savannah Coastal Refuge Complex is a grouping of wildlife refuges spanning an over 57,000-acre, 100-mile stretch of coastline from Hilton Head, South Carolina to Darien, Georgia. Refuges in the complex also include Savannah NWR, Wassaw NWR, Tybee NWR, Harris Neck NWR, and Blackbeard NWR. A detailed description of these refuges is located in Chapter 16.2.1.1. One-half mile west of Hilton Head Island, South Carolina, Pinckney Island NWR in Beaufort County, includes more than 4,000 acres with freshwater ponds, salt marsh, forestland, and fields on multiple islands and hammocks. Fed by the Savannah River and located in Georgia and South Carolina, the Savannah NWR encompasses more than 31,500 acres of freshwater marshes, tidal creeks, and bottomland hardwoods along with 3,000 acres of freshwater ponds managed for migratory waterfowl. Covered with sand deposits from USACE dredging of the Savannah River, Tybee NWR at the mouth of the Savannah River, is a 400-acre, closed-access island refuge with saltwater marshes and beaches providing nesting habitat for shorebirds. About 10 miles south of the city of Savannah, Wassaw NWR is a 10,000-acre island refuge providing beaches, sand dunes, mixed woodland, and salt marshes. Wassaw NWR also provides nursery habitat for sea turtles and rookeries for egrets and herons. About 45 miles south of the city of Savannah, Harris Neck NWR provides important nesting, foraging, and wintering resources with its diverse habitat of freshwater ponds, fields, forested wetlands, mixed forest, and saltwater marsh. About 50 miles south of the city of Savannah, Blackbeard Island NWR includes more than 5,600 acres of marshlands, beaches, wooded areas, and saltwater creeks. Wolf Island NWR, the most southerly of the refuges in the coastal complex, is located at the mouth of the Altamaha River, providing sanctuary and habitat for migrating birds and sea turtles on three islands with more than 5,000 acres long, narrow beach and salt marsh. Located along the Atlantic Flyway, this complex of coastal refuges provides habitat for migratory birds (USFWS 2019b).Visually, McIntosh County has the largest total area of protected lands. This is primarily because of the Sapelo Island Wildlife Management Area, encompassing 9,000 of 16,500 acres on Sapelo Island, as well as private and State-owned land encompassing most of the coast in this county.

Army Base Fort Stewart covers approximately 280,000 acres across Liberty and Bryan Counties and is approximately 41 miles southwest of the city of Savannah (Military.com 2020). Fort Stewart was originally a billeting space during World War II, housing approximately 2,705 United States military officers and over 37,000 enlisted personnel. The current population of Fort Stewart is currently over 11,500 individuals with a make-up of more than 7,600 males and 3,800 females as of the July 2007 census. It currently has 1,849 households with over 1,791 families (MilitaryBases.com 1988).

In general, protected areas in the Study Area are extensive and may limit certain growth opportunities within these areas. Wildlife refuge areas and management areas also occupy a large area of the coast. It is also important to note that there are hundreds of protected areas in the Study Area, specifically in Bryan, Liberty, Chatham, McIntosh, and Charlton Counties. Although the coast is filled with protected areas, there is still potential for future growth in areas surrounding the aforementioned protected areas. Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.

16.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq.*, is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Georgia, resided in the area long before the era of European exploration. Over time, they became increasingly sedentary, establishing villages, building rock structures, and developing horticulture (Cobb and Inscoe 2019). Eventually, complex native cultures, or chiefdoms, emerged with towns that had defensive structures and mound platforms that housed various

structures. The two major tribes merged to form larger societies, including the Creeks and Cherokees. The arrival of European explorers and settlers led to the decline of these tribes, and by 1838-1839, the Creeks and Cherokee populations were forcibly removed from the area in what became known as the "Trail of Tears" (NGE 2019d).

In the mid 1500's, people like Hernando de Soto explored Georgia, but did not settle there. In 1733, James Oglethorpe founded the first colony of Georgia, which would later become Savannah (Chatham County). The colony of Georgia was the last of the original thirteen British colonies established (Nelson 2020a). Originally, the British government intended Georgia to be a buffer zone between South Carolina (and other southern colonies) and Florida against invasions by the Spaniards in Florida. Because of this, several forts were built along Georgia's coast and the Battle of Bloody Marsh took place on July 7, 1742, on St. Simons Island (Glynn County).

It is important to note that, unlike the other British Colonies, Georgia had no governor. Georgia was ruled by a Board of Trustees in England, which had banned slavery, rum, lawyers, and Catholics from the beginning. After rum was legalized in 1742 and slavery legalized in 1751, Georgia was governed by royal-appointed governors from 1752-1776 (NGE 2019d). The lifting of the ban on slavery contributed to the development of a coastal plantation economy of rice, Sea Island cotton, and the development of the cotton gin by Eli Whitney in 1793 (NGE 2019d). By 1860, there were half a million slaves living and working on cotton farms and plantations in Georgia (Nelson 2020a).

During the Revolutionary War (1775-1783), one of the battles in Georgia was fought in 1779 at Fort Morris (Liberty County). The Siege of Savannah also occurred in 1779 and was considered the second deadliest battle of the Revolutionary War. During this battle, the Americans, with the help from the French, unsuccessfully tried to free the city from the British (Smith 2016). That same year, the capital of Georgia was moved from Savannah to Augusta.

During the American Civil War (1861-1865), Georgia was the fifth State to secede from the Union as a Confederate State. Georgia was crucial in the secession because, at the beginning of the war, they had the largest population and the largest number of slaves and slaveholders of any Deep South State (NGE 2019d). Georgia was also crucial because it was a transportation and industrial center for the Confederacy; therefore, both the Confederate and Union fought for control of the State (Fowler 2019). In 1861, General Robert E Lee was sent to Savannah to organize the defense of Georgia and Florida, but he lacked resources. This ultimately led to Union forces capturing key locations along the coast. By 1862, Union troops had seized all of Georgia's coastal islands, ruined Fort Pulaski (Chatham County), and forced the port of Savannah to close (Fowler 2019).

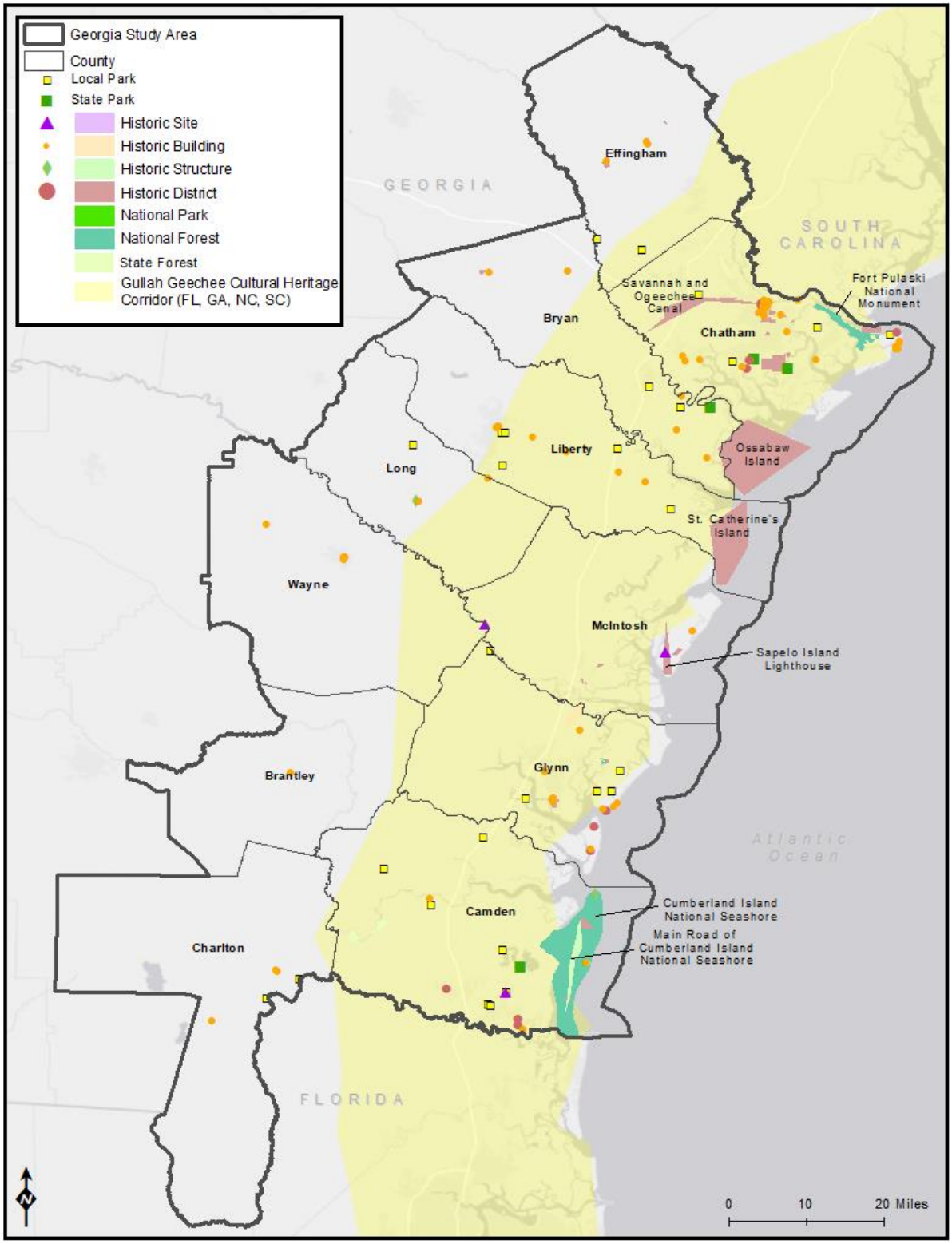
The Reconstruction era (1865-1877) in Georgia contributed to conflicts, racial violence, and political challenges; therefore, the U.S. Congress imposed military rule in the State. Consequently, Georgia was the last Confederate State to be readmitted to the Union on July 15, 1870 (NGE 2019d). However, racial tension continued to be a factor in Georgia as the Jim Crow laws, enforcing racial segregation in the southern states, were enacted from 1870's until 1965. The passing of the Civil Rights Act of 1964 put an end to the Jim Crow laws and outlawed discrimination (NGE 2019d). The decline in worldwide cotton demand and the loss of slavery led to the decline of plantations and cotton production in Georgia. Tenant and crop lien systems imposed a credit system which was exploitative and stifling for local farmers and by 1880, 45% of Georgia's farmers (both black and white) had been driven into tenancy. By 1920, two-thirds of farmers worked largely as sharecroppers on land they did not own (NGE 2019d).

The challenges of segregation and agricultural politics and policies had a permanent impact on the State. More than 400,000 residents, almost all black, migrated to other parts of the country during the 1920s, and between 1910 and 1930, nearly half the State's agricultural workers gave up farming. The Great Depression contributed to additional strain on farmers and certain New Deal, policies imposed to remedy

the effects of the Great Depression, further contributed to agricultural declines (NGE 2019d). Georgia's economy saw a further shift toward industry during World War II. The ports of Savannah and Brunswick within the Georgia Study Area produced nearly 200 "Liberty Ships" between 1942 and 1945 (NGE 2019d).

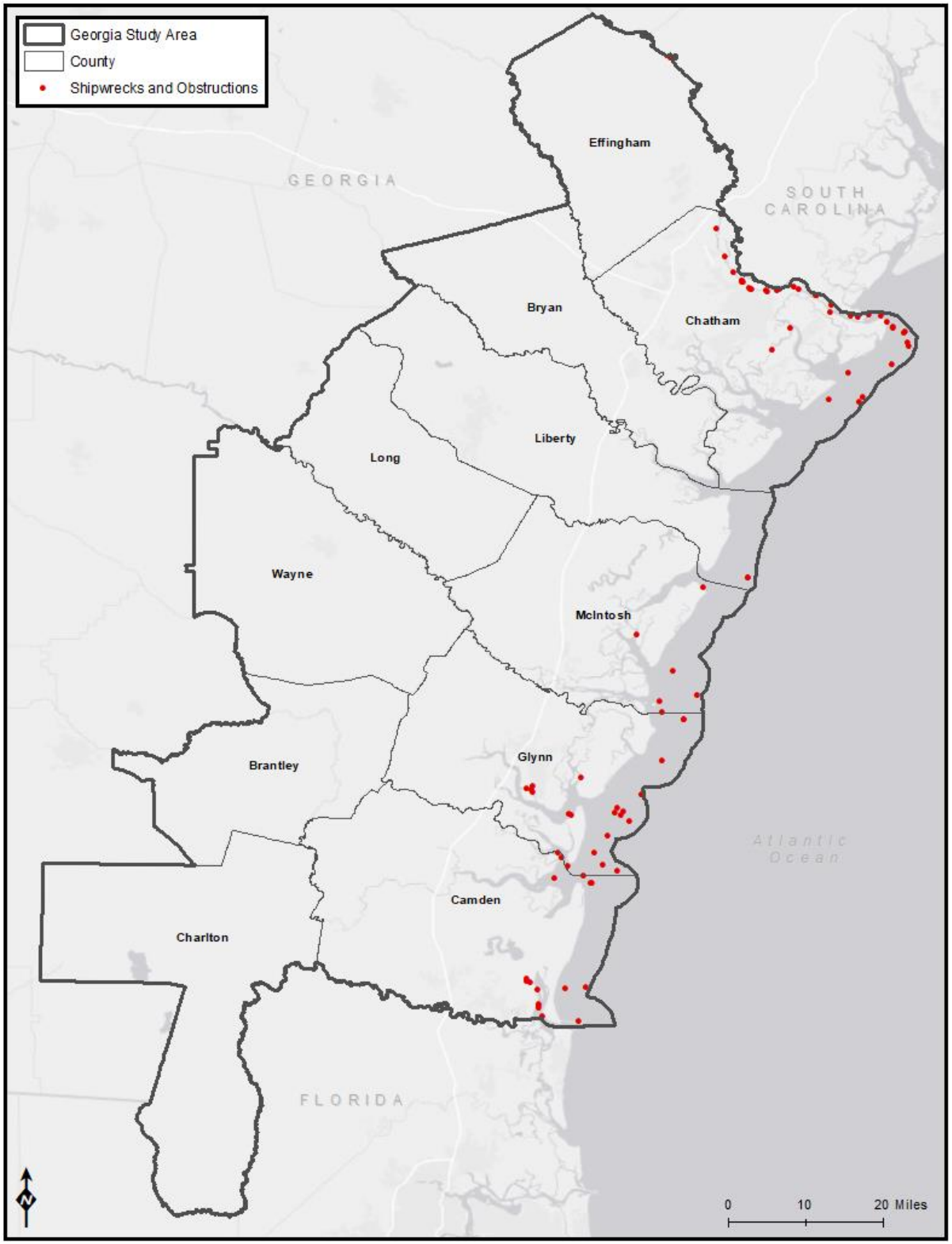
Historic sites in the Study Area, in addition to cemeteries and archaeological sites, include sites associated with major turning points in American history, including early colonial settlements, the American Revolution, the American Civil War, the Industrial revolution, and World Wars I and II, and the Civil Right era. Figure 16-15 and Figure 16-16 present a summary of many of the cultural and historic sites and locations in the Study Area, including maritime sites and shipwrecks and obstructions off Jekyll Island (Glynn County) in the Atlantic Coast. Notable locations in Figure 16-15, include the Gullah/Geechee Cultural Heritage Corridor, the Savannah and Ogeechee Canal and St. Catherine's Island. The Gullah/Geechee Cultural Heritage Corridor is the area within which the Gullah culture in the Carolinas and the Geechee culture in Georgia and Florida primarily reside. The Corridor extends from Wilmington, North Carolina to Jacksonville, Florida and includes an approximately 30-mile region containing roughly 80 barrier islands and portions of adjacent coastal counties. The Gullah and Geechee are cultural groups descended from enslaved peoples from West and Central Africa. The geographic isolation of the region has contributed to both cultures being able to preserve their linguistic, artistic, and societal traits while simultaneously assimilating aspects of other cultures in the area (NPS 2017a). The Savannah and Ogeechee Canal is a 16.5-mile passage from the Savannah River to the Ogeechee River that was dug between 1826 and 1830 by African and Irish laborers. The canal allowed for the movement of cotton, rice, bricks, and natural fertilizer which created a significant boost to the State's economy. A yellow fever epidemic blamed on the canal, and the advent of the Central of Georgia Railroad led to the closure of the canal in the 1890s (Georgia Historical Society 2014). Also in Figure 16-15, is Ossabaw Island which is largely undeveloped, but the built environment dates back to the 1820s with vernacular architecture. Around a dozen structures remain on Ossabaw Island, though hundreds of structures may have previously existed in American Indian villages and plantations (Ossabaw Island Foundation 2019b). Finally, St. Catherine's Island is one of Georgia's barrier islands about 35 miles south of Savannah that was inhabited by American Indians from at least 5000 years ago to the mid-1700's. A number of burial mounds, two Late Archaic shell rings, and numerous village sites still remain as evidence of American Indian occupation. Georgia's first church is also on this island. The island holds a deep history and has had various notable owners over the years, but it has been largely left in its natural state (St. Catherines Island 2015).

Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Georgia) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* once site-specific information is known (Klein et al. 2012).



Source: NPS 2014

Figure 16-15. Cultural and Historic Sites within the Georgia Study Area



Source: NOAA 2016a

Figure 16-16. Shipwrecks and Obstructions within the Georgia Study Area

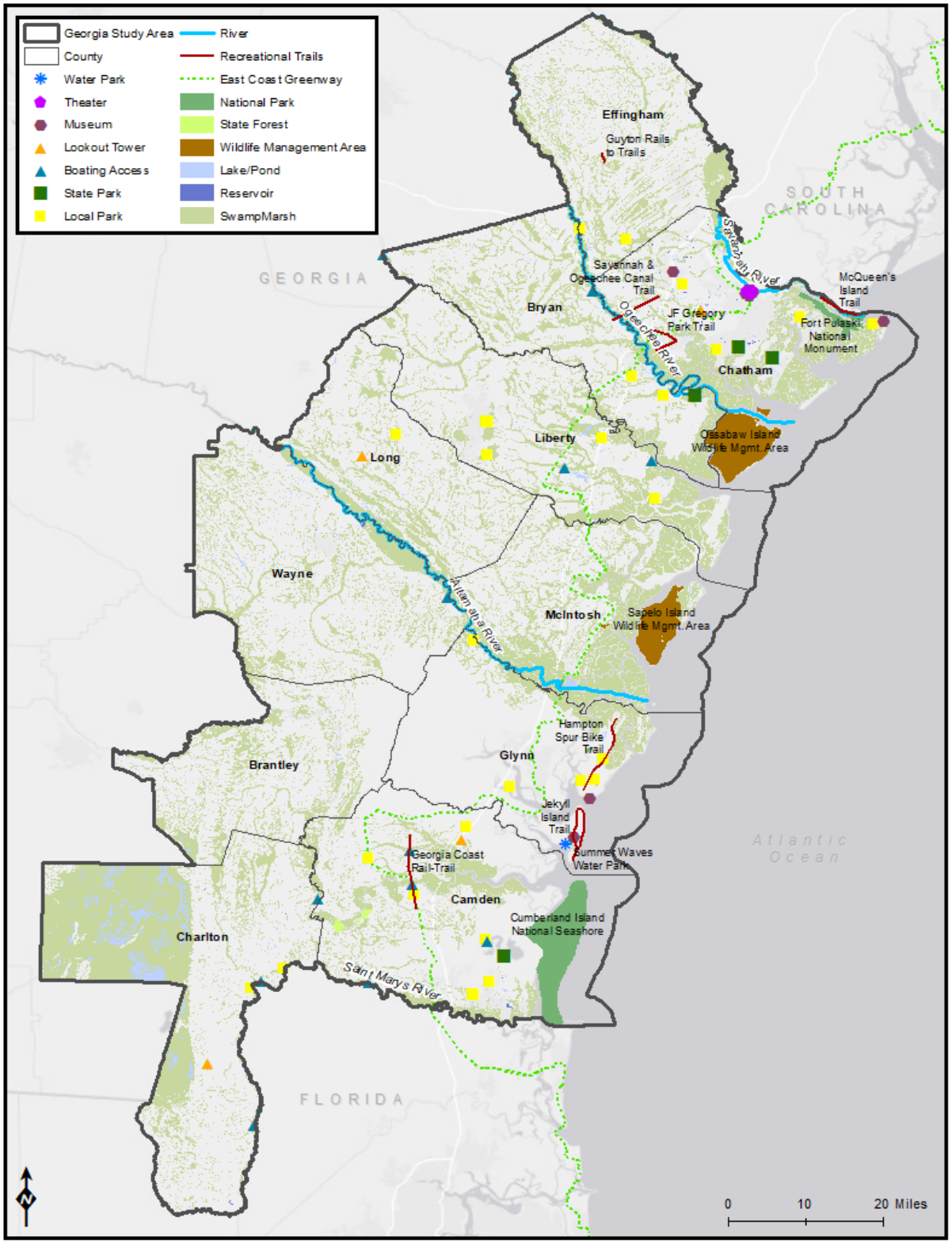
In summary, many cultural sites in the Study Area are identified in Figure 16-15; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near waterbodies for use as a drinking water, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are ample high probability areas for potential archaeological resources within the Georgia Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Georgia's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and the immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.

16.3.2.7 Recreation

There are a variety of outdoor recreational activities within the Study Area, comprising both natural and built locations and experiences. Select recreational resources and activities in the Study Area include Cumberland Island National Seashore, State and local parks, National wildlife refuges, wildlife management areas, National monuments, museums, beaches, camping, boating, fishing, and golfing. Some recreation resources in the Study Area are shown in Figure 16-17, some of which are also included in the protected areas shown in Figure 16-14. The cultural and historic resources shown in Figure 16-15 also can be considered potential recreational resources as can many of the protected areas. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 16.3.2.6), transportation (Chapter 16.3.2.8), tourism employment (included in Chapter 16.4.4), and rental housing (included in Chapter 16.4.3).

Chatham County

In Chatham County, Savannah is a popular tourist destination. In 2017, over 14.1 million people visited Savannah, spending approximately $2.9 billion. The peak tourist season in Savannah is considered to be April through June, but tourists visit Savannah year-round (Savannah Area Chamber 2019). The Savannah Historic District is the largest National Historic District in the United States and offers several walking tours of the district, as well as motorized (e.g., bus, trolley, Segway) and horse-drawn carriage tours (Savannah 2019). Activities and tours in Savannah's Historic District include visiting Forsyth Park, the Owens-Thomas Home (a National Historic Landmark built in 1819), Telfair Museum of Art, Cathedral of St. John the Baptist, the Historic Savannah Theater (the oldest operating theater in the United States built in 1818), Wormsloe Historic Site, Old Fort Jackson Historic Site, Juliette Gordon Low Birthplace (founder of the American Girl Scouts), University of Georgia Aquarium, Tricentennial Park (which includes the Savannah History Museum and Battlefield Memorial Park, the Georgia State Railroad Museum, and Children's Museum), the City Market, and several other historic buildings, cemeteries, and museums (The Crazy Tourist 2019). Notable annual festivals and events in Savannah include Savannah Book Festival (February), Black Heritage Festival (February), Savannah Music Festival (March-April), Savannah Stopover (March), Sidewalk Arts Festival (April), Tybee Wine Festival (April), SCAD Sand Art Festival on Tybee Island (May), Savanah Film Festival (October), Pin Point Seafood Festival (September), Savannah Jazz Festival (September), Tybee Island Pirate Fest (October), and the Rock 'n Roll Savannah marathon (November) (Go South Savannah 2019). There are also fishing charter companies and fishing tournaments in Chatham County including the Tybee Island's Big Bully Redfish Tournament and Savannah River Spring Classic Fishing Tournament.



Sources: NPS 2014, USFS 2019b, MapCruzin.com 2019a, Georgia GIS Clearinghouse 2019, TrailLink 2019

Figure 16-17. Select Recreational Resources within the Georgia Study Area

State Parks in Chatham County include Skidaway Island State Park (588 acres) and Fort McAllister State Park (1,725 acres) where visitors can go camping, hiking, biking, kayaking, canoeing, picnicking, and saltwater fishing. Also in Chatham County are Tybee Island, Wassaw National Wildlife Refuge, and Ossawaba Island Wildlife Management Area. Tybee Island is near Savannah where people can visit the beach, shops, restaurants, and Fort Pulaski National Monument. In 2018, almost 420,000 people visited Fort Pulaski National Monument (NPS 2018a) at a cost of $10 for a seven day pass for visitors 16 years of age and older (NPS 2019h). Wassaw National Wildlife Refuge is a 10,053-acre refuge on Wassaw Island with beaches, woodlands and salt marshes. Visitors can hunt for deer, fish, birdwatch, walk the beaches, and hike, but the refuge is only accessible by boat and the USFWS does not provide transportation (USFWS 2019r). The Ossabaw Island Wildlife Management Area contains 16,000 acres of tidal marshes and 9,000 acres of high grounds consisting of ponds, saltwater creeks a river, sloughs, inlets and beaches. This area is a popular location for hunting deer and/or feral hogs; hunting is permitted five times per year between October and February. (Georgia DNR 2019e). Ossabaw Island is also accessible only by boat, but hunt guides provide transportation to hunt areas and game pickup (Bruce 2012). Other activities on the Ossabaw Island include boating, canoeing, and river fishing.

McIntosh County

The Sapelo Island Wildlife Management Area is located in McIntosh County. The area includes a 9,000-acre refuge used for hunting deer, small game and feral hog. Similar to Wassaw National Wildlife Refuge and Ossawaba Island Wildlife Management Area, Sapelo Island is only accessible by boat. There are no motorized vehicles allowed on the island. The Reynold's Mansion is located on Sapelo Island within the Sapelo Island Wildlife Management Area. The Mansion grounds include a 6,110-acre reserve that provides guided tours, lodging, and campgrounds. Visitors can go biking, hiking, birding, hunting, and fishing, among other activities (Georgia State Parks 2019).

Glynn County

In Glynn County, popular tourist locations include St. Simon Island, Jekyll Island, Sea Island, Little St. Simons Island, and the port city of Brunswick, collectively known as the Golden Isles. In this region, there are several beaches, boat launches and piers, golf courses, historical sites and landmarks, museums and theaters, and parks and trails (Golden Isles 2019a). It was estimated that tourists spend approximately $1.4 billion annually in the Glynn County and this is expected to increase in the future. Therefore, Glynn County invested millions of dollars to expand and upgrade hotels and resorts in the Golden Isles (Southerland 2016). In 2017, it was estimated that almost 1.34 million people visited Jekyll Island supporting 7,170 jobs (Humphreys et al. 2017). Jekyll Island has 10 miles of beaches, a 250-acre Historic Landmark District, and tourist attractions such as the Georgia Sea Turtle Center and Summer Waves Water Park (Explore Georgia 2019). To increase tourism on Jekyll Island, several existing structures will be torn down and new hotels built in their footprint to increase the economic impact of tourism to over $1.6 billion; however State statutes restrict development on Jekyll Island to no more than 1,674 acres (Darby 2019).

Annual events in Glynn County include Island Treasures (January-February), Jekyll Island Shrimp and Grits Festival (September), Brunswick Rockin' Stewbilee (January), The RSM Golf Classic (November), Georgia-Florida Weekend and Golf Classic (October-November), Whiskey, Wine, and Wildlife, Coastfest (February), Holly Jolly Jekyll (November-December), and the Brunswick Christmas Parade (December) (Golden Isles 2019b). Similar to Chatham County, Glynn County has several fishing charter options for tourists in the Golden Isles area (Trip Advisor 2020a).

Camden County

In Camden County, notable recreational destinations include Crooked River State Park (500 acres) and Cumberland Island National Seashore. Cumberland Island is 17.5 miles long and has approximately 16,850 acres, of which over 9,800 acres are Congressionally designated wilderness. There is very little commercial development on the island. Visitors can only access Cumberland Island by ferry and there is an entrance fee of $10 per person with additional costs for campground use (NPS 2019i). In the spring, summer, and fall, the ferry runs twice a day, seven days a week. In the winter, the ferry runs twice a day, five days a week with no service on Tuesdays and Wednesdays (NPS 2019i). On the island, visitors, can go hiking, swimming, beachcombing, biking, hunting, fishing, boating, and kayaking (NPS 2018d). In 2018, it was estimated that 55,650 people visited Cumberland Island National Seashore (NPS 2018a).

Summary

There are many recreational activities within the Study Area. The two most popular counties for recreation are Chatham and Glynn Counties. Because of the hot summers in Georgia, the peak tourist season in the Study Area is the spring, followed by fall, summer (especially beaches), and winter. Rental rates vary with the season and location within the Study Area, but it can be expected that Chatham and Glynn Counties will be more expensive than other counties in the Study Area. There will likely be restrictions for development that affects certain recreational resources such as the wildlife management areas. Therefore, future developers should consider the potential impacts on all recreational areas and events during the planning phase and site selection process.

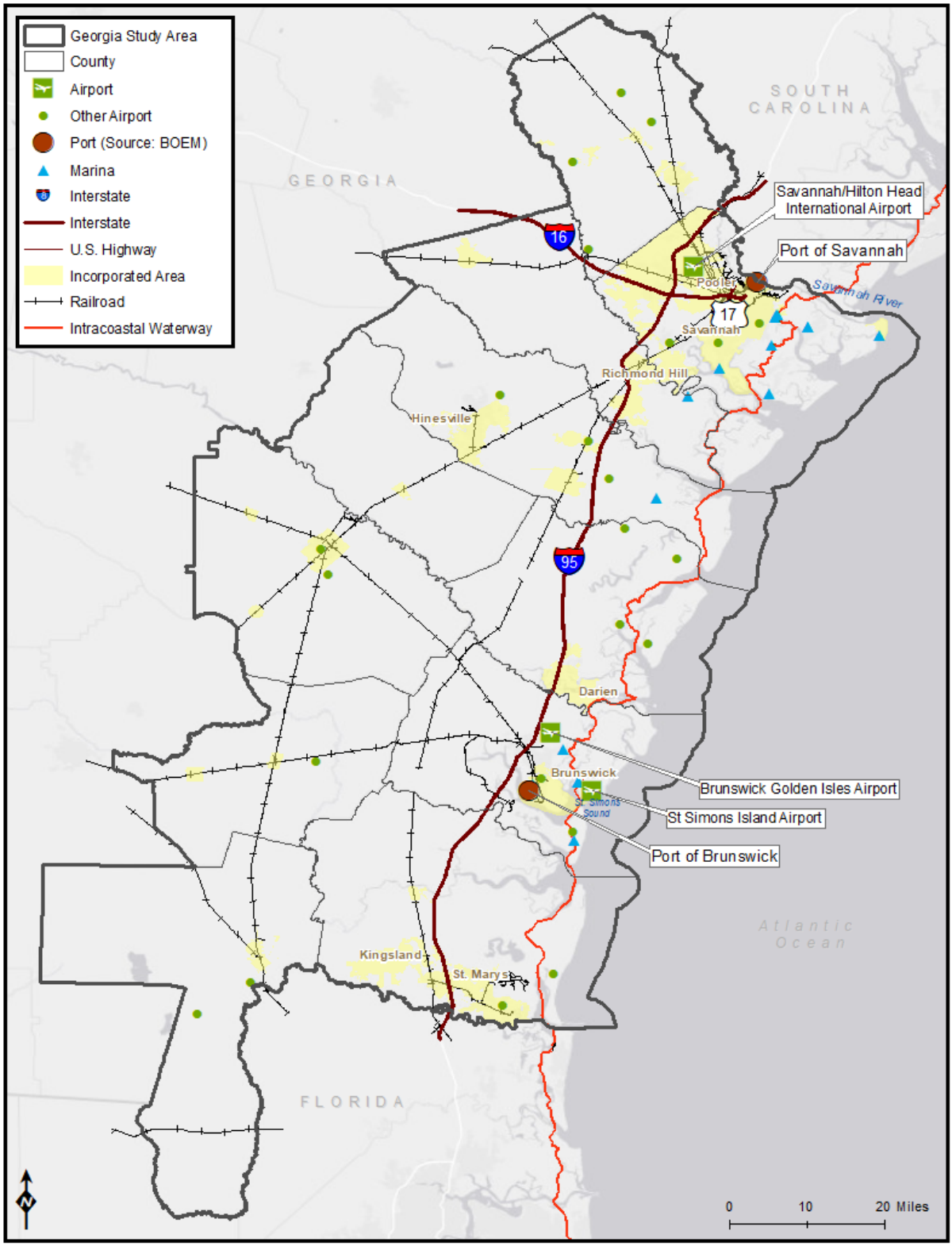
16.3.2.8 Transportation Resources

Transportation resources in the Study Area allow for quick movement of a variety of goods. Figure 16-18 shows the variety of transportation resources throughout the Study Area including roads, interstates, railroads, airports, and ports. The State's highways, railroads, and ports provide an extensive infrastructure that allow for a competitive advantage for many types of industry (Wells Fargo 2019). The deepwater ports and associated rail infrastructure allow freight cargo to quickly be offloaded and moved onto other major industrial centers in the Southeast (Wells Fargo 2019). The Georgia Department of Transportation plans, constructs, and manages Georgia's State and Federal highways, as well as collaborates with plans and programs that involve bridge, waterway, public transport, rail, commercial aviation, bike and pedestrian transportation (Georgia DOT 2013). The State boasts impressive transportation infrastructure including (Wells Fargo 2019, Georgia DOT 2013)

- 123,546 highway miles
- 104 public use airports
- 9 commercial service airports
- 128 Urban and Rural public transit programs
- 4,976 miles of railroad track
- 2 deepwater ports
- 2 inland barge operations

There are a variety of transportation resources throughout the Georgia State area. These resources include major interstates and State highways; National, international, regional, and local public airports; interstate passenger and freight railroads and some local railroad spurs; and ports.

Georgia is the industrial center for the rapidly expanding Southeast with major highways, key ports, and railroad terminals to manage trade logistics and an increasing volume of international trade (Wells Fargo 2019). The State's interstates, I-16 and I-95, allow goods to quickly travel by truck to major markets from Savannah to Atlanta, Orlando, and Charlotte (Wells Fargo 2019).



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 16-18. Transportation Resources within the Georgia Study Area

The Study Area contains two deepwater ports in Savannah and in Brunswick, both of which enable and fuel industrial development and foreign direct investment into the Study Area and the entire State (Wells Fargo 2019). The Port of Savannah is a major container port and the Port of Brunswick is the third largest exporter of large machinery in the Nation (Georgia DOT 2013). The Port of Savannah is served by Norfolk Southern and CSX, two Class 1 railroads, which allow for shipments to transfer from ships onto trains (Wells Fargo 2019). The Port of Savannah currently has a draft depth of 42 feet and dredging is ongoing for deepening the channel to 47 feet, allowing large container ships to access the port (WPS 2019c). In comparison, the Port of Brunswick focuses on managing breakbulk, agri-bulk, and roll-on/roll-off cargoes and the depth of the channel is 36 feet (WPS 2020a). As described in Chapter 16.2.1.2, the Atlantic Intracoastal Waterway connects the rivers of Georgia. The Savannah District of the USACE manages 161 miles of shallow draft channel from Port Royal Sound, SC to Cumberland Sound, FL. Although depths of the channel are permitted to depths of 12 feet, there are nine major shoaling areas reducing channel depths along the Georgia portion of the Atlantic Intracoastal Waterway, resulting in increased safety risks due to groundings and possible environmental impacts to natural resources. At low tide, depths in these areas may only reach 3 feet. Maintenance dredging of the channel has been held up by sufficient funding, lack of dredge disposal areas, and environmental concerns (USACE 2019f). The Atlantic Intracoastal Waterway is shown in Figure 16-18 in Chapter 16.3.2.8.

Connecting the rivers of Georgia is the Atlantic Intracoastal Waterway. which extends from the Florida State line to the South Carolina State line (Georgia DOT 2013). This navigable waterway is key to local residents and the movement of tugboats, barges, and commercial fishing vessels (GA Encyclopedia, Intracoastal Waterways). The Savannah District of the USACE manages 161 miles of shallow draft channel from Port Royal Sound, SC to Cumberland Sound, FL. Although depths of the channel are permitted to depths of 12 feet, there are nine major shoaling areas reducing channel depths along the Georgia portion of the Atlantic Intracoastal Waterway, resulting in increased safety risks due to groundings and possible environmental impacts to natural resources. At low tide, depths in these areas may only reach three feet. Maintenance dredging of the channel has been held up by insufficient funding, lack of dredge disposal areas, and environmental concerns (USACE 2019f). The Atlantic Intracoastal Waterway is shown in Figure 16-18 in Chapter 16.3.2.8.

Rail pathways in the Study Area run through Savannah and Brunswick; and connect the North end of the Study Area to the Southern end, as well as penetrating west into the interior of the Study Area (Georgia DOT 2013). Freight rail lines are split between light density lines and mainlines. Georgia's mainlines carry the majority of product transportation, with some mainlines transporting over 80 million gross tons annually (Georgia DOT 2013).

16.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area is predominantly wetland (an average of 41.5% of the area). Most of the rest of the Study Area, with exception of Chatham County, remains largely forested. Savannah (Chatham County) is the only sizable city within the Study Area; however, it does not qualify as a metropolitan area. Regardless, land use trends are typical with major developed areas having higher concentrations of impervious surfaces, more business, commercial, and industrial facilities, and more transportation resources (road, rail, air, and port). Industry is concentrated in the areas of Pooler, Port Wentworth, Garden City and Savannah in Chatman County and Brunswick, Sterling Station and Pennick in Glynn County.

All the counties within the Study Area have future land use plans, and many have zoning ordinances. These future land use plans and ordinances often consider preservation of existing protected areas, cultural and historic areas, and recreation resources and may plan for expansion of such land uses in the future. Future development will need to be consistent with existing future land use plans, existing zoning ordinances.

The State of Georgia offers tax credits and incentives to promote industry development and job creation in the State; however, most of these are not available for OCS-related ventures. The Georgia Department of Economic Development should be experienced in helping businesses coordinate with local and State governments and regulatory bodies during the project planning and site selection phases. Coordination with such organizations would be beneficial to both project developers and the local community. Projects that are consistent with planned future development and project developers interested in working in partnership with the communities during the planning and siting process to minimize potential impacts will receive more support for a potential project.

Energy facilities to be located in or affecting the coastal area are given special consideration as activities of National interest in energy production and transmission. Regardless, there are currently no OCS-related refining facilities and heavy manufacturing is relatively limited in the coastal area of Georgia. Suitable sites for industrial uses are limited in the Study Area (GCMP 1997). There was a moratorium on OCS-related development activities imposed in Chatham County in the past, but it expired in 2017. Regardless, the moratorium indicates that OCS-related development near Savannah may be difficult, even though the Savannah Port is the only port in Georgia capable of handling a large industrial development.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Members of the community attach significance to such sites, whether it be because of memories attached to visits to a site, the environmental importance of a site, or the cultural and historical importance of a site. When there is an emotional attachment to a site, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way, even in ways that may ultimately benefit the site. Because of the quantity and distribution of these sites across the Study Area, it is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

Recreational opportunities are unique to the season, geographical region, and individual person's preferences. Peak tourism season is dependent upon the outdoor recreational activities that tourists enjoy. The two most popular counties for recreation are Chatham and Glynn Counties. Because of the hot summers in Georgia, the peak tourist season in the Study Area is the spring, followed by fall, summer (especially beaches), and winter. Annual festivals in the Study Area take place during the spring months of late February to mid-April. Rental rates vary with the season and location within the Study Area, but it can be expected that Chatham and Glynn Counties will be more expensive than other counties in the Study Area. Therefore, future developers should consider the potential impacts on these recreational areas and events during the planning phase and site selection process.

Georgia is the industrial center for the rapidly expanding Southeast with major highways, key ports, and railroad terminals to manage trade logistics and an increasing volume of international trade (Wells Fargo 2019). The State's interstates, I-16 and I-95, allow goods to quickly travel by truck to major markets from Savannah to Atlanta, Orlando, and Charlotte (Wells Fargo 2019). The Study Area contains two deepwater ports in Savannah and in Brunswick, both of which enable and fuel industrial development and foreign direct investment into the Study Area and the entire State (Wells Fargo 2019). Connecting the rivers of Georgia is the Atlantic Intracoastal Waterway, which extends from the Florida State line to the South Carolina State line (Georgia DOT 2013). Rail pathways in the Study Area run through Savannah and Brunswick; and connect the North end of the Study Area to the Southern end, as well as penetrating west into the interior of the Study Area (Georgia DOT 2013).

16.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

16.4.1 Population

In 2017, Georgia was ranked the 8th most populous State in the Nation and the 2nd most populous southeastern State after Florida (State of Georgia 2018). Between 2016 and 2017, Georgia added 115,759 new residents. Georgia ranked 6th in the Nation for the largest numeric population increase and 14th for the largest population growth rate. The City of Atlanta, which lies outside of the Study Area, ranked 10th among the cities for the largest numeric population increase (13,323 people) during the same time period (State of Georgia 2018).

After decades of growth, Georgia's population is increasing, and at a rate faster than the National population. Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. According to the U.S. Census Bureau (USCB), Georgia's estimated population was 10.2 million in 2017. As shown in Table 16-6, Georgia grew 5.3% since the 2010 Census, having added approximately 500,000 people. During the same time period, the population of the U.S. grew just 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). These values are USCB estimates. As estimates they contain "residuals" which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Population growth in the U.S. has slowed over the last decade, and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (Brookings Institute 2018, USCB 2019a). While Georgia is affected by the Nationwide trend of aging population, it continues to grow due to migration, both domestic and international. In short, there are more people moving into Georgia than moving out (USCB 2019b).

Nationally, migration remains at historic lows, as most of those who have moved tend to relocate relatively short distances away from their original residence (Governing.com 2018). However, Georgia is not part of this National trend, as Georgia is one of the southern States that is a popular destination for relocation. Reasons for relocation, derived from the USCB survey data for 2015-2017, include work related reasons (new job or transfer), a change in marital status, and desire for better housing (Governing.com 2018). USCB 2018 estimates indicate that the biggest domestic in-migration came from Florida, Texas, Tennessee, North Carolina, California, South Carolina, New York and New Jersey (USCB 2017c).

Table 16-6. 2010 and 2017 Total Population and Population Projections Through 2040 in the Georgia Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Coastal	Bryan	30,233	34,883	39,137	44,300	47,361	15.4	35.8
	Camden	50,513	52,252	53,924	55,715	56,272	3.4	7.7
	Chatham	265,128	285,506	292,176	313,387	328,655	7.7	15.1
	Effingham	52,250	57,087	64,026	72,294	76,579	9.3	34.1
	Glynn	79,626	83,467	86,047	93,084	99,312	4.8	19.0
	Liberty	63,453	62,120	61,904	62,286	61,727	-2.1	-0.6
	Long	14,464	17,857	19,915	25,096	31,324	23.5	75.4
	McIntosh	14,333	14,061	14,567	14,707	13,394	-1.9	-4.7
	Total Coastal	***570,000***	***607,233***	***631,696***	***680,869***	***714,624***	***6.5***	***17.7***
Heart of Georgia Altamaha	Wayne	***30,099***	***29,833***	***29,974***	***30,798***	***31,180***	***-0.9***	***4.5***
Southern Georgia	Brantley	18,411	18,411	19,202	20,326	19,836	0.0	7.7
	Charlton	12,171	12,963	13,251	13,751	13,116	6.5	1.2
	Total Southern Georgia	***30,582***	***31,374***	***32,453***	***34,077***	***32,952***	***2.6***	***5.0***
	Study Area Total	**630,681**	**668,440**	**694,123**	**745,744**	**778,756**	**6.0**	**16.5**
	Georgia	**9,687,653**	**10,201,635**	**10,833,472**	**12,292,423**	**13,298,742**	**5.3**	**30.4**
	United States	**308,745,538**	**321,004,407**	**332,639,000[4]**	**355,101,000[4]**	**373,528,000[4]**	**4.0**	**16.4**

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - Governor's Office of Planning and Budget 2019a; 4 - USCB 2018b

16.4.1.1 Study Area Trends

Figure 16-19 shows the demographic regions comprising the Study Area. These regions are different from the physiographic regions described in Chapter 16.2 because they are derived from official demographic regions used by the Governor's Office of Planning and Budget. The counties within the Study Area are located within three demographic regions defined as Coastal, Heart of Georgia Altamaha, and Southern Georgia (Governor's Office of Planning and Budget 2019b). According to the State Office of Rural Health, 120 of the 159 counties in Georgia are classified as rural. Generally, rural counties have less than 35,000 population; however, counties with populations in excess of that number which also host a military installation may be classified as rural. Such is the case of Liberty and Camden counties within the Study Area. In total, 8 of the 11 counties within the Study Area are rural. In the Coastal Region, the following counties are identified as rural: Bryan, Camden, Liberty, Long, and McIntosh. Brantley and Charlton, the two counties comprising the Southern Region, are rural. Wayne County, the only county in the Study Area included in the Heart of Georgia Altamaha Region, is also rural (SORH 2017).

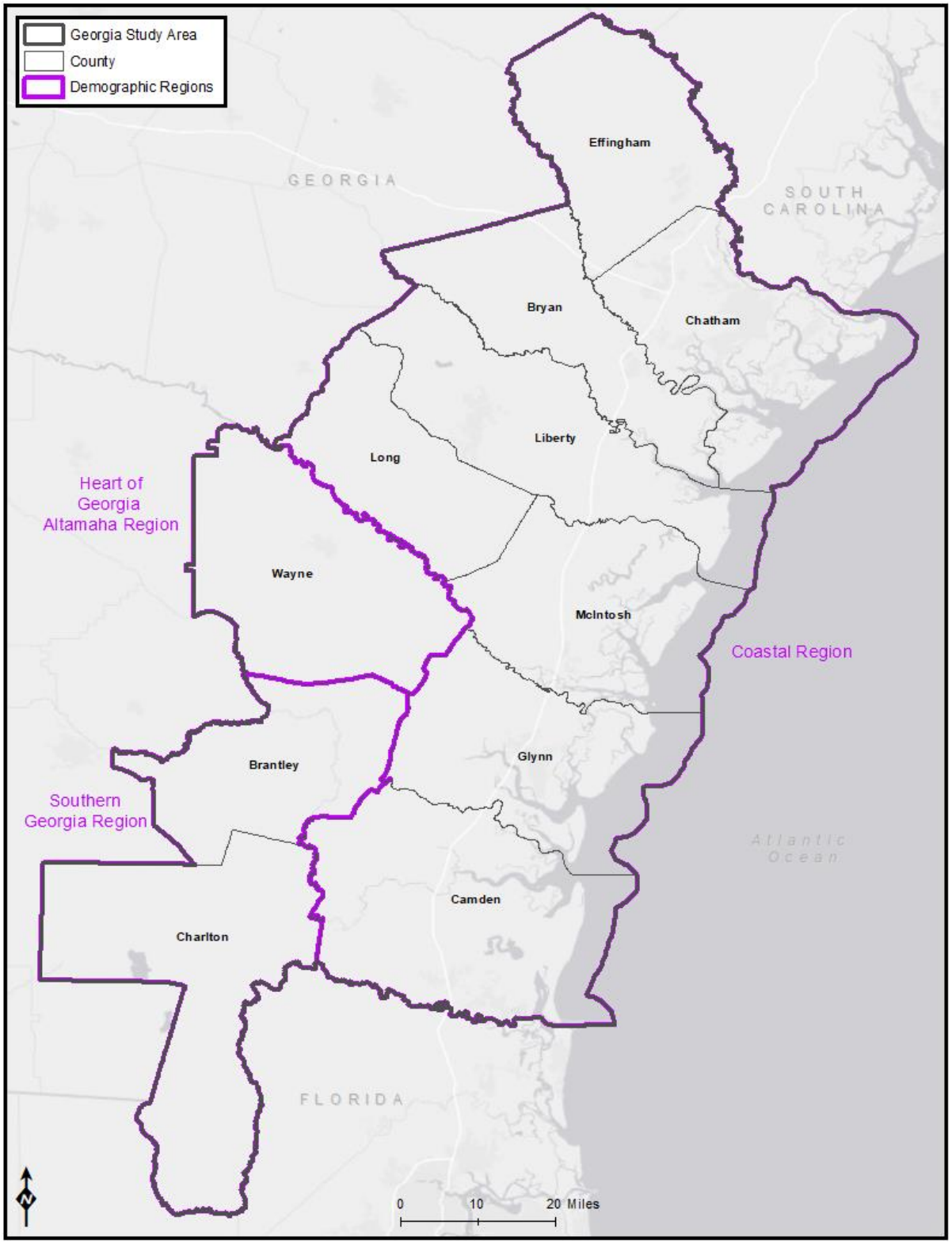
According to 2017 population estimates, the Study Area represented 6.6% (668,440 residents) of the overall State population of 10,201,635. Table 16-6 shows population growth and decline in the Study Area counties, as well as their location within the demographic regions. Between 2010 and 2017, 7 of the 11 Study Area counties experienced growth. Overall, the population of the Study Area grew 6.0%, faster than the State (5.3%), and the Nation (4.0%) (USCB 2017a, USCB 2017d).

Between 2010 and 2017, Coastal Region counties grew 6.5%; the Heart of Georgia Altamaha Region decreased by 0.9%; and the Southern Region increased by 2.6%. The fastest growing counties were Long and Bryan counties (23.5% and 15.4%, respectively) in the Coastal Region; the counties that decreased in population included Wayne (0.9%), Liberty (2.1%), and McIntosh (1.9%) (USCB 2017a, USCB 2017d).

Figure 16-20 shows population counts in census block groups within the 11 counties located in the Study Area. The Figure illustrates higher density concentrations in urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). As illustrated in Figure 16-21, the MSAs present in the Study Area are

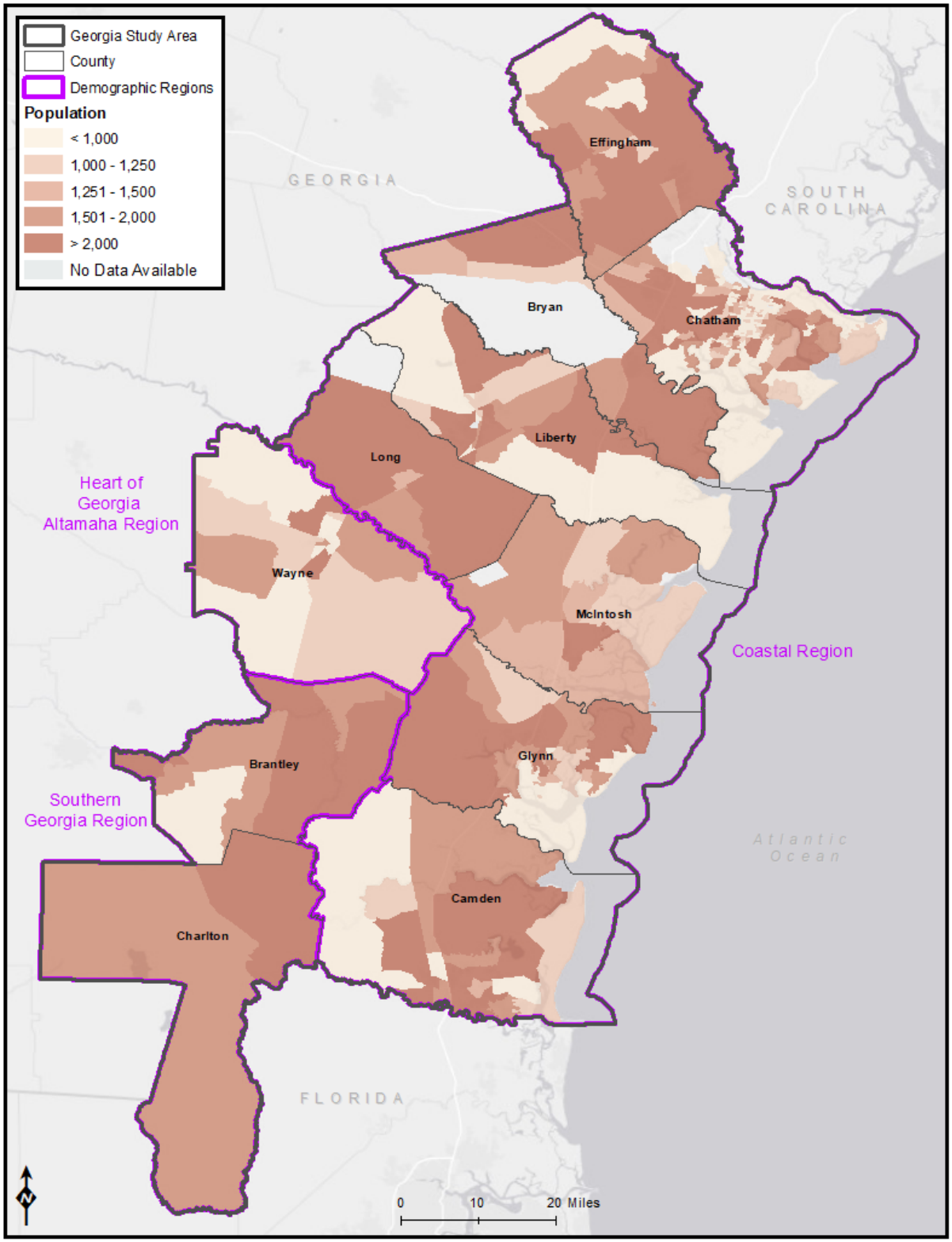
- Brunswick, GA
- Hinesville, GA
- Savannah, GA
- Hilton Head Island-Bluffton-Beaufort, SC

The MSAs are located within the Coastal and Southern Georgia Regions. No portion of any MSA is located within the sparsely populated Heart of Georgia Altamaha Region (Wayne County) (Data.gov 2017).



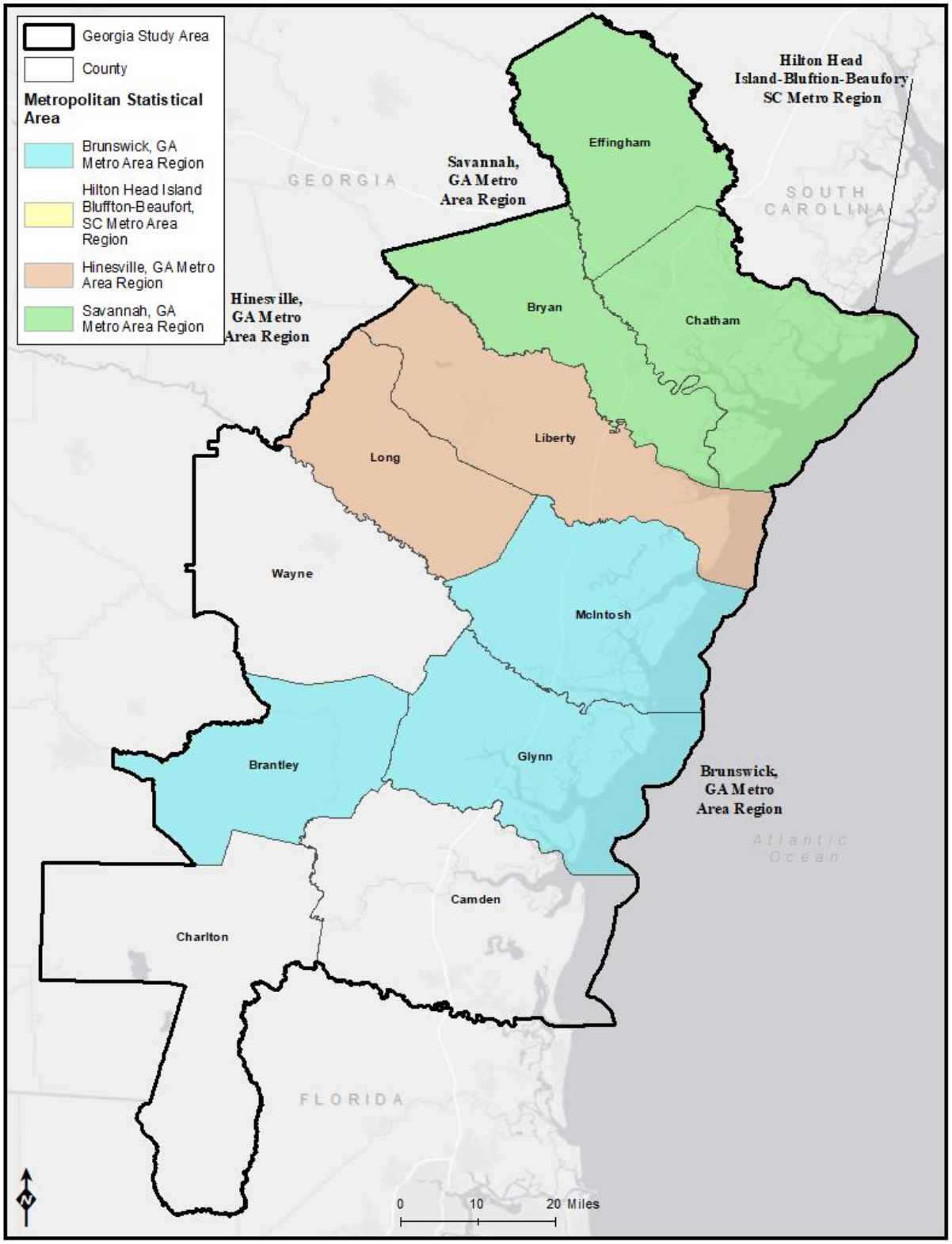
Source: Governor's Office of Planning and Budget 2019b

Figure 16-19. Demographic Regions of the Georgia Study Area



Source: USCB 2017r

Figure 16-20. Population in the Georgia Study Area Counties by Census Block Group



Source: USCB 2017s

Figure 16-21. Metropolitan Statistical Areas Located within the Georgia Study Area

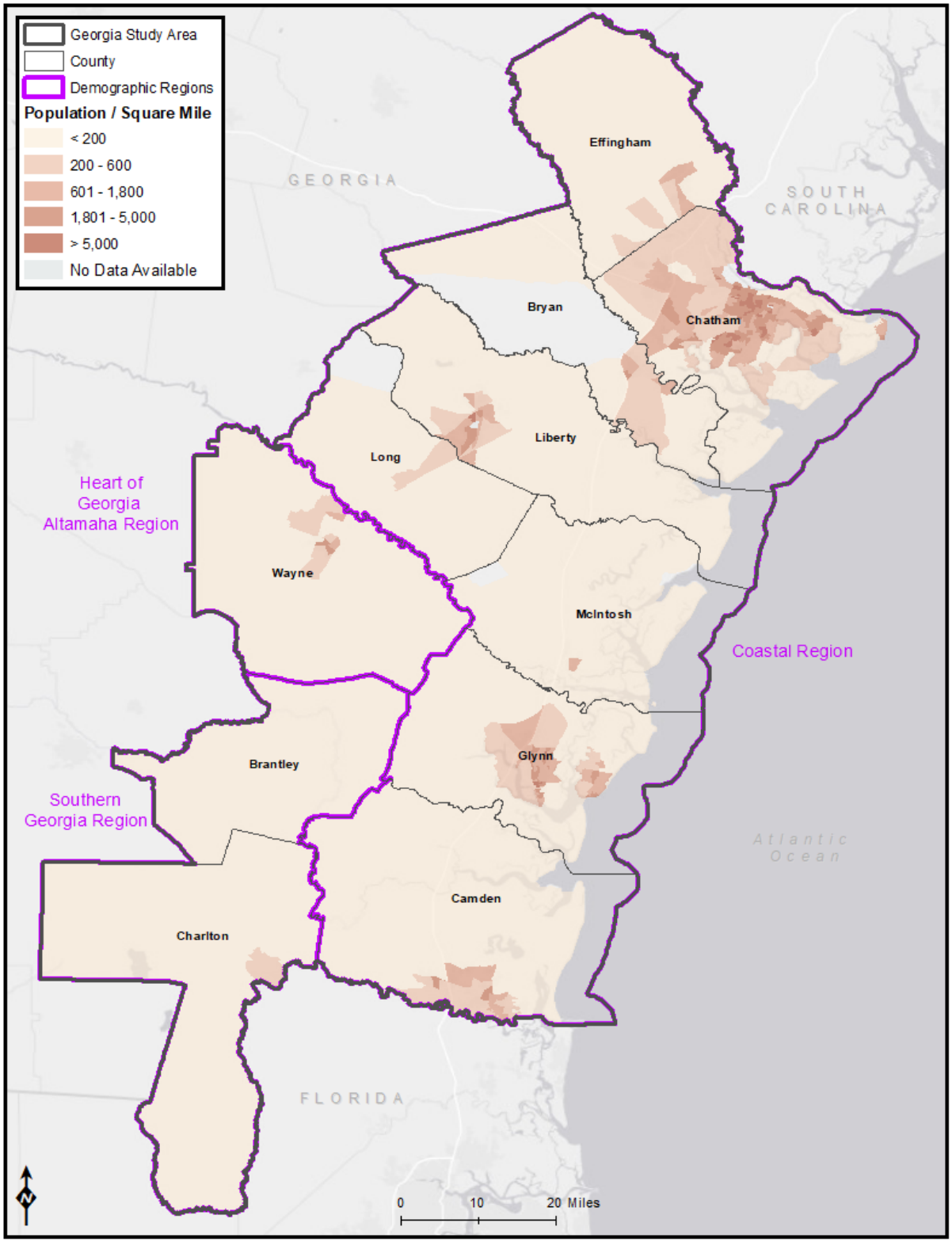
Figure 16-22 shows population per square mile in the Study Area. The Figure illustrates higher-density concentrations in urban areas surrounded by contiguous low-density areas comprising the "between 5 and 107 persons per square mile" category. As shown in Table 16-7, the population density of the Study Area is 119 persons per square mile, lower than the State's density of 176 persons per square mile. As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Georgia Study Area is one of two states that had less population density as compared to the State. Population densities in the Study Area range from 17 persons per square mile in Charlton County (in the less populous rural Southern Georgia Region) to 659 persons per square mile in urban Chatham County near Savannah (located in the populous Coastal Region) (USCB 2017c, USCB 2017d).

16.4.1.2 Population Projections

According to the State, Georgia's population is projected to grow 30.4% (3.1 million residents) by 2040. Population in the Study Area is projected to grow 16.5% (110,316 residents), significantly less than the State during the same period. The Nation's population is projected to grow 16.4% (373.5 million), similar to that of the Study Area. Table 16-7 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040, delineated by region. Strongest growth is projected in Long and Bryan counties in the Coastal Region; weaker growth or declines are projected in the rural counties of the Southern and Heart of Georgia Altamaha Regions. Within the Coastal Region, rural Long and Liberty counties are projected to experience a population decline (USCB 2017c, USCB 2017d, USCB 2018b, Governor's Office of Planning and Budget 2019a). Figure 16-23 shows the overall projected percent change in population in each county during the same period.

As shown in Table 16-6, projections indicate that 6.4% (778,756 people) of the State's population will reside in the Study Area by 2040 as compared to 6.6% (668,440) in 2017. Projected growth by study region is Southern Georgia (3.2%), Heart of Georgia Altamaha (4.9%), and Coastal (23.1%) (Governor's Office of Planning and Budget 2019a, USCB 2017d, USCB 2018b). The distribution of projected population increases illustrates migration toward the Savannah metropolitan area (Coastal Region), and away from the rural area. This is reflective of a nationwide trend toward urbanization, caused by large numbers of people moving away from rural and non-metropolitan areas towards better jobs in the metropolitan areas. As a result, a significant rural-urban divide pattern has emerged, as population in rural communities decline, a pattern which is projected to continue over future decades (Carl Vinson Institute of Government 2019).

Population densities in National coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future. This trend is reflected in the Study Area, as population density is projected to increase from 119 persons per square mile in 2017 to 139 persons per square mile in 2040 (USCB 2017d, Governor's Office of Planning and Budget 2019a). This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.



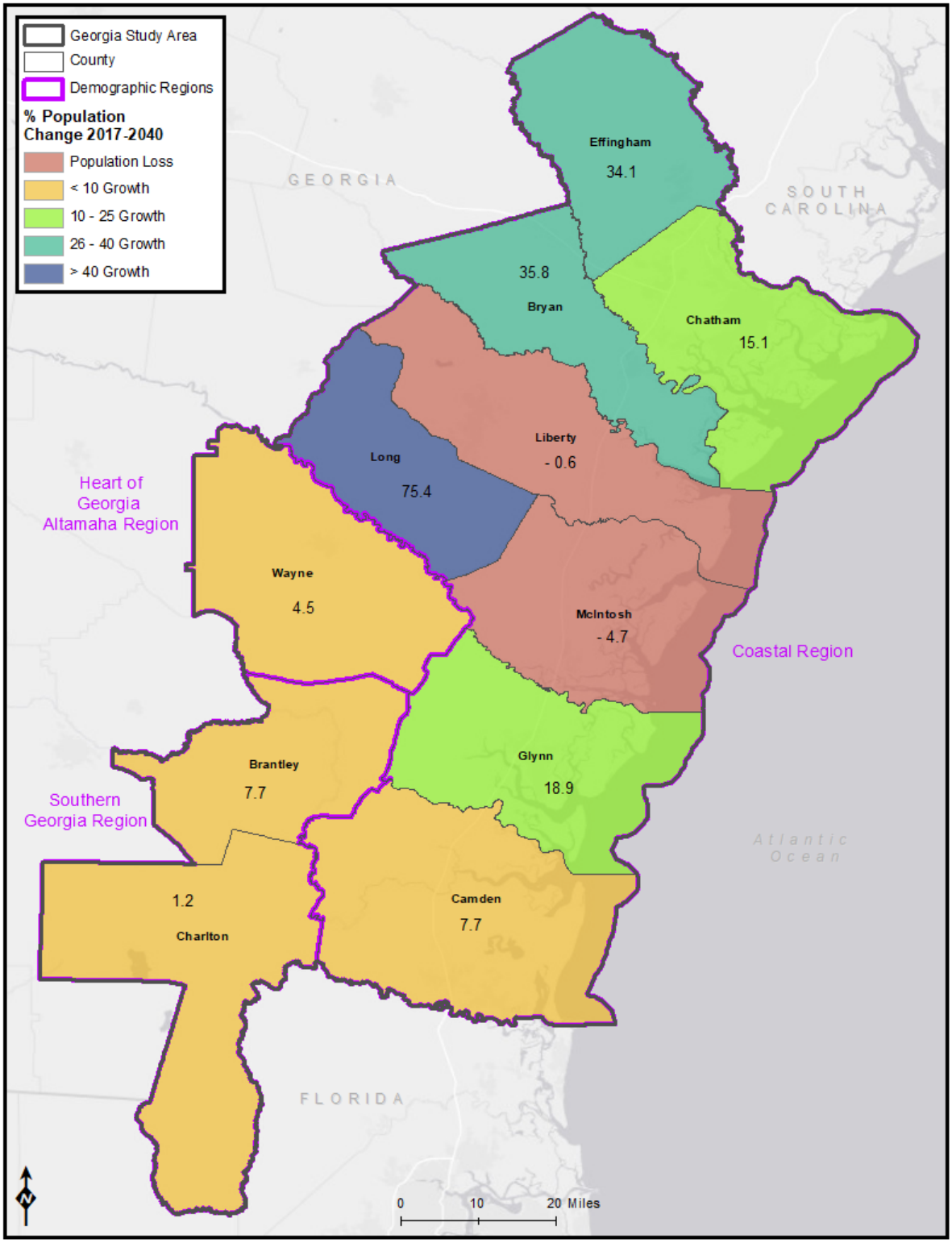
Source: USCB 2017r

Figure 16-22. Population Density in the Georgia Study Area by Census Block Group

Table 16-7. 2017 and 2040 Population Density in the in the Georgia Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Coastal	Bryan	34,883	47,361	437.6	79.7	108.2
	Camden	52,252	56,272	630.3	82.9	89.3
	Chatham	285,506	328,655	433.1	659.2	758.8
	Effingham	57,087	76,579	478.8	119.2	159.9
	Glynn	83,467	99,312	419.6	198.9	236.7
	Liberty	62,120	61,727	516.5	120.3	119.5
	Long	17,857	31,324	400.4	44.6	78.2
	McIntosh	14,061	13,394	431.4	32.6	31.1
	Total Coastal	***607,233***	***714,624***	***3,748***	***3,747.5***	***79.7***
Heart of Georgia Altamaha	Wayne	***29,833***	***31,180***	***641.9***	***46.5***	***48.6***
Southern Georgia	Brantley	18,411	19,836	443.0	41.6	44.8
	Charlton	12,963	13,116	780.1	16.6	16.8
	Total Southern Georgia	***31,374***	***32,952***	***1,223***	***1,223.1***	***25.7***
	Study Area Total	**668,440**	**778,756**	**5,612.6**	**119.1**	**138.8**
	Georgia	**10,201,635**	**13,298,742**	**57,919.0**	**176.1**	**229.6**
	United States	**321,004,407**	**373,528,000**	**3,531,905.0**	**90.9**	**105.8**

Sources: USCB 2017a, USCB 2017d, USCB 2018b, Governor's Office of Planning and Budget 2019a



Source: Governor's Office of Planning and Budget 2019a

Figure 16-23. Overall Projected Population Change from 2017-2040 in the Georgia Study Area by County

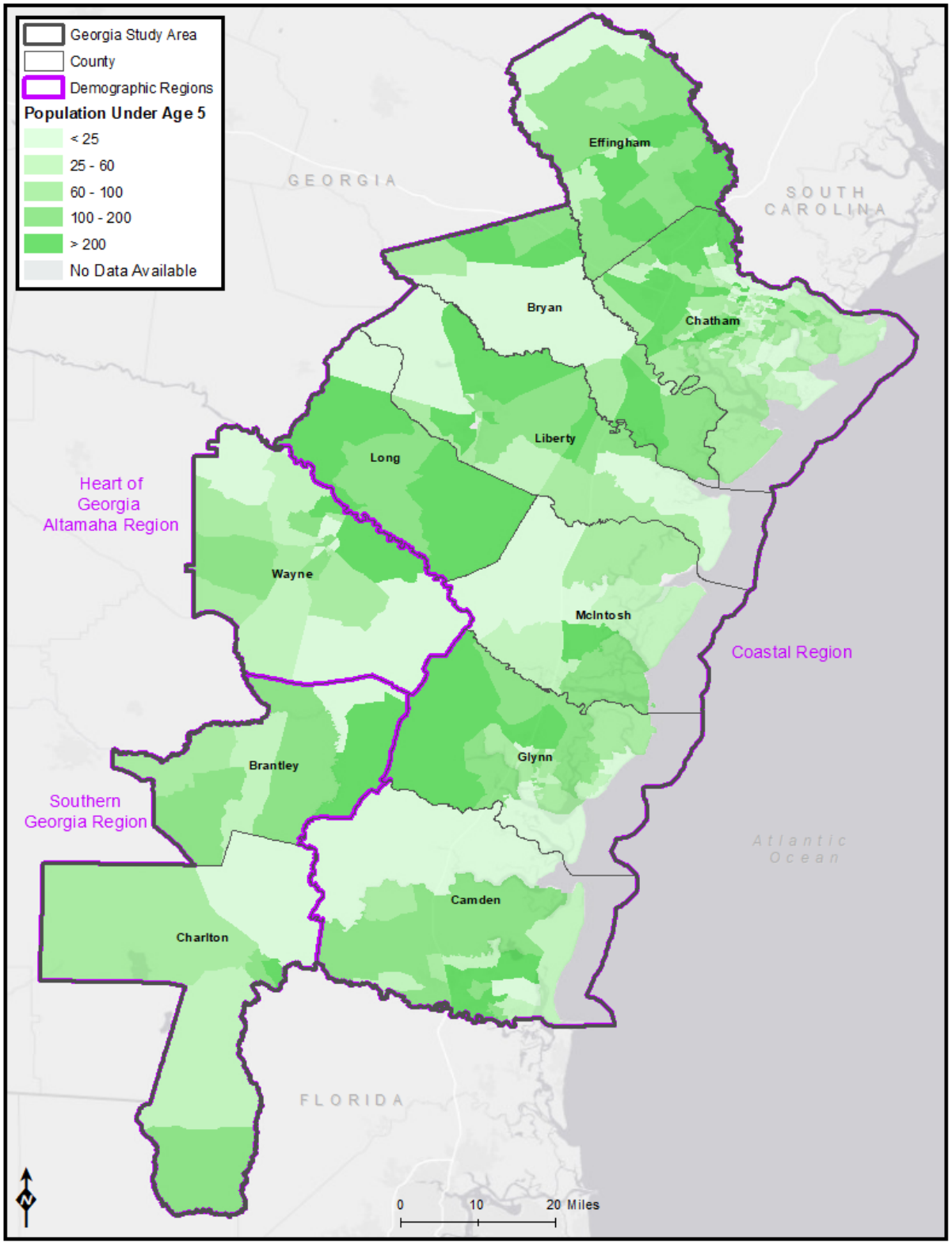
16.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the USCB indicated that the U.S. population growth hit an 80 year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Georgia and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as children under 5 and adults over 65, who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 16-24 and Figure 16-25 show the 2017 estimated population Under Age 5, and Over Age 65, respectively. Figure 16-26 and Figure 16-27 show the projected change in these groups by 2040. Table 16-8 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Georgia, and the Study Area (Brookings Institute 2018, Governor's Office of Planning and Budget 2019a, USCB 2017b).

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area in 2017, but they were not in proportions significantly greater than the State or Nation, according to Table 16-8 (USCB 2017b).

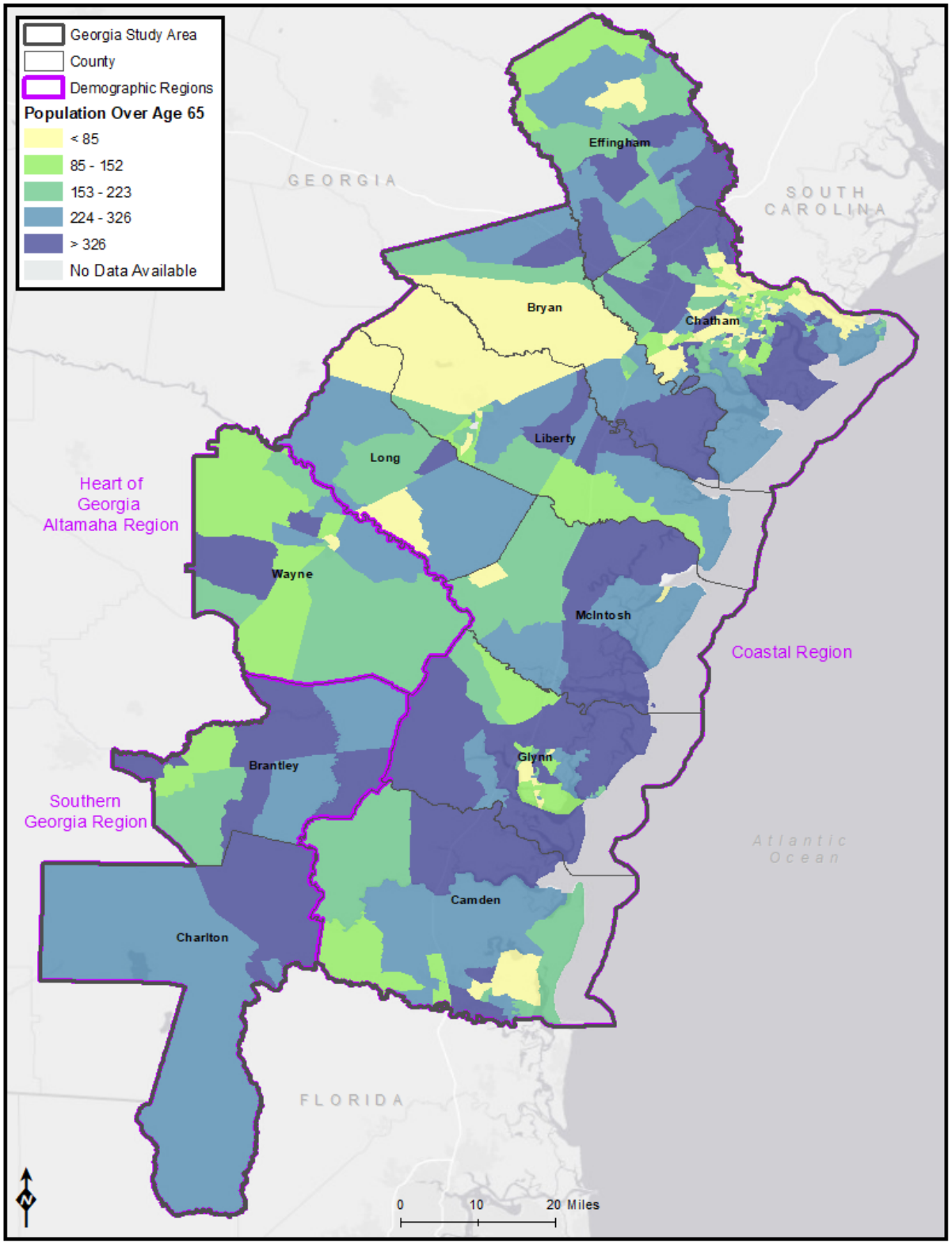
According to 2017 estimates, young children represented 6.2% of the U.S. population; 6.4% in Georgia, and 6.9% in the Study Area. While the population of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline. Consequently, declining natural increase suppresses population growth, resulting in the aging of the general population. Table 16-8 shows the breakdown by demographic region. Projections by the year 2040 indicate this group's decline in the Nation (to 5.7%), the State (to 5.5%) and the Study Area (to 6.2%). The rural Southern Georgia Region had the smallest percentage (5.9%) of this population in 2017; a decrease to 2.7% is projected by 2040. For the study area, this is an overall decrease of 0.7% in the proportion of the population under age 5 from 2017-2040, reflecting an aging of the population, as well as urbanization and migration trends discussed in Chapter 16.4.1.1 and 16.4.1.2 (USCB 2017b, USCB 2018b, Governor's Office of Planning and Budget 2019a).

According to 2017 estimates shown in Table 16-8, the elderly represented 14.9% of the U.S. population; 12.7% in Georgia, and 13.4% in the Study Area. The State's lower percentage of the elderly indicates its higher relative birth rate and in-migration rate of younger individuals. Table 16-8 shows the breakdown by region. The population of the elderly is projected to rise, fueled by aging baby boomers, and domestic in-migration; the percentage of this group in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 18.8% in the State, and 19.3% in the Study Area. Each region in the Study Area projects an increase in the elderly population. The Southern Georgia and Heart of Georgia Altamaha Regions had the largest percentage (14.7%) of this population in 2017; a further increase to 32.7% and 20.7%, respectively, is projected by 2040. For the study area, this is an overall increase of 5.9% in the proportion of the population over age 65 from 2017-2040, reflecting an aging of the population, as well as urbanization and migration trends discussed in Chapters 16.4.1.1 and 16.4.1.2 (Governor's Office of Planning and Budget 2019a, USCB 2017b, USCB 2018b, Luminary Labs 2019).



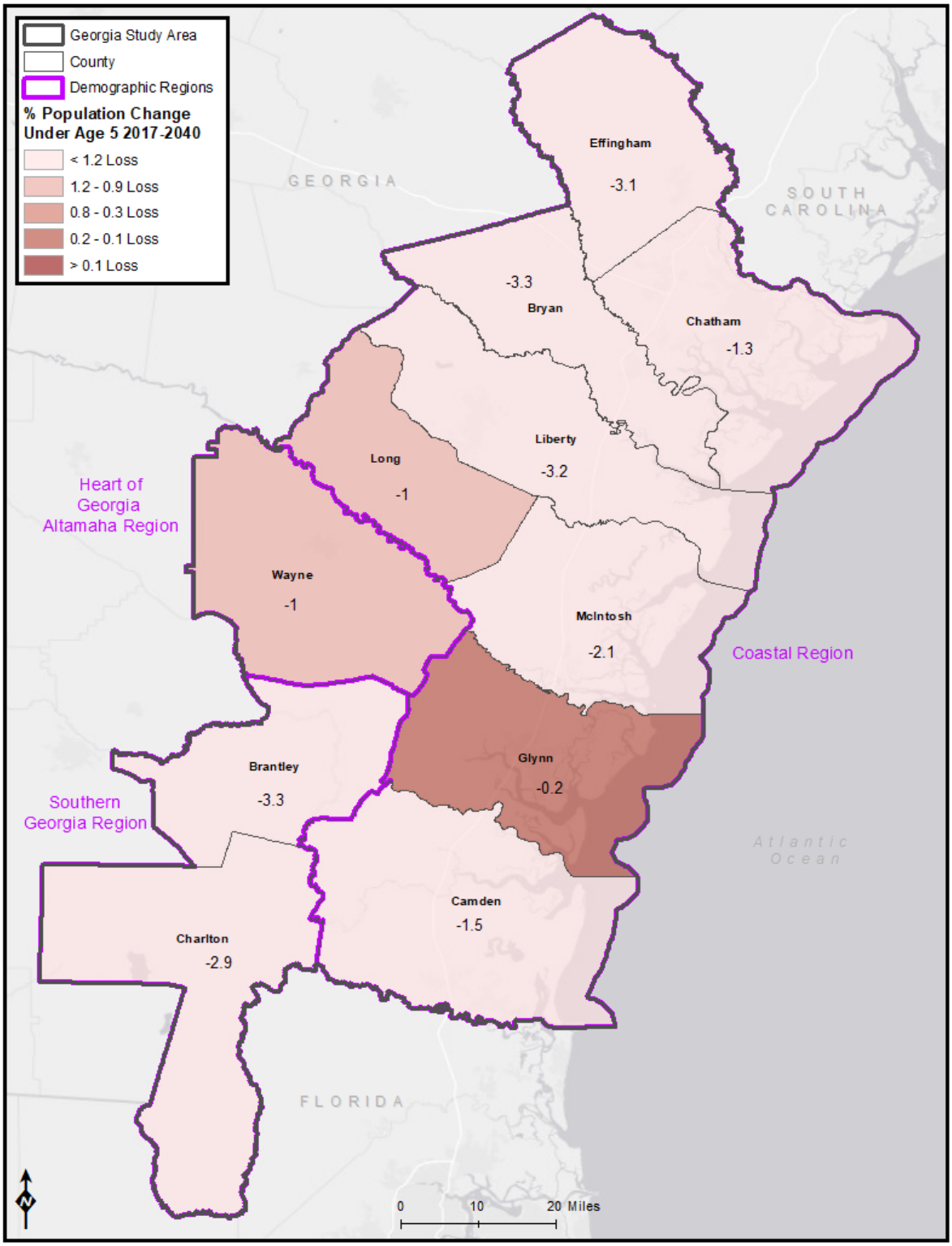
Source: USCB 2017r

Figure 16-24. Population Under Age 5 in the Georgia Study Area by Census Block Group



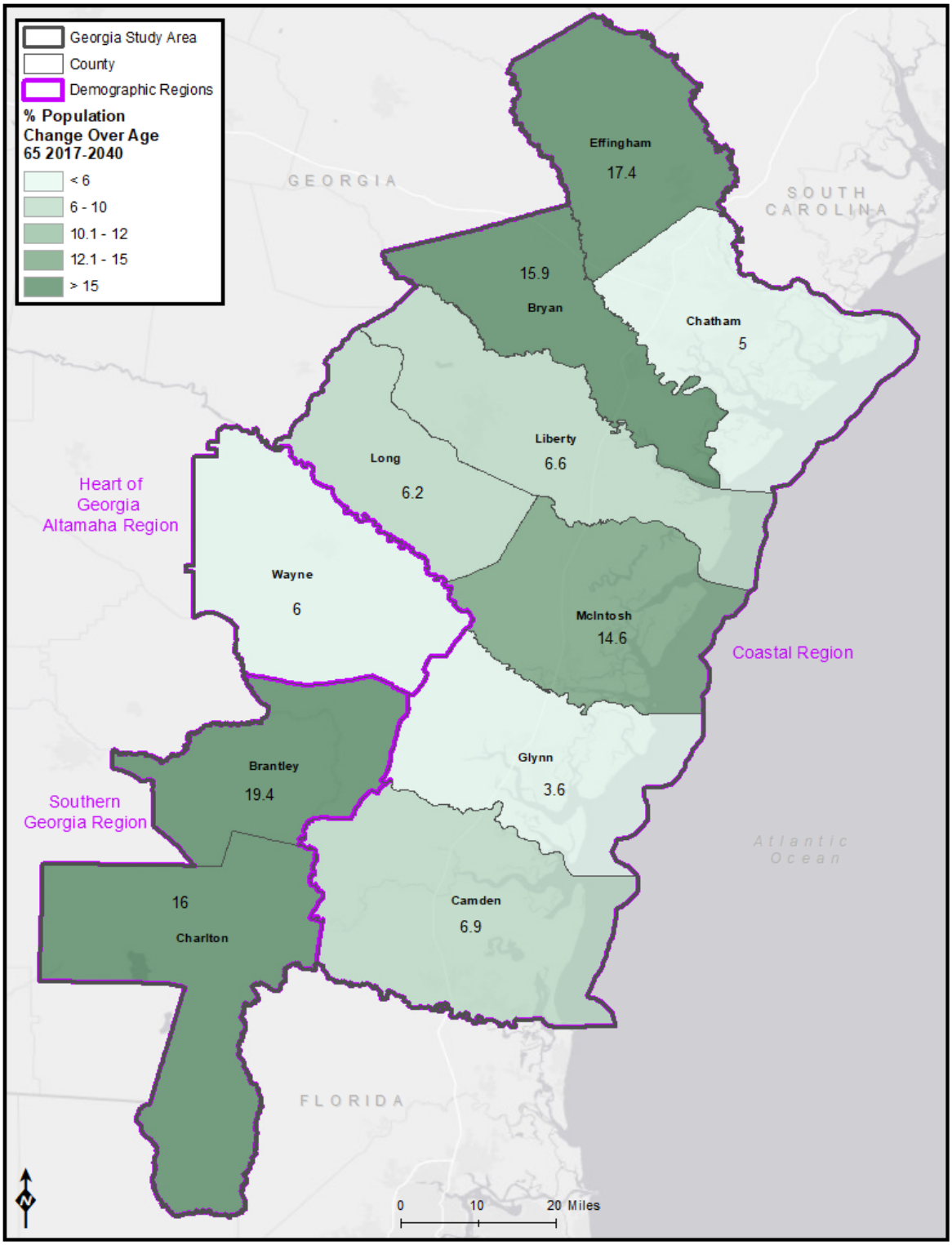
Source: USCB 2017r

Figure 16-25. Population Over Age 65 in the Georgia Study Area by Census Block Group



Sources: USCB 2017b, Governor's Office of Planning and Budget 2019a

Figure 16-26. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Georgia Study Area by 2040



Sources: USCB 2017b, Governor's Office of Planning and Budget 2019a

Figure 16-27. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Georgia Study Area by 2040

Table 16-8. Population Under Age 5 and Over Age 65 in the Georgia Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Population Projection (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Coastal	Bryan	34,883	2,444	7.0	3,508	10.1	47,361	1,766	3.7	12,309	26.0
	Camden	52,252	3,900	7.5	6,114	11.7	56,272	3,332	5.9	10,490	18.6
	Chatham	285,506	18,861	6.6	39,955	14.0	328,655	17,384	5.3	62,479	19.0
	Effingham	57,087	3,905	6.8	6,268	11.0	76,579	2,828	3.7	21,763	28.4
	Glynn	83,467	5,029	6.0	15,150	18.2	99,312	5,769	5.8	21,615	21.8
	Liberty	62,120	6,307	10.2	4,939	8.0	61,727	4,273	6.9	8,973	14.5
	Long	17,857	1,417	7.9	1,459	8.2	31,324	2,180	7.0	4,506	14.4
	McIntosh	14,061	623	4.4	3,294	23.4	13,394	317	2.4	5,097	38.1
	Total Coastal	***607,233***	***42,486***	***7.0***	***80,687***	***13.3***	***714,624***	***37,849***	***5.3***	***147,232***	***20.6***
Heart of Georgia Altamaha	Wayne	***29,833***	***2,095***	***7.0***	***4,399***	***14.7***	***31,180***	***1,874***	***6.0***	***6,460***	***20.7***
Southern Georgia	Brantley	18,411	1,112	6.0	2,758	15.0	19,836	546	2.8	6,810	34.3
	Charlton	12,963	727	5.6	1,848	14.3	13,116	351	2.7	3,966	30.2
	Total Southern Georgia	***31,374***	***1,839***	***5.9***	***4,606***	***14.7***	***32,952***	***897***	***2.7***	***10,776***	***32.7***
	Study Area Total	**668,440**	**46,420**	**6.9**	**89,692**	**13.4**	**778,756**	**48,001**	**6.2**	**150,276**	**19.3**
	Georgia	**10,201,635**	**657,428**	**6.4**	**1,300,430**	**12.7**	**13,298,742**	**736,625**	**5.5**	**2,501,941**	**18.8**
	United States	**321,004,407**	**19,853,515**	**6.2**	**47,732,389**	**14.9**	**373,528,000**	**21,106,000**	**5.7**	**80,827,000**	**21.6**

Sources: USCB 2017b, USCB 2018b, Governor's Office of Planning and Budget 2019a

16.4.3 Housing Utilization and Vacancy Rates

As indicated in Chapter 1.6.3, an analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 16-9.

As shown in Table 16-9, in 2017 homeownership in Georgia was 63.0%, slightly lower than the Nation (63.8%) but significantly higher than the Study Area (59.3%). Renters comprised approximately 37.0% of the State population in 2017. The percentage of households in renter-occupied housing units in the Study Area was higher (40.7%) (USCB 2017m). The State of Georgia reported that Georgia's homeownership rate had declined from 67.2% in 2010 to 62.8% in 2016. Additionally, the State reported that new single unit residential construction in Georgia increased from 14,779 units in 2010 to 40,311 in 2017 (State of Georgia 2018).

Figure 16-28 illustrates median home values in the Study Area. As shown in the Figure, median home values are highest in the northern part of the Coastal Region, which encompasses Effingham, Chatham, and Bryan Counties. These counties are part of the Savannah, GA Metro Area MSA, as shown in Figure 16-21. According to Zillow, an online real estate database company that provides information about housing market trends, the market temperature of the metropolitan area is categorized as "very hot," indicating market conditions favorable to sellers. According to Zillow, Savannah Metro home values have gone up 7.1% during the 12-month period ending October 2019 (USCB 2017l, Zillow.com 2019i). Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including Georgia.

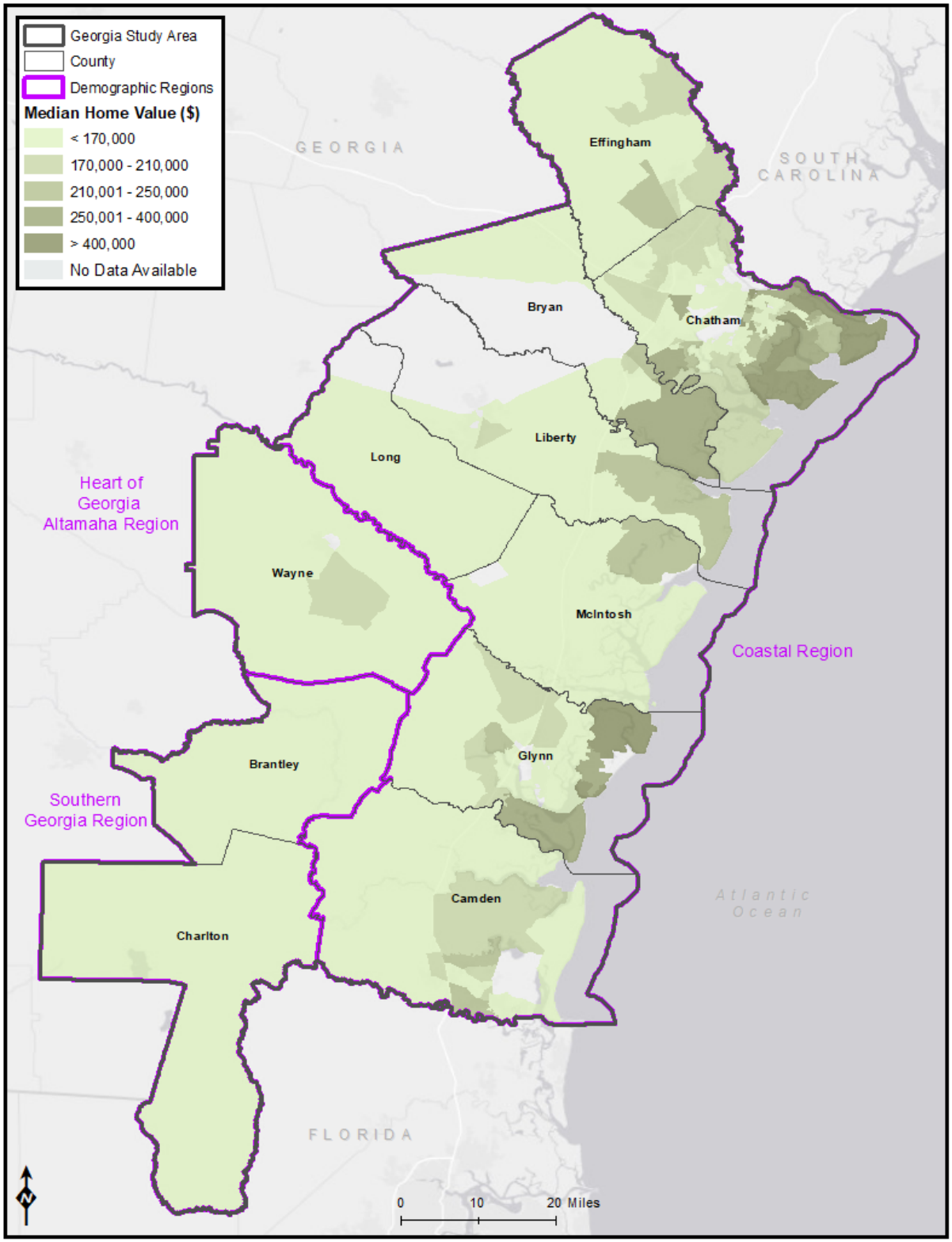
The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they can't afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

In metropolitan parts of Georgia, affordable housing options continue to move farther away from job centers and, in many cases, connect to few – if any – public transportation options. The Georgia Budget and Policy Institute reports that in some cases, teachers, police officers and fire fighters, are unable to find affordable housing options in the immediate area in which they work or serve. As a result, some communities struggle to provide transitional housing options to people dealing with substance abuse, mental health, disabilities and homelessness (Owens 2018).

Table 16-9. Housing Utilization and Vacancy Rates in the Georgia Study Area

Region	Geographical Unit	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Coastal	Bryan	13,430	12,366	1,064	7.9	8,515	68.9	3,851	31.1	$201,700	$1,229
	Camden	21,687	18,913	2,774	12.8	11,358	60.1	7,555	39.9	$154,500	$957
	Chatham	123,555	107,427	16,128	13.1	57,915	53.9	49,512	46.1	$177,900	$993
	Effingham	21,508	19,584	1,924	8.9	15,028	76.7	4,556	23.3	$155,500	$957
	Glynn	42,299	33,200	9,099	21.5	20,351	61.3	12,849	38.7	$161,200	$846
	Liberty	27,696	23,108	4,588	16.6	10,356	44.8	12,752	55.2	$120,500	$1,014
	Long	6,541	5,399	1,142	17.5	3,708	68.7	1,691	31.3	$117,500	$759
	McIntosh	9,492	5,730	3,762	39.6	4,513	78.8	1,217	21.2	$112,700	$754
	Total Coastal	***266,208***	***225,727***	***40,481***	***15.2***	***131,744***	***58.4***	***93,983***	***41.6***	***NA***	***NA***
Heart of Georgia Altamaha	***Wayne***	***12,229***	***10,362***	***1,867***	***15.3***	***6,537***	***63.1***	***3,825***	***36.9***	***NA***	***NA***
Southern Georgia	Brantley	8,112	6,658	1,454	17.9	5,212	78.3	1,446	21.7	$68,200	$579
	Charlton	4,494	3,537	957	21.3	2,566	72.5	971	27.5	$82,200	$551
	Total Southern Georgia	***12,606***	***10,195***	***2,411***	***19.1***	***7,778***	***76.3***	***2,417***	***23.7***	***NA***	***NA***
	Study Area Total	**291,043**	**246,284**	**44,759**	**15.4**	**146,059**	**59.3**	**100,225**	**40.7**	**$132,655**	**$841**
	Georgia	**4,203,288**	**3,663,104**	**540,184**	**12.9**	**2,306,772**	**63.0**	**1,356,332**	**37.0**	**$158,400**	**$927**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m



Source: USCB 2017r

Figure 16-28. Median Home Value in the Georgia Study Area by Census Block Group

Figure 16-29 illustrates median gross rent, indicating the more expensive rents are close to the beach communities in the Coastal Region. Median rents in Bryan and Liberty Counties are $1,229 and $1,014, respectively. Rents are lowest in the Southern Georgian Region. Data from the National Low Income Housing Coalition tabulated from 2017 ACS data show that 24.0% of rental households in Georgia are considered extremely low income (household income below $24,600 for a four-person household). The largest demographic types within this category include persons in the labor force, seniors, and disabled persons, a large portion of which are on a fixed income. The Coalition estimates that there is a shortage of over 204,000 affordable rental units across the State and that 73.0% of extremely low-income households have a severe cost burden due to rental prices and availability. A minimum wage worker would have to work approximately two or more full-time jobs in order to afford a one-bedroom fair market rate home (National Low Income Housing Coalition 2019a, National Low Income Housing Coalition 2019b).

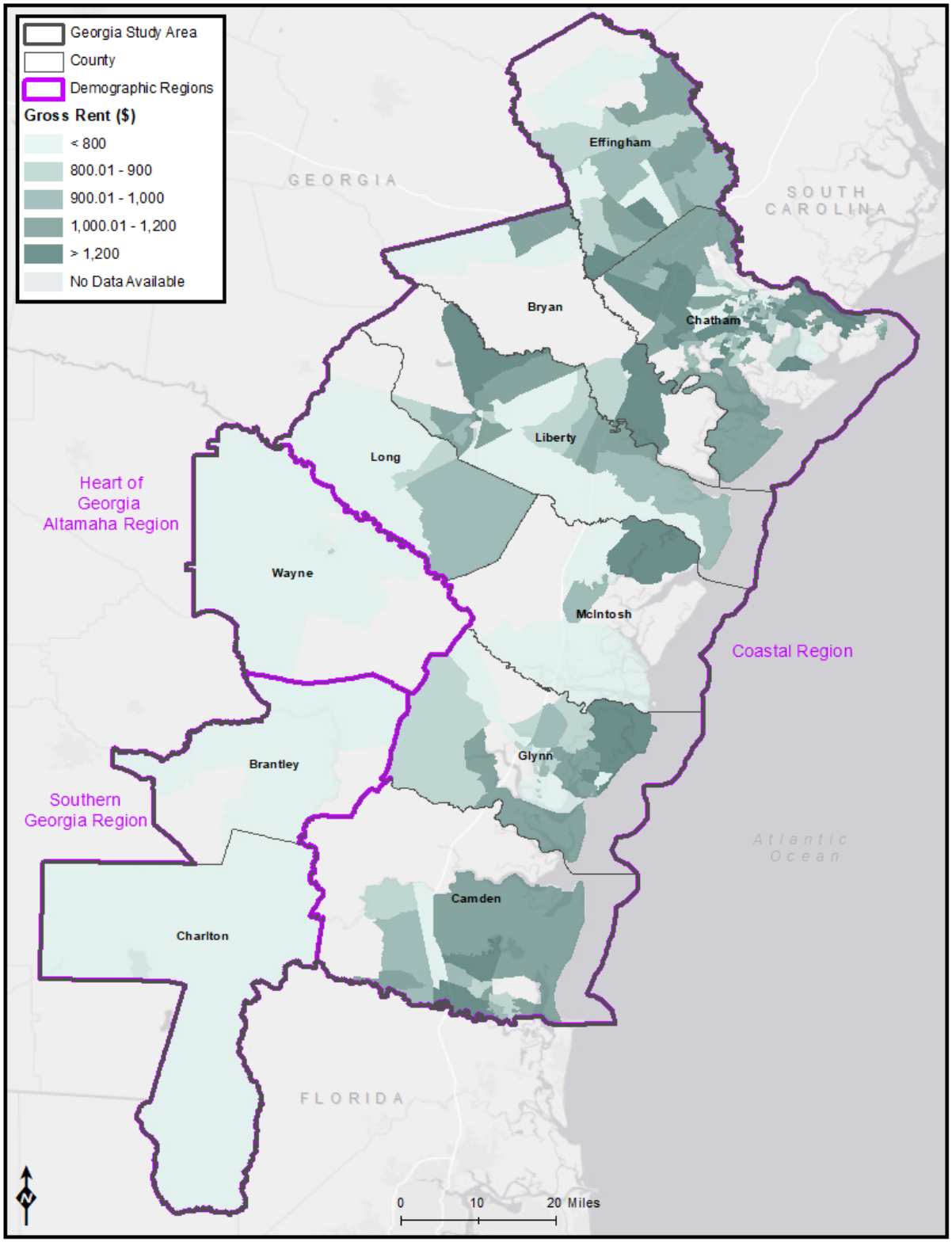
As shown in Table 16-9, home vacancy rates in Georgia (12.9%) in 2017 were similar to the Nation's vacancy rates (12.2%), but lower than the Study Area (15.4%) (USCB 2017g). Figure 16-30 shows vacancy rates in the Study Area by census block group. The Figure illustrates the highest vacancy rates along the coast in the Coastal Region. High vacancy rates are often indicative of properties defined as vacant by the Census Bureau that are vacation homes and/or investment properties used as short-term rentals. Short-term rental businesses are growing in Georgia, especially Atlanta (Capelouto 2019). The City of Savannah permits short-term rentals only in mixed-use zoning districts (savannahga.gov 2019). The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019).

16.4.4 Employment

16.4.4.1 Types of Employment

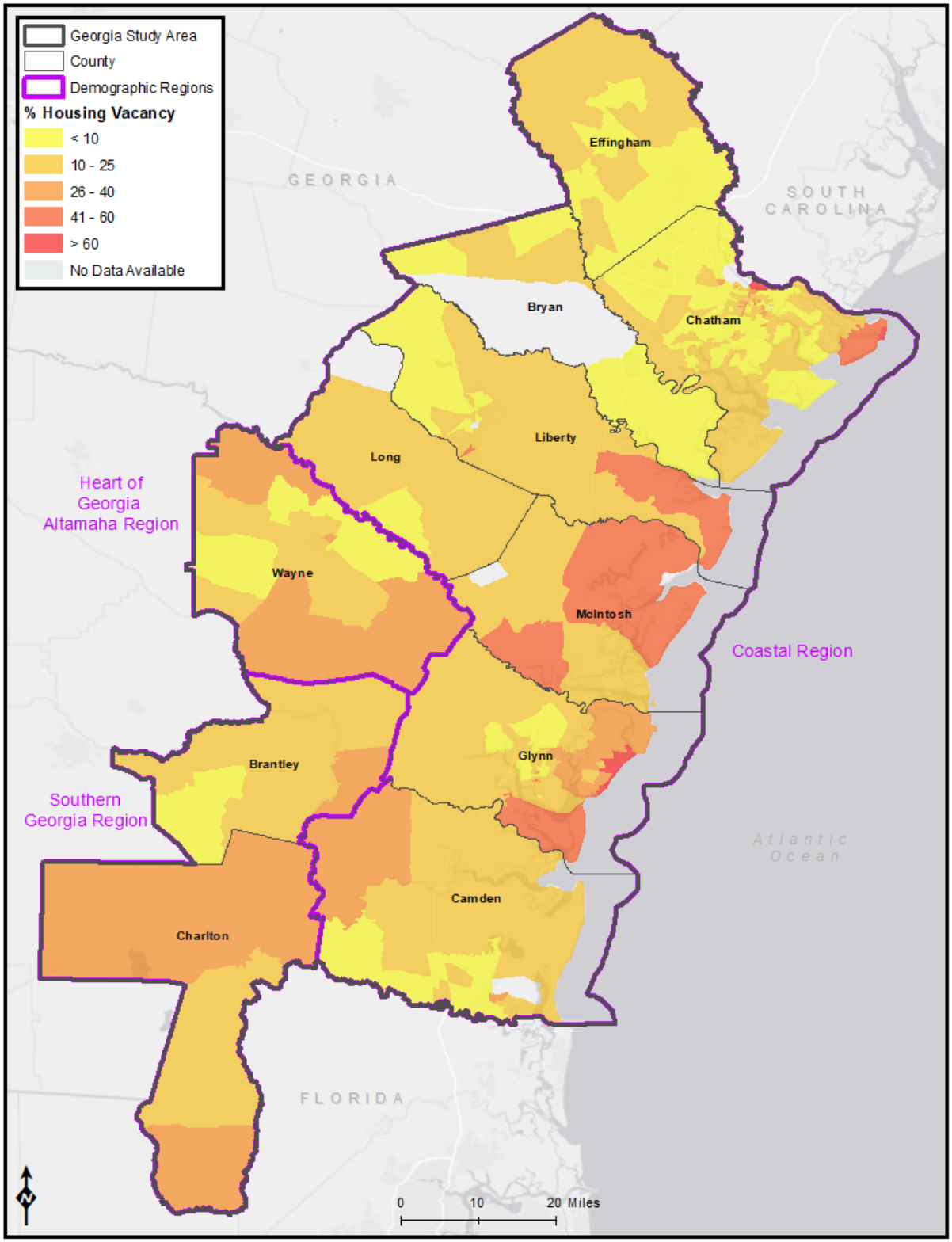
Employment data by industry sector are presented in Table 16-10. In 2017, the Study Area had a total employment of 241,862 jobs, representing approximately 5.7% of the total jobs in the State. Georgia has a total employment of 4.2 million jobs, representing 3.0% of the total jobs in the U.S. (USCB 2017p).

Georgia's 2018 Annual Gross Domestic Product was 592.1 billion, which represented 4.5% of the Nation's gross domestic product (BEA 2019).



Source: USCB 2017r

Figure 16-29. Median Gross Rent in the Georgia Study Area by Census Block Group



Source: USCB 2017r

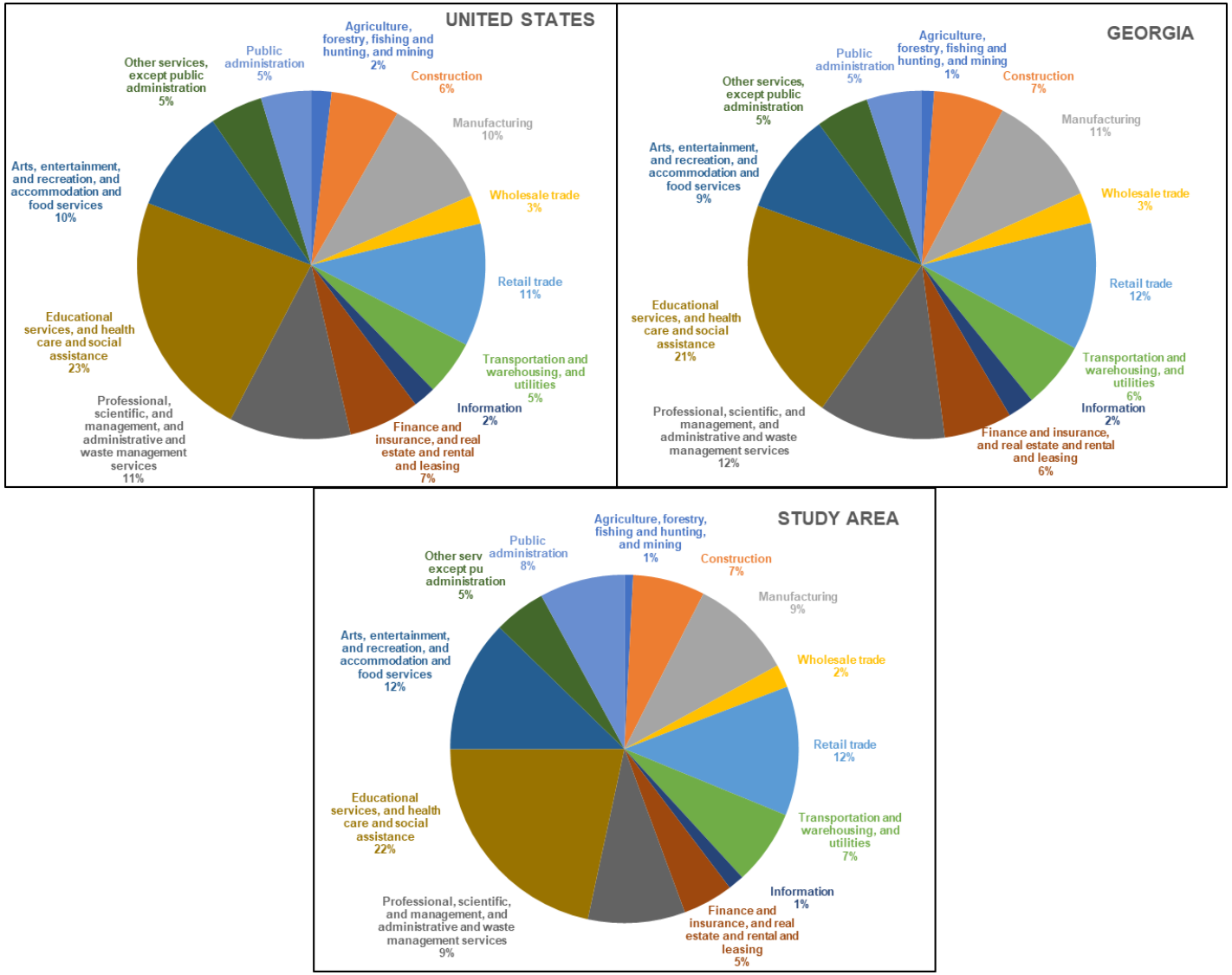
Figure 16-30. Housing Vacancy Rates in the Georgia Study Area by Census Block Group

Table 16-10. Census Bureau Labor and Industry Statistics for the U.S., Georgia, and the Georgia Study Area (number of jobs)

Industry	United States	Percent (%)	Georgia	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**4,606,329**		**288,313**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	52,374	1.1	2,308	0.8
Construction	9,564,541	6.4	301,027	6.5	19,271	6.7
Manufacturing	15,477,389	10.3	487,467	10.6	27,597	9.6
Wholesale trade	4,042,867	2.7	132,095	2.9	6,161	2.1
Retail trade	17,167,000	11.4	543,971	11.8	34,604	12.0
Transportation and warehousing, and utilities	7,681,579	5.1	285,663	6.2	20,153	7.0
Information	3,173,300	2.1	113,019	2.5	4,273	1.5
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	290,246	6.3	13,522	4.7
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	543,837	11.8	26,011	9.0
Educational services, and health care and social assistance	34,781,348	23.1	959,259	20.8	62,262	21.6
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	435,062	9.4	35,477	12.3
Other services, except public administration	7,371,226	4.9	226,826	4.9	13,864	4.8
Public administration	7,025,870	4.7	235,483	5.1	22,810	7.9

Source: USCB 2017p

Table 16-10 and Figure 16-31 show the number of jobs in each major industry sector for the U.S., the State and the Study Area. Generally, the dominant industry sectors in the Study Area are similar to those of the State. The dominant industry sectors in the Study Area are educational services, and health care and social assistance (21.6%), arts, entertainment, and recreation, and accommodation and food services (12.3%), retail trade (12.0%), manufacturing (9.6%) and professional, scientific, and management, and administrative and waste management (9.0%). The State has a higher percentage of professional, scientific, and management, and administrative and waste management (11.8%) likely due to the abundance of jobs in this category in Atlanta, which lies outside the Study Area. The State has less arts, entertainment, and recreation, and accommodation and food services (9.4%) as compared to the Study Area, likely due to greater number of jobs in this category near the beaches and popular tourist destinations (USCB 2017p). The Georgia Department of Economic Development lists the core industry sectors as Aerospace, Agribusiness, Arts, Film and Entertainment, Automotive, Corporate Innovation Centers, Defense, Energy, Food Processing, Headquarters, Life Sciences, Logistics and Supply Chain, Manufacturing, Technology, and Tourism (GDED 2019b).



Source: USCB 2017p

Figure 16-31. Number of Jobs by Industry Sector for the U.S., Georgia, and the Georgia Study Area

Figure 16-32 shows the location of jobs within the Study Area. The greater portion of jobs are available in high-density concentrations in major urban areas with large and growing cities such as Savannah and Brunswick. There are more jobs in counties with high density populations, located in the Coastal Region (USCB 2017i). Population density increases the demand for all goods, services, space and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services. Job distribution is sparse in the rural counties of Charlton, Brantley, and Long. Rural areas tend to have fewer locally available options and less economic development.

Georgia's Ocean Economy

Overall's Georgia's ocean economy ranked 26th in employment among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016b). As shown in Table 16-11 Georgia's ocean economy accounted for 28,994 maritime jobs in 2016, accounting for 0.7% of Georgia's employment (NOAA 2016b, USCB 2017i).

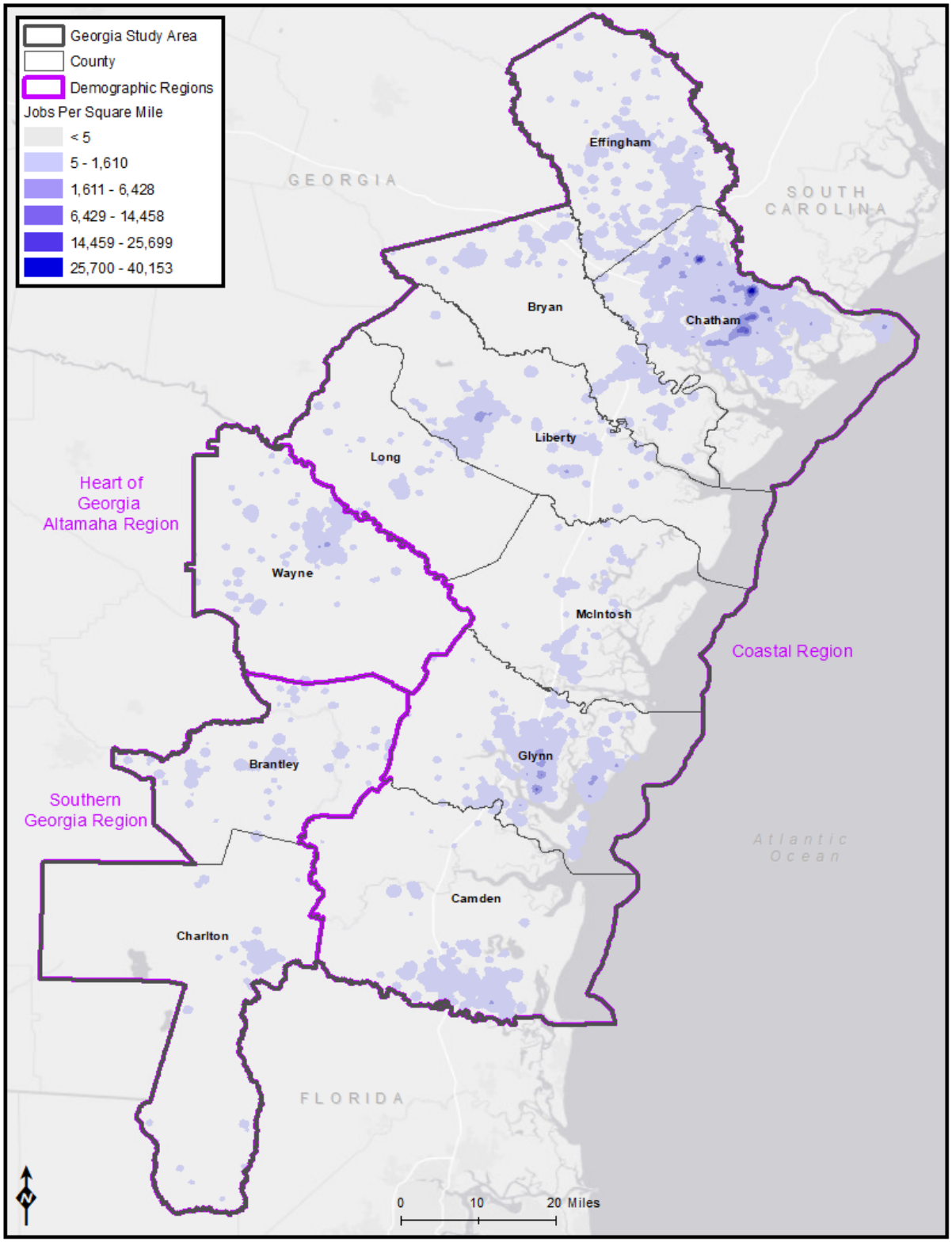
Within the State, tourism and recreation and marine transportation were the dominant sectors, accounting for 60.6% (17,581) and 25.8% (7,701) of maritime jobs, respectively. Tourism and Recreation sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums. Marine transportation includes deep sea freight, marine passenger transportation, pipeline transportation, marine transportation services, search and navigation equipment, and warehousing (NOAA 2016b).

The Study Area had 22,856 maritime jobs, representing 78.8% of total maritime jobs in the State. Chatham County had the greatest number of maritime jobs (14,430), representing 63.1% of maritime jobs in the Study Area. Figure 16-33 shows the percent of maritime related jobs to total jobs in each county in the Study Area. The highest percentage of maritime jobs to overall county jobs were in McIntosh (28.1%), Glynn (13.8%), and Bryan (13.9%) counties, indicative of less economic diversity in rural areas (NOAA 2016b).

16.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 16-11, Georgia lags the U.S. in both median household income and per capita income. (USCB 2017k, USCB 2017n). According to the USCB the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, Georgia had a median income of $52,977 (8.2% lower than the Nation's median income), and a per capita income of $28,018 (10.1% lower than the Nation's per capita income). Median and per capita income in the Study Area is lower than both the State and Nation at $49,798 and $24,045, respectively (USCB 2017g, USCB 2017i). According to Forbes, as a State's population grows its labor force typically grows as well, and this can push down wages, which are a big component of personal income (Forbes 2018b).

Although Georgia's per capita income lags the National average, the State has the 15th lowest cost of living among the 50 States (State of Georgia 2018). Projected changes in industry and occupational employment discussed in Chapter 16.4.4.2 may indicate that wages in the State of Georgia may continue to increase due to a shift towards higher paying jobs requiring more education and skill levels.



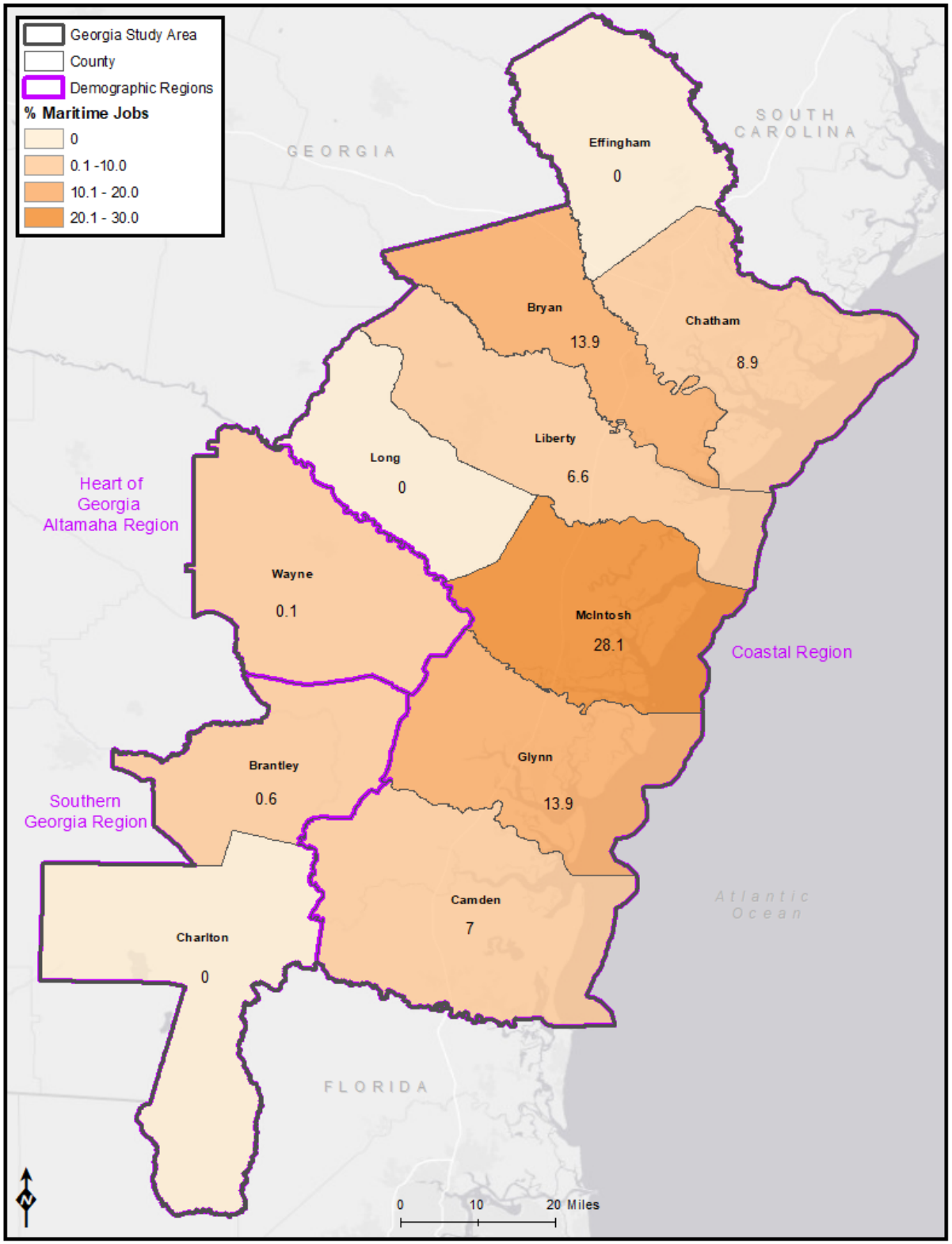
Source: USCB 2017r

Figure 16-32. Jobs Per Square Mile in the Georgia Study Area by Census Block Group

Table 16-11. Employment Data in the Georgia Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (Civilian and Armed Forces) (2017)[1]	Civilian Labor Force[1]	Employed (Civilian Labor Force)[1]	Unemployed (Civilian Labor Force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Coastal	Bryan	17,579	16,565	15,250	1,315	7.9	7,890	1,093	13.9	$68,589	$29,880
	Camden	26,327	22,896	21,015	1,881	8.2	11,424	800	7.0	$53,687	$26,854
	Chatham	148,205	145,040	132,386	12,654	8.7	147,694	14,430	9.8	$52,215	$28,765
	Effingham	28,632	28,332	26,904	1,428	5.0	9,120	0	0.0	$64,279	$26,765
	Glynn	40,135	40,098	37,393	2,705	6.7	36,803	5,087	13.8	$47,546	$29,209
	Liberty	30,893	25,434	22,406	3,028	11.9	14,088	926	6.6	$43,493	$20,966
	Long	7,890	7,242	5,999	1,243	17.2	972	0	0.0	$53,083	$20,321
	McIntosh	6,338	6,296	5,716	580	9.2	1,786	502	28.1	$43,285	$25,226
	Total Coastal	***305,999***	***291,903***	***267,069***	***24,834***	***8.1***	***229,777***	***22,838***	***9.9***	***NA***	***NA***
Heart of Georgia Altamaha	Wayne	***11,522***	***11,500***	***10,402***	***1,098***	***9.5***	***7,596***	***5***	***0.1***	***NA***	***NA***
Southern Georgia	Brantley	6,973	6,973	6,430	543	7.8	2,285	13	0.6	$36,812	$18,220
	Charlton	4,924	4,924	4,412	512	10.4	2,204	0	0.0	$43,257	$19,102
	Total Southern Georgia	***11,897***	***11,897***	***10,842***	***1,055***	***8.9***	***4,489***	***13***	***0.3***	***NA***	***NA***
	Study Area Total	**329,418**	**315,300**	**288,313**	**26,987**	**8.6**	**241,862**	**22,856**	**9.5**	**$49,798**	**$24,045**
	Georgia	**5,026,306**	**4,978,910**	**4,606,329**	**372,581**	**7.5**	**4,246,473**	**28,994**	**0.7**	**$52,977**	**$28,015**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n



Source: NOAA 2017b

Figure 16-33. Maritime Jobs in the Georgia Study Area by County

As shown in Table 16-11, Per Capita income in the regions comprising the Study Area ranged from an average of $19,102 (Southern Georgia Region) to an average of $25,998 (Coastal Region). Median Household Income ranged from an average of $40,035 (Southern Georgia Region) to an average of $53,272 (Coastal Region). Figure 16-34 shows 2017 Median Household Income in the Study Area. Figure 16-35 shows Per Capita Income in the Study Area (USCB 2017k, USCB 2017n). The figures portray that highest paying jobs are near the Study Area's metropolitan areas; lower paying jobs are in rural areas.

Georgia's income rates are projected to rise as the economy shifts from low-skilled labor requiring little secondary education to higher paying jobs in the health sector and manufacturing industries, which require post-high school education (State of Georgia 2018).

16.4.4.3 Unemployment Rates

Georgia's unemployed labor force experienced the effects of the Great Recession in 2008 and 2009. In January 2008, the unemployed labor force was 248,000 individuals. This grew to 503,000 individuals by December 2009. Correspondingly, the unemployment rate rose from 5.1% to 10.5% during that same period. This rate continued through 2010, reaching 10.6%. The State has seen recovery after that period with the unemployment rate declining to 4.5% in December 2017. Georgia's overall labor force increased from 4.9 million in January 2008 to 5.1 million in December 2017 (State of Georgia 2018).

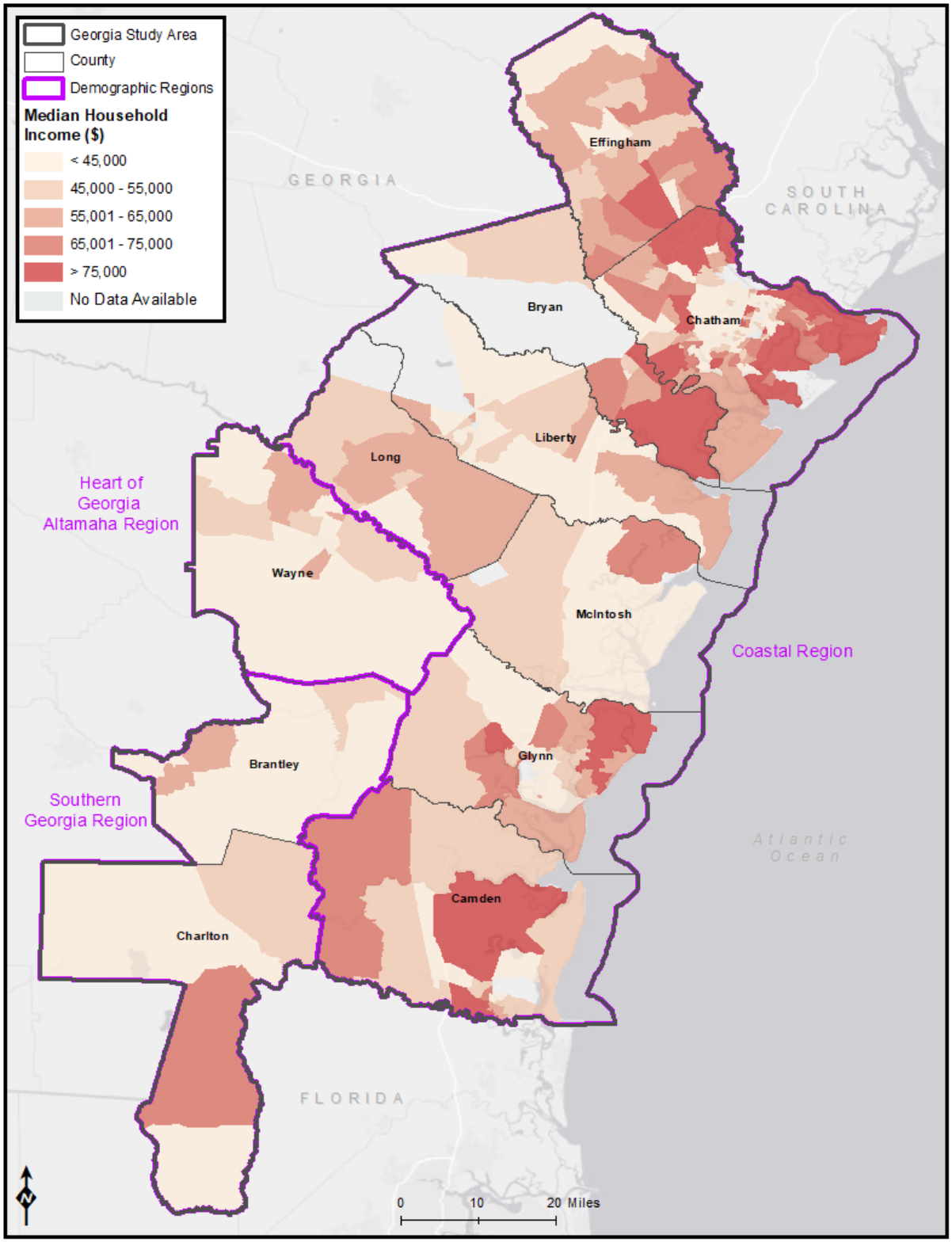
Wells Fargo Securities Economic Group performed an economic outlook review for Georgia in May 2019. Wells Fargo concluded that Georgia's economy is currently stronger and more resilient than prior to the recession with a broader economic base, increased global connectivity, and the addition of higher-value-added industries. Though Georgia's Real Gross Domestic Product plunged during the recession, for most of the past decade it has grown more rapidly than the Nation as a whole. To spur growth, Georgia lowered its corporate tax rate to 5.75% (effective January 2019). Additionally, Georgia has implemented numerous business-friendly incentives, including many focused on workforce training (Wells Fargo 2019).

Figure 16-36 shows the 2017 unemployment rates in the counties of the Study Area by census block group. The average unemployment rate in the Study Area was 8.6%, higher than both the State (7.5%) and the Nation (6.6%). Table 16-11 presents unemployment rates for each county in the Study Area grouped by demographic region. The Coastal Region had the lowest average unemployment rate (8.1%), with the highest rate occurring in Long County (17.2%). The Southern Georgia Region had an average unemployment rate of 8.9%. The Heart of Georgia Altamaha Region had an average of 9.5%. Unemployment rates ranged from 5.0% in Effingham County to 17.2% in Long County, both located in the Coastal Region (USCB 2017h).

16.4.4.4 Educational Attainment

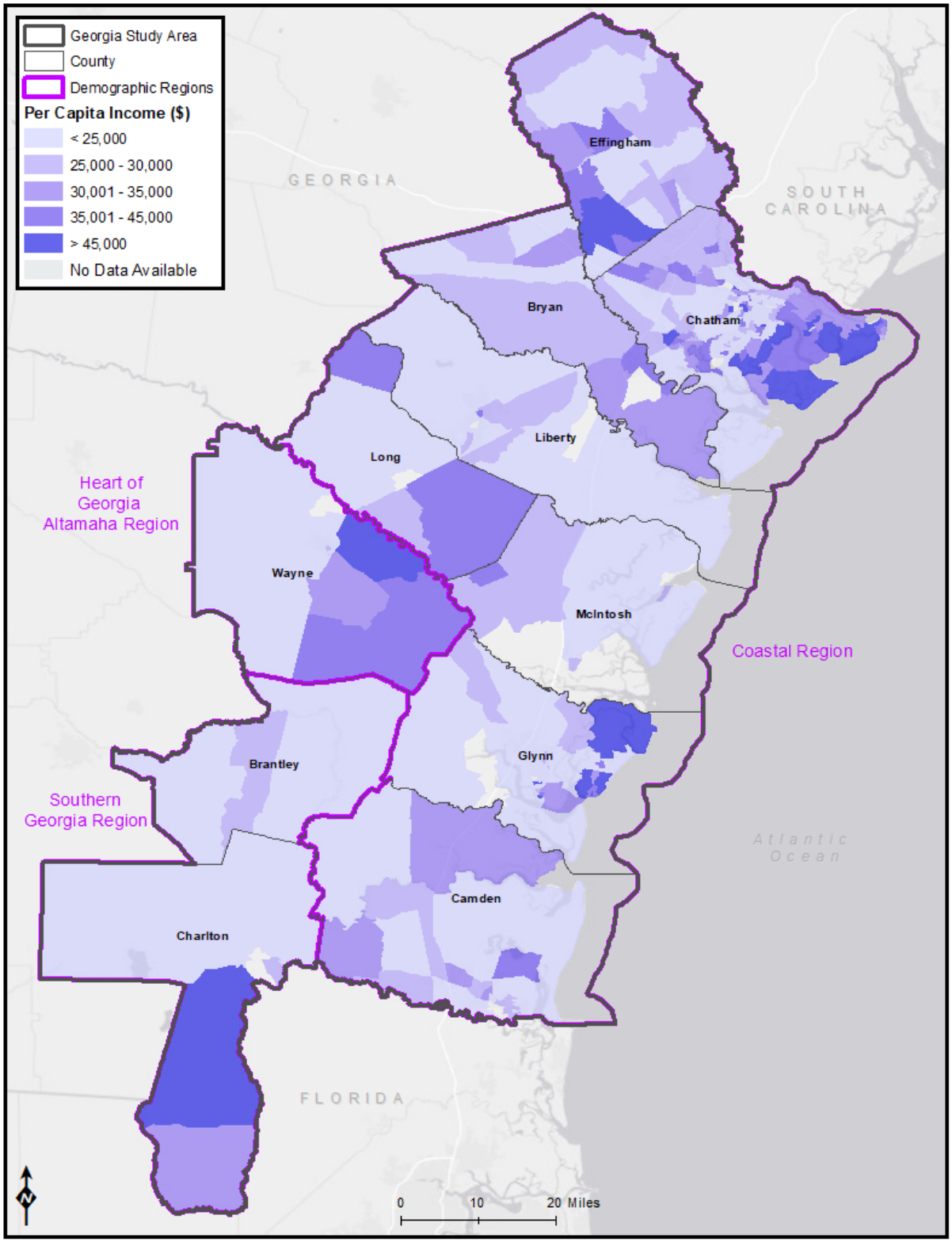
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 16-12 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in counties comprising the Study Area, the State, and the Nation (USCB 2017t).



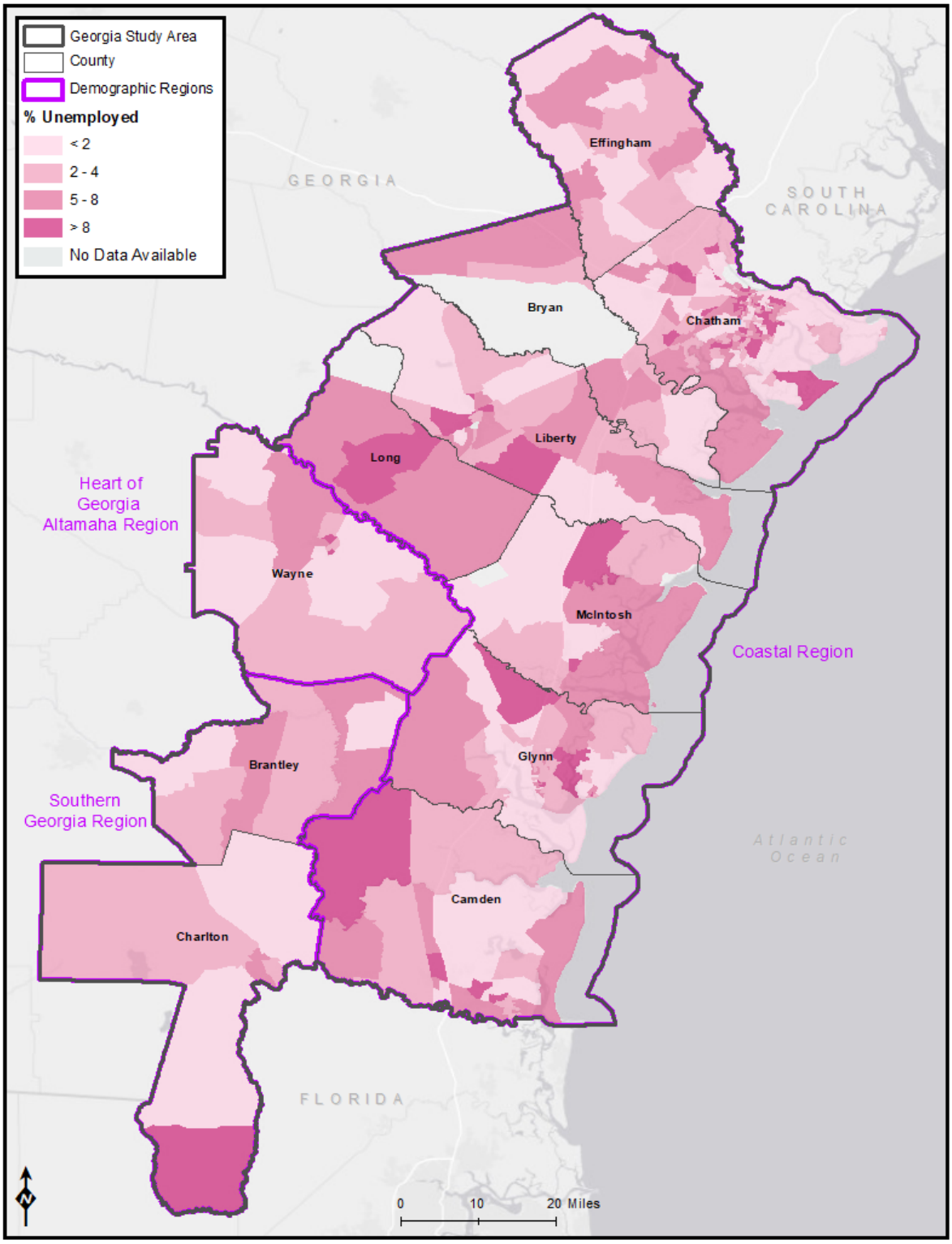
Source: USCB 2017r

Figure 16-34. Median Household Income in the Georgia Study Area by Census Block Group



Source: USCB 2017r

Figure 16-35. Per Capita Income in the Georgia Study Area by Census Block Group



Source: USCB 2017r

Figure 16-36. Unemployment Rates in the Georgia Study Area by Census Block Group

Table 16-12. Educational Attainment in the Georgia Study Area

Region	Geographic Unit	Number							Total	Percent						
		Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree		Less Than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Coastal	Bryan	538	1,951	6,796	6,042	2,087	4,660	2,617	24,691	2.2	7.9	27.5	24.5	8.5	18.9	10.6
	Camden	719	2,741	13,188	11,526	3,006	5,325	2,810	39,315	1.8	7.0	33.5	29.3	7.6	13.5	7.1
	Chatham	5,749	19,012	55,370	62,834	13,622	41,684	24,463	222,734	2.6	8.5	24.9	28.2	6.1	18.7	11.0
	Effingham	1,365	4,227	16,189	9,793	2,883	4,977	2,278	41,712	3.3	10.1	38.8	23.5	6.9	11.9	5.5
	Glynn	1,790	6,283	18,885	15,903	4,468	10,714	6,370	64,413	2.8	9.8	29.3	24.7	6.9	16.6	9.9
	Liberty	996	3,274	14,871	14,544	3,421	5,090	2,114	44,310	2.2	7.4	33.6	32.8	7.7	11.5	4.8
	Long	429	1,275	4,420	3,937	978	1,127	598	12,764	3.4	10.0	34.6	30.8	7.7	8.8	4.7
	McIntosh	468	1,436	4,326	2,736	1,091	914	597	11,568	4.0	12.4	37.4	23.7	9.4	7.9	5.2
	Total Coastal	***12,054***	***40,199***	***134,045***	***127,315***	***31,556***	***74,491***	***41,847***	***461,507***	***2.6***	***8.7***	***29.0***	***27.6***	***6.8***	***16.1***	***9.1***
Heart of Georgia Altamaha	Wayne	***1,312***	***3,243***	***8,682***	***4,837***	***1,783***	***1,551***	***1,058***	***22,466***	***5.8***	***14.4***	***38.6***	***21.5***	***7.9***	***6.9***	***4.7***
Southern Georgia	Brantley	660	2,003	6,581	2,699	881	651	429	13,904	4.7	14.4	47.3	19.4	6.3	4.7	3.1
	Charlton	793	1,645	4,459	2,027	718	274	520	10,436	7.6	15.8	42.7	19.4	6.9	2.6	5.0
	Total Southern Georgia	***1,453***	***3,648***	***11,040***	***4,726***	***1,599***	***925***	***949***	***24,340***	***6.0***	***15.0***	***45.4***	***19.4***	***6.6***	***3.8***	***3.9***
	Study Area Total	**14,819**	**47,090**	**153,767**	**136,878**	**34,938**	**76,967**	**43,854**	**508,313**	**2.9**	**9.3**	**30.3**	**26.9**	**6.9**	**15.1**	**8.6**
	United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**
	Georgia	**313,025**	**736,443**	**2,285,888**	**1,814,016**	**540,564**	**1,404,811**	**819,867**	**7,914,614**	**4.0**	**9.3**	**28.9**	**22.9**	**6.8**	**17.7**	**10.4**

Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.

Figure 16-37 show the percentage of the working-age population who earned a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree).

- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Georgia, 28.9% of the working-age population earned only a high school diploma; 34.9% earned a college or advanced degree.
- In the Study Area, 30.3% of the working-age population earned only a high school diploma; 30.6% earned a college or advanced degree (USCB 2017q).

Figure 16-38 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

16.4.5 Vulnerable Populations

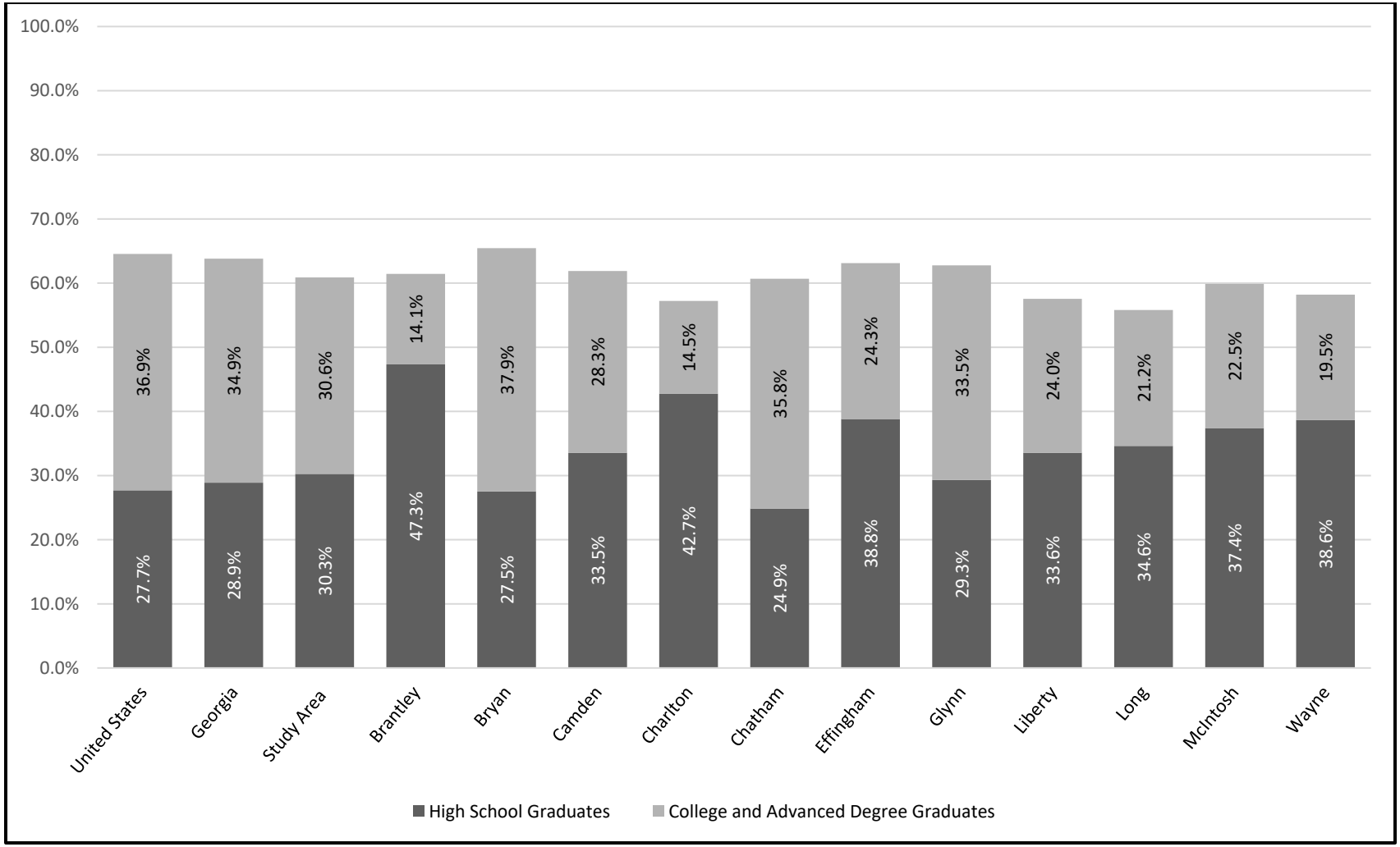
Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with development on the OCS. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary. Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the Council on Environmental Quality and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

16.4.5.1 Environmental Justice Communities of Concern

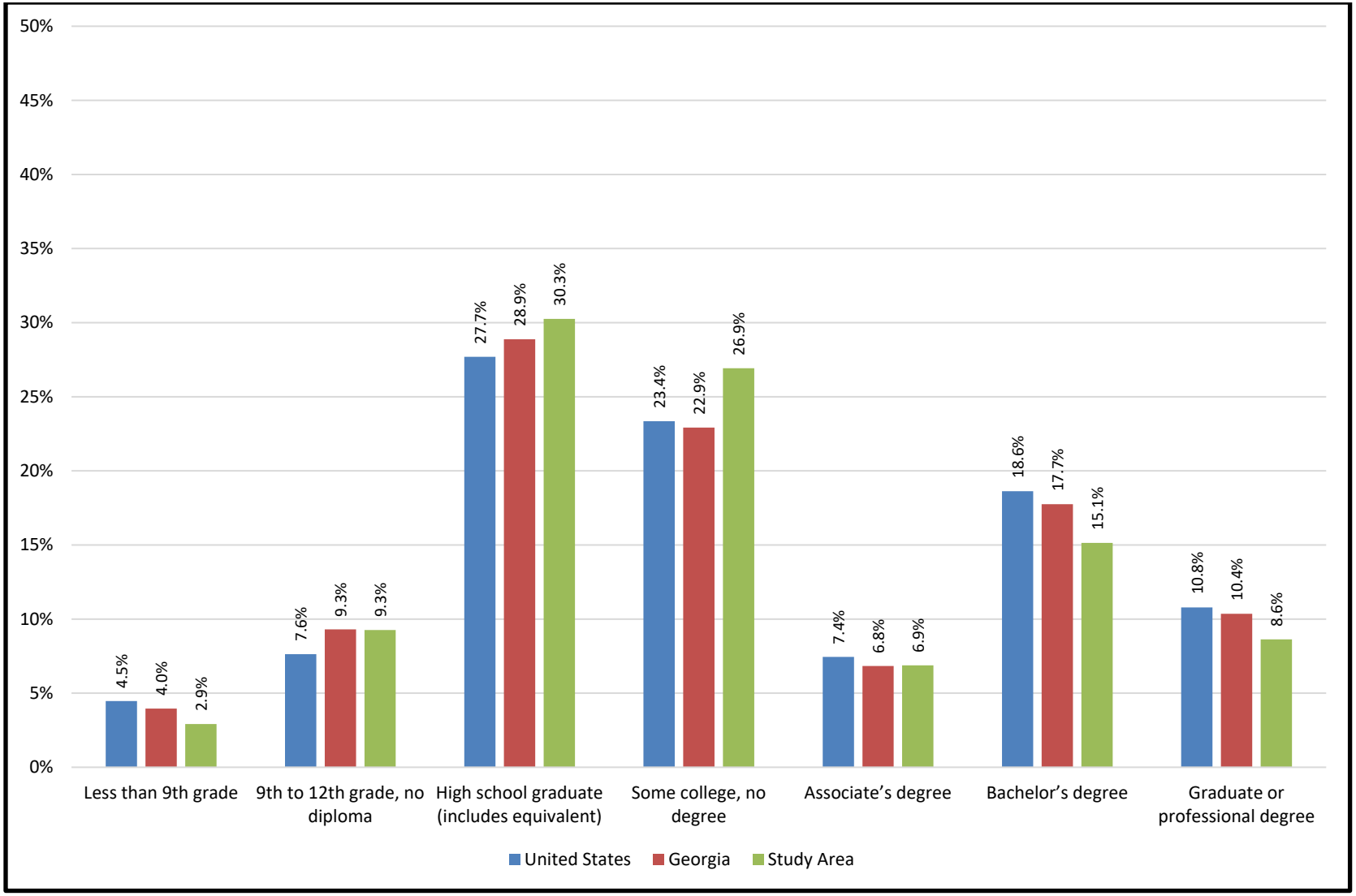
Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 16-39 shows the location of census block groups within the Study Area that contain minority and low-income populations which constitute potential environmental justice populations under EO 12898.



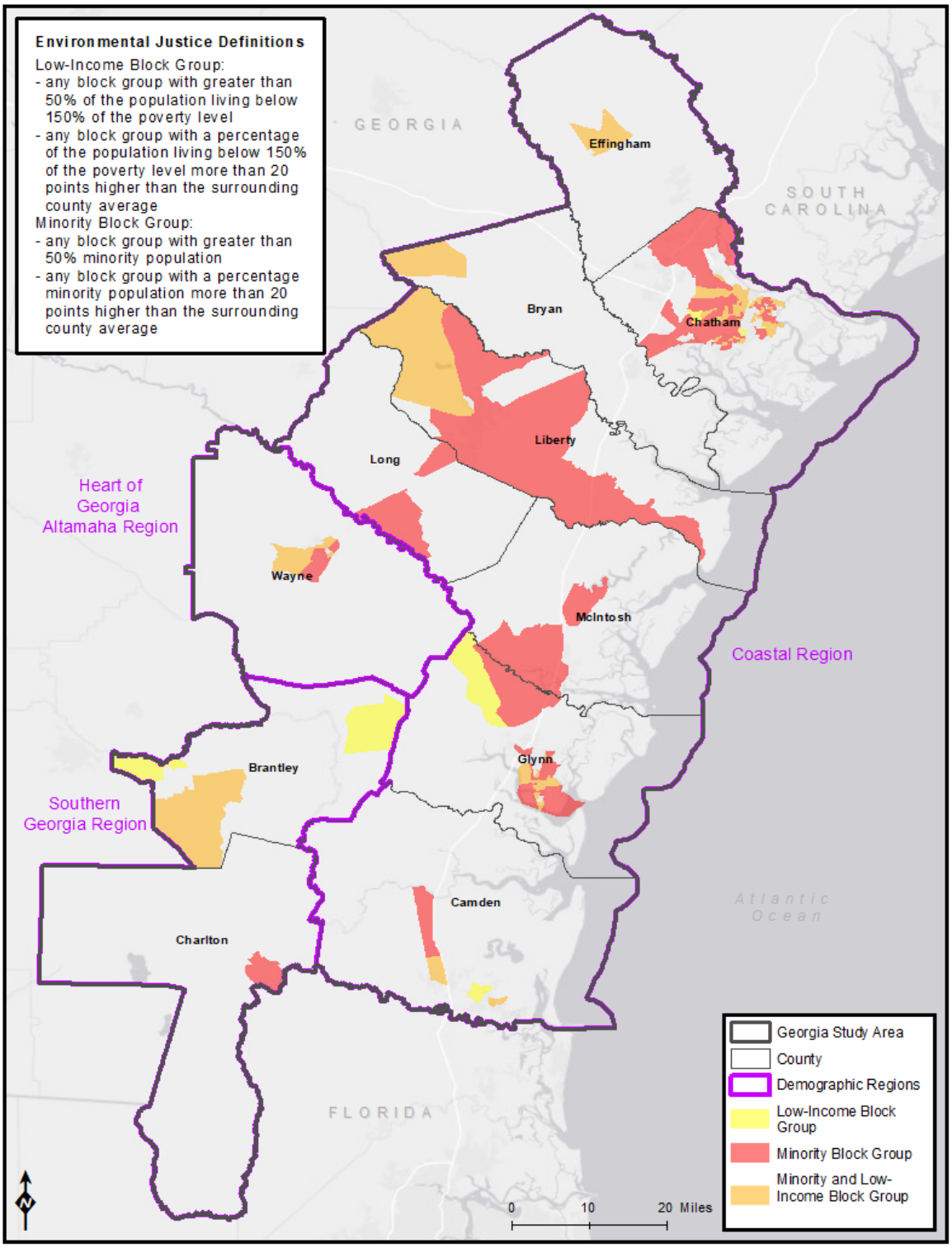
Source: USCB 2017q

Figure 16-37. High School, College, and Advanced Degree Graduation Rates in the Georgia Study Area



Source: USCB 2017q

Figure 16-38. Educational Attainment in the Georgia Study Area



Source: USCB 2017r

Figure 16-39. Minority and Low-Income Population in the Georgia Study Area by Census Block Group

16.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 16-13 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 668,440 people living in the Study Area, approximately 276,821 (41.4%) are minority. This is slightly higher than the Nation (38.5%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 406 block groups in the Study Area, approximately 42.4% (172 block groups) are considered minority populations (USCB 2017f).

Each of the demographic regions contain census block groups with high percentages of minority populations. As shown in Table 16-13, the Coastal, Heart of Georgia Altamaha, and Southern Georgia Regions have varying percentages of minority block groups at 44.0%, 30.4%, and 20.0%, respectively. As illustrated in Figure 16-39, several cities, such as Savannah, contain block groups with high percentages of minority populations. Most of these cities are in the Coastal Region. Within the overall Study Area the largest minority group is Black or African-American (29.9%) followed by Hispanic or Latino (4.4%) (USCB 2017f).

Table 16-13 provides detail of the high percentages of minority block group populations. The counties are Liberty (78.1%), Chatham (50.5%), and Glynn (46.3%). These counties are located in the Coastal Region within the Study Area (USCB 2017f).

16.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 16-13 presents population and environmental justice-related characteristics for the Study Area regarding low-income populations. Of the population of 645,376 people for whom poverty status is determined living in the Study Area, approximately 175,754 (27.2%) individuals have incomes less than 150% of the poverty level. This is equivalent to the Nation (27.0%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 406 census block groups in the Study Area, approximately 19.0% (77 block groups) are considered low-income populations (USCB 2017o).

As shown in Table 16-13, the Southern Georgia Region has the highest percentage of the population with incomes less than 150% of the poverty level at 37.4%. The Coastal Region has the lowest percentage of population with incomes less than 150% of the poverty level at 26.4% (USCB 2017o).

As illustrated in Figure 16-39, four counties in the Study Area contain census block groups with high percentages of low-income populations. Table 16-13 provides details of the high percentages of low-income block groups. The largest proportions are in rural Brantley County (33.3%), located in the Southern Georgia Region, followed by Chatham (25.0%), Glynn (24.1%), and Wayne (17.4%) Counties (USCB 2017o).

Table 16-13. Low-Income and Minority Populations in the Georgia Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Block Groups	Number of Low-Income Block Groups	Percent of Low-Income Block Groups (%)	Number of Minority Block Groups	Percent of Minority Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of the Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Coastal	Bryan	34,883	25,908	8,975	25.7	14	1	7.1	1	7.1	34,738	7,099	20.4
	Camden	52,252	36,635	15,617	29.9	24	3	12.5	3	12.5	50,473	11,992	23.8
	Chatham	285,506	140,127	145,379	50.9	204	51	25.0	103	50.5	272,450	73,107	26.8
	Effingham	57,087	45,248	11,839	20.7	22	1	4.5	1	4.5	56,545	10,705	18.9
	Glynn	83,467	53,220	30,247	36.2	54	13	24.1	25	46.3	82,098	23,936	29.2
	Liberty	62,120	25,011	37,109	59.7	32	1	3.1	25	78.1	59,949	18,465	30.8
	Long	17,857	10,449	7,408	41.5	7	0	0.0	2	28.6	17,659	5,681	32.2
	McIntosh	14,061	8,679	5,382	38.3	11	0	0.0	2	18.2	13,969	4,291	30.7
	Total Coastal	***607,233***	***345,277***	***261,956***	***43.1***	***368***	***70***	***19.0***	***162***	***44.0***	***587,881***	***155,276***	***26.4***
Heart of Georgia Altamaha	Wayne	***29,833***	***21,243***	***8,590***	***28.8***	***23***	***4***	***17.4***	***7***	***30.4***	***27,469***	***9,242***	***33.6***
Southern Georgia	Brantley	18,411	17,057	1,354	7.4	9	3	33.3	1	11.1	18,246	7,351	40.3
	Charlton	12,963	8,042	4,921	38.0	6	0	0.0	2	33.3	11,780	3,885	33.0
	Total Southern Georgia	***31,374***	***25,099***	***6,275***	***20.0***	***15***	***3***	***20.0***	***3***	***20.0***	***30,026***	***11,236***	***37.4***
	Study Area Total	**668,440**	**391,619**	**276,821**	**41.4**	**406**	**77**	**19.0**	**172**	**42.4**	**645,376**	**175,754**	**27.2**
	Georgia	**10,201,635**	**5,469,446**	**4,732,189**	**46.4**						**313,048,563**	**74,202,606**	**23.7**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**9,931,935**	**2,681,299**	**27.0**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

16.4.5.2 Socially Vulnerable Populations

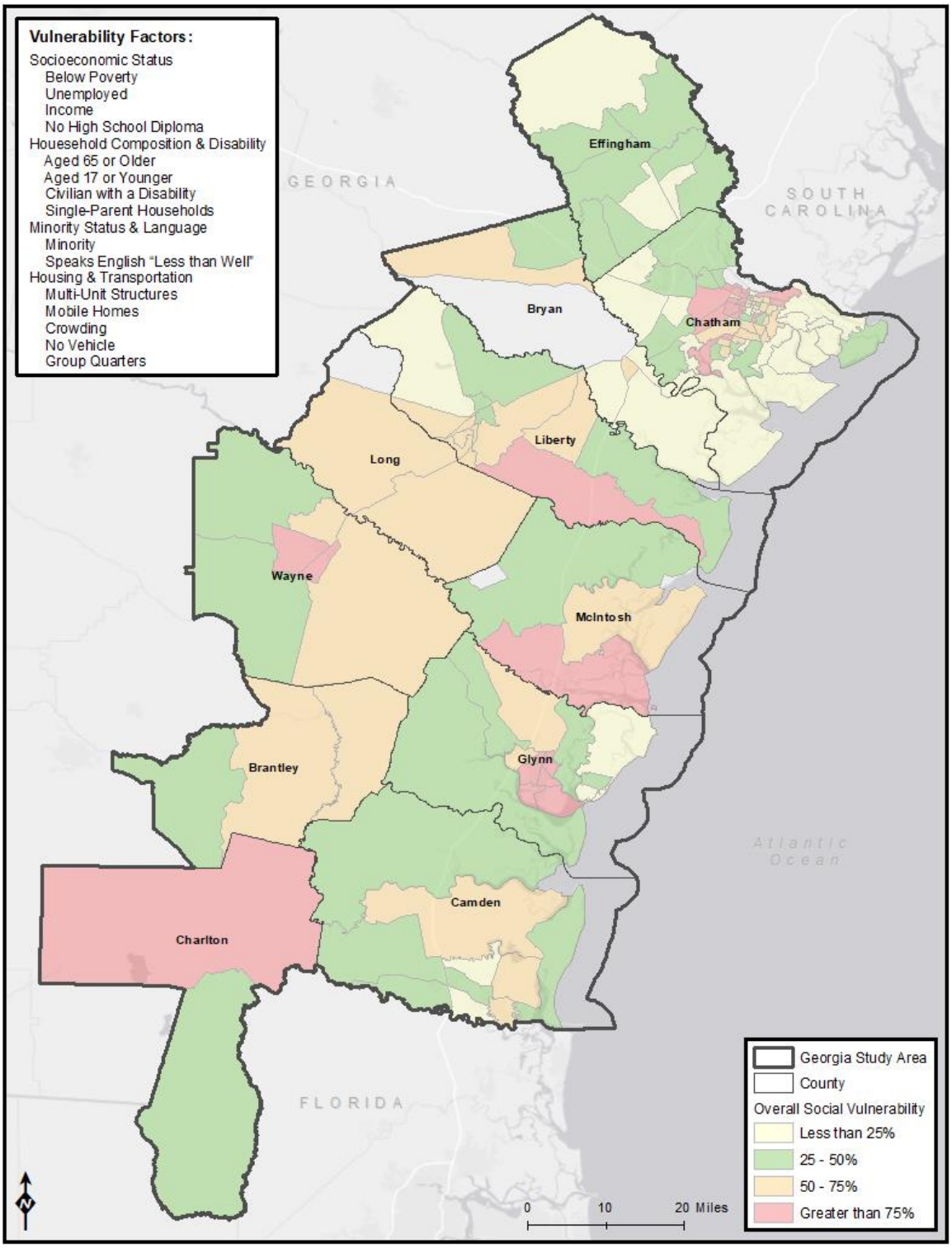
As described in more detail in Chapter 1.6.5.2, the term "vulnerable population" is subject to myriad interpretations. As used in this chapter, the term "socially vulnerable population" includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC's SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA's SVI tool is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The NOAA SVI is used as social vulnerability indicators relevant to fishing-dependent communities along the Nation's coasts and discussed in detail in Fishing Communities (Chapter 16.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community's overall social vulnerability, as illustrated by census tract in Figure 16-40 for the Study Area. As shown in Figure 16-40, Charlton, Wayne, Glynn, McIntosh, Liberty, and Chatham Counties, located throughout all of the Demographic Regions, have the highest vulnerability ranking within the Study Area. All counties have some populations deemed vulnerable to varying degrees (CDC 2016).

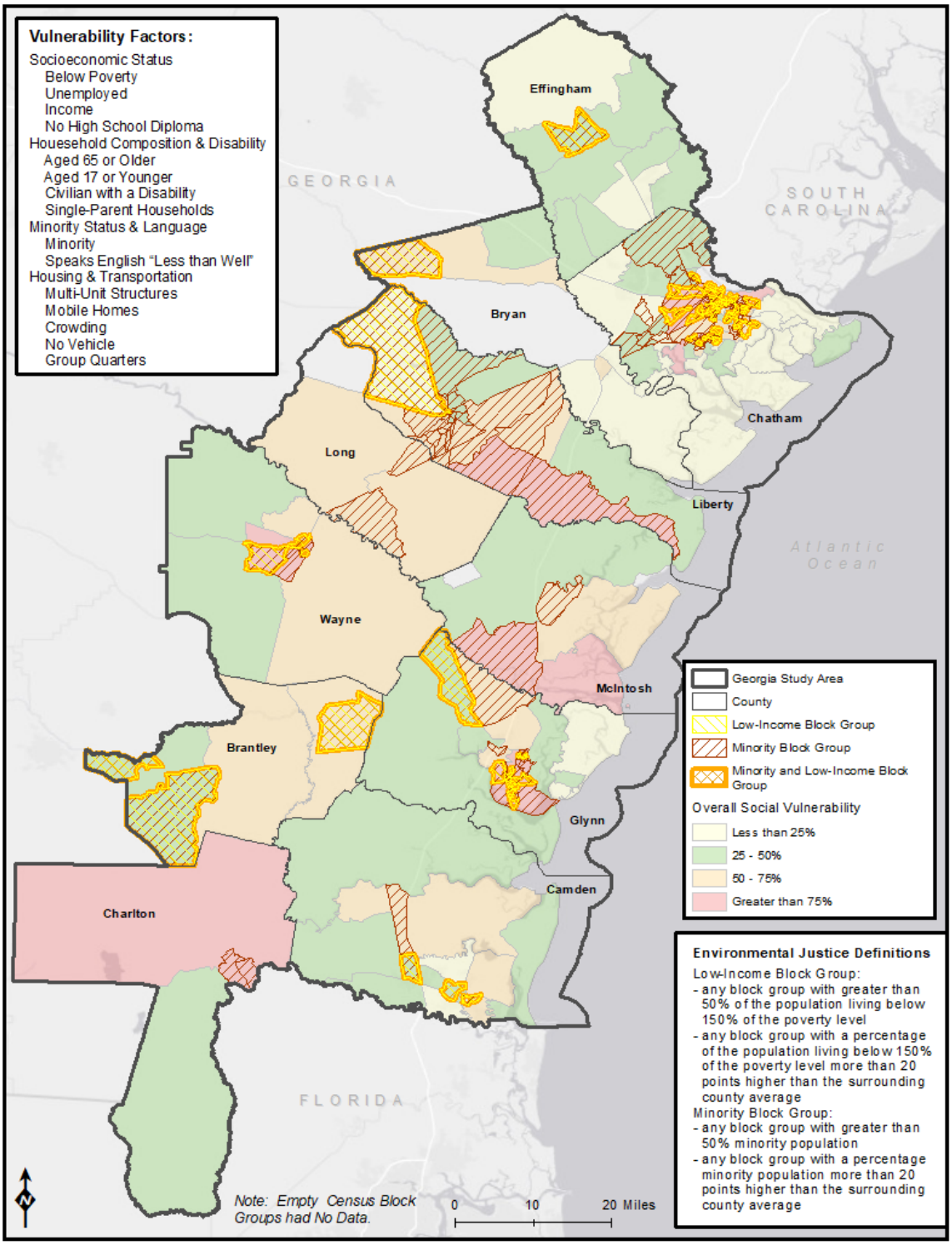
To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 16-41 combines the CDC SoVI index as shown in Figure 16-40 with minority and low-income populations as shown in Figure 16-39 (CDC 2016). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from these two datasets to see the direct correlation; areas with defined higher vulnerability rankings are also areas where minority and low-income population groups are more prevalent; especially notable in McIntosh, Liberty and Chatham counties.

Figure 16-42 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 16-42 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown, but also applicable (as discussed in Chapter 16.2.2 above), are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure.



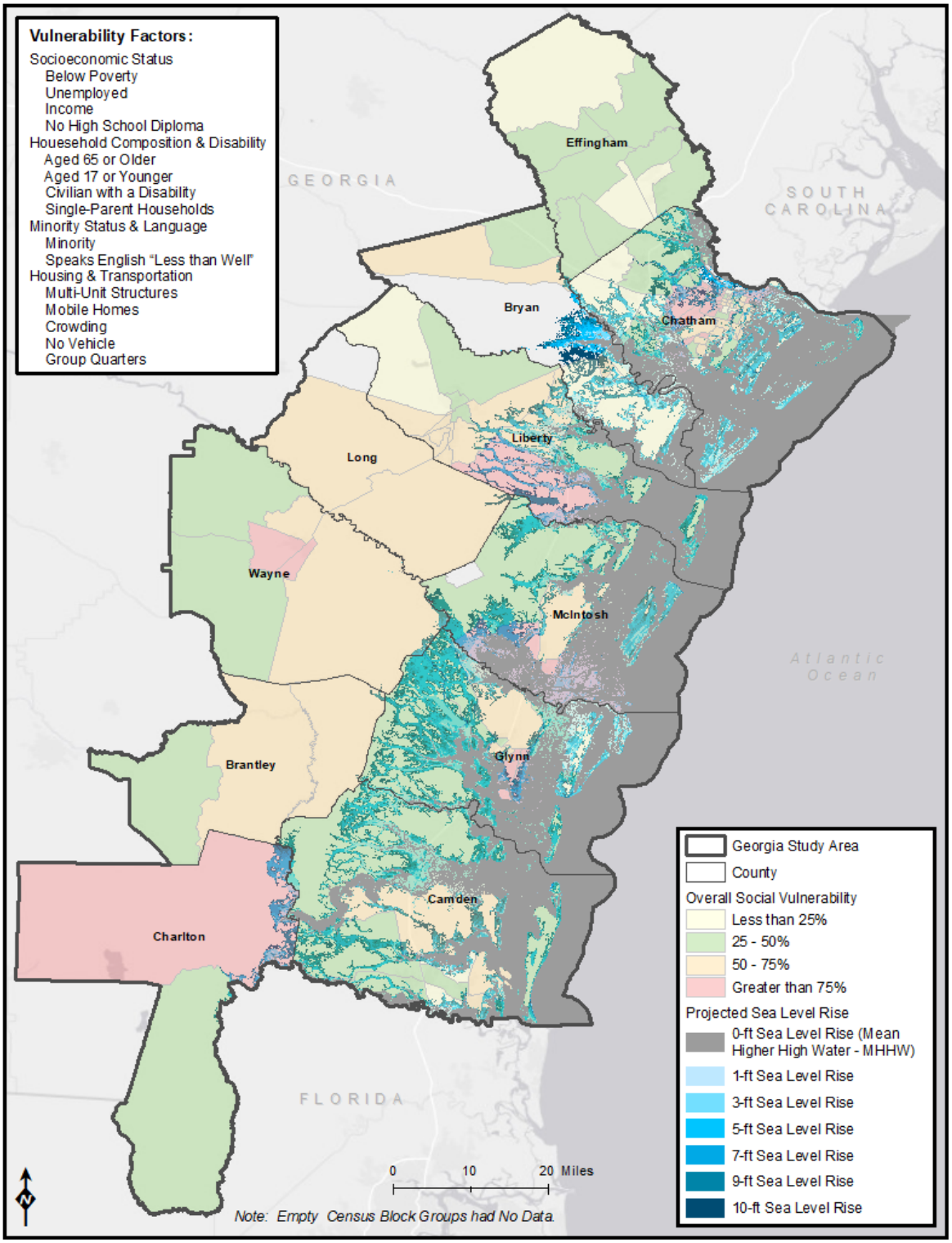
Source: CDC 2016

Figure 16-40. Overall Social Vulnerability using the CDC Social Vulnerability Index in the Georgia Study Area by Census Tract



Sources: CDC 2016, USCB 2017r

Figure 16-41. Overall Social Vulnerability using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Georgia Study Area



Sources: CDC 2016, NOAA 2018a

Figure 16-42, Overall Social Vulnerability using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Georgia Study Area by Census Tract

As discussed in Chapter 16.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

By 2035, the USCB anticipates the population of those aged 65 and older will outnumber the population under 18 (78.0 million and 76.4 million people nationwide, respectively). A majority, 80% of seniors in the United States, suffer one chronic health condition according to the USCB, and 50% have two or more conditions. These chronic conditions (such as arthritis, hypertension, heart disease, diabetes and respiratory diseases) can limit activity, including the ability to work, for older Americans (State of Georgia 2018).

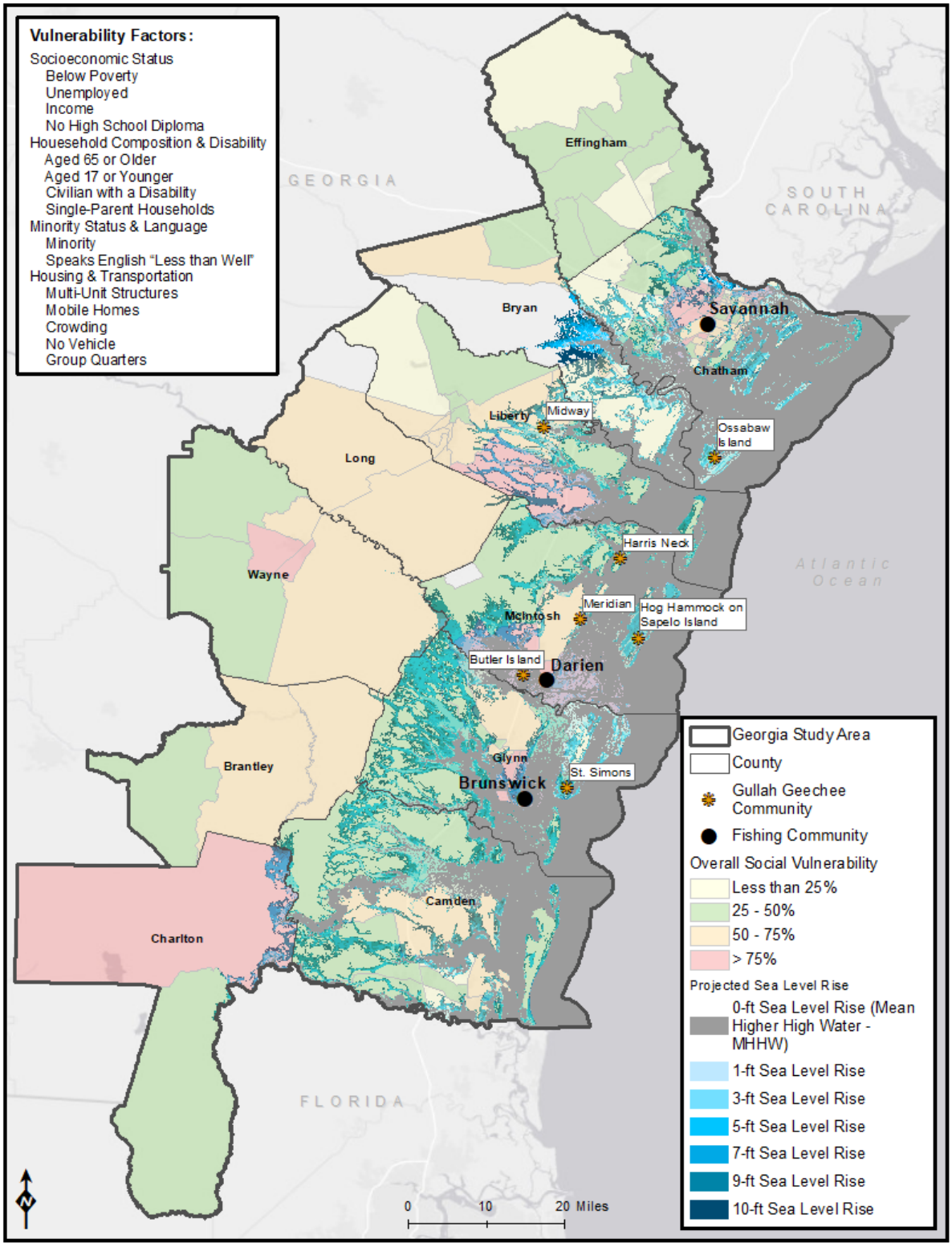
Compounding health issues is a shortage of doctors in Georgia's rural counties. According to the Kaiser Family Foundation, Georgia falls below the National average for primary health care providers in needy areas statewide. Within the Study Area, Long County does not have a doctor and Brantley, Charlton, and McIntosh Counties do not have a pediatrician and an obstetrician/gynecologist. The lack of access to primary health care contributes to overall health outcomes for Georgia patients also lagging the National numbers; Georgia ranks among the worst 10 States for most measures. In general, rural counties in Georgia tend to have a lot of patients on Medicare and Medicaid and many patients without any insurance which creates income issues for doctors that see these patients. As with much of the population, many doctors are moving from rural to urban areas contributing to the shortages in primary care in rural areas. In addition to a shortage of healthcare professionals, low-income populations may also have difficulty with transportation to medical services and pharmacies given the general lack of public transportation options in rural areas. These difficulties further hinder access to medical care. Georgia's Legislature continues to consider legislation to address the State's rural health care crisis (Hart 2018).

16.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources "from the land" rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities and subsistence populations. There are no Amish or Mennonite populations within the Study Area; therefore, religious subpopulations are not discussed further in this chapter (NGE 2019d).

16.4.5.3.1 Fishing Communities

There are three fishing communities (Brunswick, Darien, and Savannah) in the Study Area located in the Coastal demographic region, and within the Gullah Geechee communities as illustrated in Figure 16-43.



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 16-43. Potential Vulnerable Communities in the Georgia Study Area by Census Tract

As can be seen in Figure 16-43, all 16 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a National effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including in the preparation of Environmental Impact Statements required under NEPA. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website (NOAA Fisheries 2019d). Fishing is a culturally significant activities for the Gullah Geechee communities. Therefore, it can be assumed these communities engage in some level of subsistence fishing.

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects.

16.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the *Council on Environmental Quality Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is, differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 16-43). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

The Gullah/Geechee Heritage Corridor is home to Gullah Geechee people, a potential subsistence community. The Gullah Geechee are descendants of enslaved Central and West Africans who worked the plantations of the Southeastern U.S. Following the abolition of slavery and the American Civil War, the descendants of the Gullah Geechee settled in remote areas throughout the southern United States including many of the barrier islands stretching from North Carolina to Northeast Florida. Cultural and communal ties still remain in these areas today (Jaxson 2018). An estimated 200,000 people of Gullah and Geechee heritage live along the southeast coast according to an environmental impact statement

published in 2005 (Otterbourg 2014). Because of the geographic isolation, segregation, and oppression that has continued to the present times, the Gullah and Geechee share similar linguistic, artistic, and societal traits that represent the many ways these peoples maintained their homeland roots while simultaneously assimilating aspects of other cultures they encountered during and after enslavement (NPS 2017a).

Also because of the geographic isolation of these communities on islands with no connected infrastructure, subsistence lifestyles were necessary and still persist in the culture. From the 1600s to present-day, Gullah/Geechees depend heavily on resources from both land and the waterways. They have historically harvested from the Intracoastal Waterway in the manner that their indigenous American and African ancestors did (Gonsalves et al. 2015). Direct access to the area's marshes and waterways is important as many Gullah Geechee residents are still heavily dependent on land and water resources (i.e., grasses for the sweetgrass baskets, food from hunting and fishing). Therefore, healthy, functioning ecosystems are critical to the Gullah Geechee people to maintaining the quality and way of life of Gullah Geechee people (GGCHCC 2012).

The Gullah Geechee Cultural Heritage Corridor, which extends from Wilmington, North Carolina in the north to Jacksonville, Florida, in the south (NPS 2017a). The Gullah/Geechee Cultural Heritage Corridor, shown in Figure 16-43, was created to achieve several objectives. The Corridor was created to endorse the important contributions of Gullah Geechee to American culture and history. Additionally, the Corridor assists local governments and entities in and preserving Gullah Geechee folklore, arts, crafts, and music. The Corridor also assists in identifying and preserving sites, historical data, artifacts, and objects associated with Gullah Geechee culture for the benefit and education of the public (GGCHCC 2012).

In Georgia, the Gullah Geechee Cultural Heritage Corridor includes 2,040,253 acres in parts of Brantley, Bryan, Camden, Effingham, Liberty, Long, and Wayne Counties and all of Chatham, Glynn, and McIntosh Counties (GGCHCC 2012). Gullah Geechee communities have been identified in Hog Hammock on Sapelo Island (McIntosh County), Ossabaw Island (Chatham), St. Simons (Glynn), Butler Island (McIntosh), Harris Neck (McIntosh), Meridian (McIntosh), Midway (Liberty), although there are likely many other Gullah Geechee living elsewhere in these Counties (Hiller 2019, NPS 2005, GGCHCC 2012). Impacts to Gullah Geechee communities should be considered for OCS-related project site selection, keeping in mind that these communities may not attend public forums for comment and prefer to be contacted directly.

The fisheries that support the Gullah/Geechee people face a multitude of threats largely derived such as urban, industrial, and agricultural development within coastal watersheds, overfishing, conflict with State agencies for harvesting in their historically traditional manner, competition with commercial fisheries, climate change, sea level rise, ocean acidification, hurricanes, and environmental pollutants (Gonsalves et al. 2015, GGCHCC 2012). The largest threat to Gullah Geechee communities is coastal development adjacent to subsistence waterways, which simultaneously have led to steadily increasing property values and taxes and physically cut off these communities from the marsh and water that is their livelihood (NPS 2005, Vargas 2019). These threats have caused declines in blue crabs, oysters, shrimp, catfish, mullet, spot, croakers, etc., which are staples of the Gullah/Geechee fishing industry and diet (Gonsalves et al. 2015).

Proximity of potentially vulnerable subsistence communities (fishing communities and Gullah Geechee in particular) to prospective sites for OCS development should be evaluated early in the site selection process. Populations with particular additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations. Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will

likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

16.4.5.4 Tribes

Georgia has 10 federally recognized tribes and three State-recognized tribes with historical ties to the State (NCSL 2019) of which one tribe (Cherokee of Georgia Tribal Council) currently resides in the Study Area. Table 16-14 lists the federally and State-recognized tribes with historical ties Georgia.

Table 16-14. Federally and State-Recognized Tribes with Historical Ties to Georgia

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Resident Tribes within the Study Area			
Cherokee of Georgia Tribal Council	State	Yes	Tribal members in Georgia currently reside in Saint George, Charlton County.
Federally and State-Recognized Tribes Outside the Study Area			
Georgia Tribe of Eastern Cherokee	State	No	Tribal members live in northwest Georgia (Lumpkin County)
Lower Muskogee Creek Tribe	State	No	Tribal members live in southwest Georgia (Grady County)
Alabama-Coushatta Tribe of Texas	Federal	No	Tribal members currently reside outside Georgia (primarily in Texas) and have historical ties to the State.
Alabama-Quassarte Tribal Town	Federal	Yes	Tribal members currently reside outside Georgia (primarily in Oklahoma), but have historical ties to all 11 counties in the Study Area.
Catawba Indian Nation	Federal	Yes	Tribal members currently reside outside Georgia (primarily in South Carolina), but have historical ties to the Study Area (Chatham and Effingham Counties).
Choctaw Nation of Oklahoma	Federal	No	Tribal members currently reside outside Georgia (primarily in Oklahoma) and have historical ties to the State.
Coushatta Tribe of Louisiana	Federal	Yes	Tribal members currently reside outside Georgia (primarily in Oklahoma), but have historical ties to all 11 counties in the Study Area.
Eastern Band of Cherokee Indians	Federal	No	Tribal members currently reside outside Georgia (primarily in western North Carolina) and have historical ties to the State.
Eastern Shawnee Tribe of Oklahoma	Federal	No	Tribal members currently reside outside Georgia (primarily in Oklahoma) and have historical ties to the State.
Mississippi Band of Choctaw Indians	Federal	No	Tribal members currently reside outside Georgia (primarily in Mississippi) and have historical ties to the State.
Muscogee (Creek) Nation	Federal	Yes	Tribal members currently reside outside Georgia (primarily in Oklahoma), but have historical ties to all counties in the Study Area except Glynn County.
Sac & Fox Tribe of the Mississippi in Iowa	Federal	No	Tribal members currently reside outside Georgia (primarily in Iowa) and have historical ties to the State.

Sources: NCSL 2019, Georgia Tribe of Eastern Cherokee 2019, Cherokee of Georgia 2017, The Lower Muskogee Creek Tribe 2019

In the early 1800's and late 1700's Europeans began to encroach on the Cherokee lands in Georgia. For several decades, many Europeans married Cherokee women and raised families. The Cherokee are a matriarchal society; as a result, all children born to Cherokee mothers were considered full blood Cherokee. Only households with a Cherokee at its head were forced to leave the State along the now infamous Trail of Tears in 1838. Thousands of mixed blood Cherokee remained behind living within the confines of the State of Georgia. They continued to practice their beliefs and customs, even when it was made illegal by the State Government and the Federal Government, in secret and behind closed doors, on farms and lands far back into the Georgia mountain valleys. In 1993, the State passed the recognition bill, recognizing the descendants of Cherokee in Georgia as the Georgia Tribe of Eastern Cherokee (Georgia Tribe of Eastern Cherokee 2019).

Although only one State-recognized tribe has historical lands within the Study Area, other small communities of American Indians could also be present. American Indian tribes could constitute socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective Federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

16.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable as described in Chapter 1.6.5.5 (USCB 2015).

Table 16-15 provides an analysis people who speak a language other than English at home in counties within the Study Area. Nationwide, 21.3% of the population speak a language "other than English" at home. Within the Study Area, 8.7% of the population do not speak English at home. The Coastal Region has the highest percentage (8.9%) of this population within the Study Area. Spanish is the language

spoken by the majority (33,061 people or 5.3% of the total population) of non-English speakers at home within the Study Area population (USCB 2017e).

Figure 16-44 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Liberty (12.1%), Long, (11.7%), Charlton (10.5%), and Chatham (10.0%). As shown in Figure 16-44, Liberty and Chatham Counties are particularly vulnerable to sea level rise and the associated storm surge impacts.

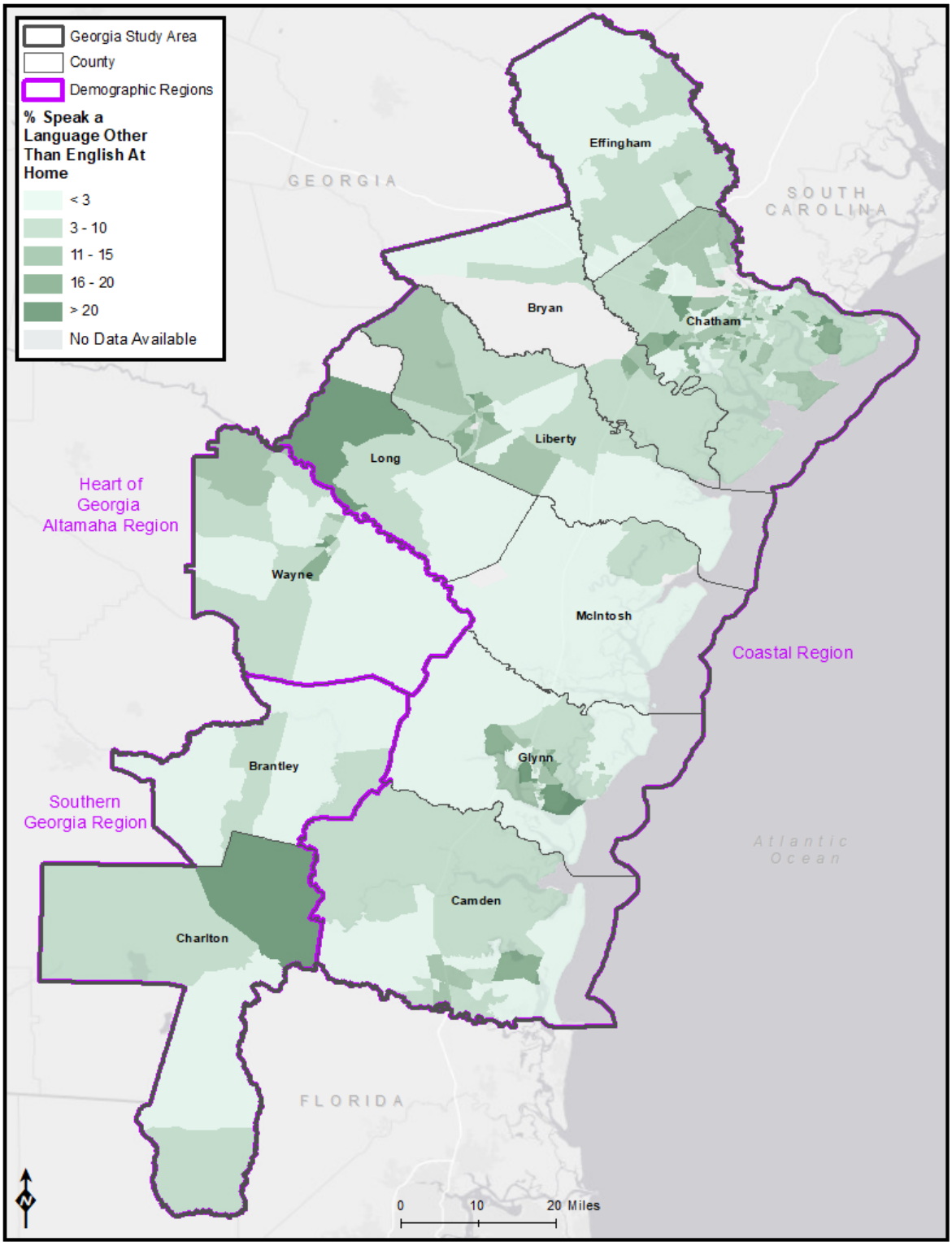
There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about the location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

Table 16-15. People who Speak a Language Other than English at Home in the Georgia Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5	Total Population Who Speak a Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Coastal	Bryan	32,439	2,534	7.8	1,493	729	249	63
	Camden	48,352	3,394	7.0	2,319	608	413	54
	Chatham	266,645	26,667	10.0	14,274	6,978	4,476	939
	Effingham	53,182	2,493	4.7	1,485	694	314	0
	Glynn	78,438	6,464	8.2	4,687	1,027	513	237
	Liberty	55,813	6,744	12.1	4,300	1,069	1,131	244
	Long	16,440	1,926	11.7	1,545	232	144	5
	McIntosh	13,438	243	1.8	124	97	19	3
	Total Coastal	***564,747***	***50,465***	***8.9***	***30,227***	***11,434***	***7,259***	***1,545***
Heart of Georgia Altamaha	Wayne	***27,738***	***1,734***	***6.3***	***1,381***	***152***	***144***	***57***
Southern Georgia	Brantley	17,299	493	2.8	272	167	42	12
	Charlton	12,236	1,289	10.5	1,181	56	52	0
	Total Southern Georgia	***29,535***	***1,782***	***6.0***	***1,453***	***223***	***94***	***12***
	Study Area Total	**622,020**	**53,981**	8.7	**33,061**	**11,809**	**7,497**	**1,614**
	Georgia	**9,544,207**	**1,323,530**	**13.9**	**763,901**	**244,989**	**222,170**	**92,470**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e



Sources: USCB 2017r, USCB 2017e

Figure 16-44. Percent of People Who Speak a Language Other than English at Home in the Georgia Study Area by Census Block Group

16.4.6 Summary – Demographics and Socioeconomics

Georgia's population continues to grow due to domestic in-migration from other States in the Northeast, particularly New York and New Jersey, as well as international migration. Projections indicate the population within the Study Area will continue to increase through at least 2040, although at rates less than the State. The highest population density within the Study Area is in urban Chatham County near Savannah. Projected growth is in coastal Study Area counties; however some counties (Charlton, Liberty, and McIntosh Counties) are predicted to decline in population (USCB 2017a, USCB 2017d, Governor's Office of Planning and Budget 2019a).

Overall current population trends and forecasts in the Study Area indicate an aging population. (Governor's Office of Planning and Budget 2019a). The aging population may indicate future social and economic challenges, such as demand for education, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

Aging of the population may further compound Georgia's rural healthcare crisis, as more elderly will require healthcare, yet medical professionals migrate to metropolitan areas along with the general population. The urban-rural divide continues to grow wider. Population distribution will be a factor for future potential projects requiring a local workforce. Population distribution is also closely tied to the distribution and concentration of centers of commerce, industry, public utilities, etc., and therefore can play a role in the site selection process for new projects.

As seen in the land cover analysis, the Study Area is mostly rural with the exception of a few small cities and Savannah. The State is projected to see a continuation of the long-standing trend toward rural depopulation and urban expansion (Carl Vinson Institute of Government 2019). Contrary to National trends, Georgia's population is not clustered in coastal areas, which may be attributed to the high number of rural counties in the Study Area, as well as the exclusion of the populous fast-growing Atlanta metropolitan area from the Study Area (USCB 2017a, USCB 2017c, USCB 2017d, Governor's Office of Planning and Budget 2019a). As compared to all study areas within the 15 coastal states and the District of Columbia comprising the Project Area, the Georgia Study Area is one of two states that had less population density as compared to the State. However, population projections through 2040 indicate increasing density in coastal areas, exposing increasing numbers of people (as the population grows) and infrastructure (as development continues) to coastal hazards. Increasing density at the coast does not necessarily mean urbanization of the coast, however, more population does equate to more infrastructure. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on development in general and available housing for residents. Mounting threats from climate change and sea level rise may compound the housing affordability crisis over time. As less-advantaged neighborhoods are damaged by flooding, they may undergo climate gentrification, being redeveloped for more affluent and advantaged groups. Eventually, as coastal development pressures increase, growth will shift to inland areas and put pressure on agricultural areas.

Homeownership in the Study Area (59.3%) is lower than the State (63.0%) and Nation (63.8%) indicating that more people are renting in the Study Area. Housing costs are rising in the State and Study Area. Bryan and Chatham Counties, located within the Savannah, Georgia metropolitan area, have the highest median homes values. Home vacancy rates in the Study Area (15.4%) are greater but similar to the State (12.9%) and the Nation (12.2%) (USCB 2017m). Home values have been rising and are projected to continue to rise in the Nation and in Georgia. Housing affordability for low- and moderate-income workers is a problem in Georgia. Rising prices make homeownership increasingly out of reach for more people especially millennials looking to purchase their first house (Zillow.com 2019i). Housing utilization is an important consideration for potential future projects to determine if a region can support the proposed project workforce. Often during the construction stage, workers need to migrate temporarily

into the area, either from nearby locations or from outside of the region. These individuals typically occupy hotels or rental properties. Employees that are part of the operational workforce may either purchase or rent homes. Therefore, understanding the current, and future projected changes in housing utilization and vacancy rates can assist during OCS-related project planning stages.

The Study Area has a total employment of 241,862 jobs, of which 78.8% are maritime related. The majority of the non-maritime jobs are concentrated in the urban areas of Chatham and Glynn Counties. This is consistent with the population distribution, land use, and business/industrial facilities distribution. Types of employment vary across the Study Area, although maritime jobs are concentrated McIntosh, Bryan, and Glynn Counties. The average unemployment rate in the Study Area was 8.6%, higher than the State (7.5%) and Nation (6.6%). The lowest unemployment rates occur in Effingham County (5.0%) and the highest occur in Long County (17.2%). Within the Study Area, high unemployment rates are generally in rural areas, rather than being in urban areas due to the larger population density (USCB 2017p).

Although Georgia lags behind the U.S. in both median household income and per capita income, the cost of living is relatively low (USCB 2017h).

The Study Area has higher rates of educational attainment relating to the percentage of people who earned only a high school diploma, but lower rates regarding advanced degrees. In the U.S., 27.7% and 18.6% of working-age population earned only a high school diploma and college or advanced degree, respectively. In Georgia, 28.9% and 17.7% of working-age population earned only a high school diploma and college or advanced degree, respectively. In the Study Area, 30.3% and 15.1% of working-age population earned only a high school diploma and college or advanced degree, respectively (USCB 2017q).

Minority and low-income status are two of several factors that the CDC and NOAA use to calculate potentially vulnerable populations. The highest percentages of minority block group populations are located in Liberty (78.1%), Chatham (50.5%), and Glynn (46.3%) Counties. Low-income populations are located primarily in the more rural areas, Brantley (40.3%), Wayne (33.6%), and Charlton (33.0%) Counties. Based on the CDC social vulnerability index, there are a variety of locations throughout the Study Area that are considered potentially vulnerable. All counties have some populations deemed vulnerable to varying degrees; however, largest populations are located in Charlton, Wayne, Glynn, McIntosh, Liberty, and Chatham Counties (USCB 2017f, USCB 2017o).

Other potentially vulnerable communities include subpopulations that may have unique characteristics that distinguish them from the rest of the population. In the Study Area, these groups include fishing communities, tribes, linguistically-challenged populations, and subsistence populations. Three significant fishing communities are present in the Study Area, Savannah, Darien, and Brunswick, all of which are dependent on the Atlantic Ocean, Atlantic Intracoastal Waterway, and major rivers for jobs and as a food source (NOAA Fisheries 2019d).

The Gullah/Geechee Cultural Heritage Corridor is present in the southern portion of the Study Area and includes several Gullah Geechee communities which are heavily dependent on plant and fish species from the local ecosystem for subsistence and to support their economy through the creation of traditional sweetgrass baskets. . Their community, which is protected by the Federal Gullah Geechee Corridor, is dependent on access to these waterways (NPS 2017a). Impacts to vulnerable communities should be considered for site selection, keeping in mind that Gullah Geechee may not attend public forums for comment and prefer to be contacted directly. These communities are particularly susceptible to projected sea level rise and storm surge changes. These communities also correlate closely with the CDC vulnerability rankings and minority and low-income populations.

American Indian tribes have a unique relationship with Federal and State governments. They have very close ties to tribal lands and cultural sites, they may have a separate language, they are classified as a

minority population, and members may also be low-income. These are considered vulnerable populations. The Cherokee of Georgia Tribal Council is located within Saint George in Charlton County, but it is not on a Federal reservation. The Cherokee have historic lands within the State. This tribe, currently reported at a population of 16, could be considered socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics. Saint George, Charlton County is between 25 and 50% vulnerability on the CDC Social Vulnerability Index. Because of its position on the St. Marys River, Saint George is are subject to sea level rise increases. Proposed development in or near these tribal areas or that would affect the tribe would require coordination and consultation with the tribal governments (NCSL 2019).

Limited-English present throughout the Study Area are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public. Within the Study Area, 8.7% of the population do not speak English at home, with Spanish being the language spoken by the majority (33,061 people or 5.3%). Counties with the highest percentages of non-English speaking populations were Liberty (12.1%), Long, (11.7%), Charlton (10.5%), and Chatham (10.0%) Counties (USCB 2017e).

16.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development in the Study Area.

16.5.1 Regional Observations

The physical characteristics of the Study Area, in particular the location of major rivers and the expanse of floodplains and wetlands along the Coastal Plain, have all influenced population trends and economic growth in Georgia. The Savannah, Altamaha, and St. Marys Rivers, and the Atlantic Intracoastal Waterway provide wild habitat and important fisheries for the region and are major transportation routes. However, the Atlantic Intracoastal Waterway has limitations for transportation due to a lack of maintenance dredging.

The Study Area is mostly rural, with a significant amount of wetlands and forested areas. As a result, population density is generally low and urban centers are few and relatively small. Savannah in Chatham County is the exception, primarily due to the Port of Savannah. Georgia has a significant number of protections and regulations limiting development, especially in coastal areas. Protected natural resources in the Study Area are generally associated with water resources and protected by various regulations and laws; they include the Savannah Coastal Refuge Complex, floodplains, prime farmland and farmland of statewide importance, critical habitat for threatened and endangered species, and a coastline of wildlife management and recreational refuges.

There are currently no OCS-related refining facilities in Georgia and heavy manufacturing is relatively limited in the coastal area of Georgia. Industry is concentrated in the areas of Pooler, Port Wentworth, Garden City and Savannah in Chatman County and Brunswick, Sterling Station and Pennick in Glynn County. There was a moratorium on OCS-related development activities imposed in Chatham County in the past, indicating that OCS-related development near Savannah may be difficult, even though the Savannah Port is the only port in Georgia capable of handling a large industrial development.

The physical characteristics of the Study Area also contribute to the physical vulnerability of the communities within this area. Current rates of sea level rise in north Georgia (0.12 inches/year) are comparable to current global rate (0.125 inches/year), but projections indicate rates could increase to 0.43 inches per year averaged over the next 100 years. A hurricane storm surge would be significantly

more damaging than past storms because of increased residential and infrastructure development at the coast. Developers of potential future OCS-related activities within these areas will need to be cognizant of the projected changes in sea level and storm surge and should plan accordingly to minimize potential impacts from the project to these areas and to minimize potential impacts to planned project activities from these occurrences.

Because the Savannah River serves as a primary water source for Georgia and South Carolina, sufficient sources for surface waters are likely to be limited in the future. Water rights and sea level rise could make developing and operating a facility at the Port of Savannah problematic.

All the counties within the Study Area have future land use plans, and many have zoning ordinances. These future land use plans and ordinances often consider preservation of existing protected areas, cultural and historic areas, and recreation resources and may plan for expansion of such land uses in the future.

Georgia's population is growing and aging. The aging population may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

Population growth in the Study Area is more concentrated in urban areas, though coastal growth is anticipated in the future. All areas along the Georgia coast have physical vulnerability to rising sea level and changes in storm surges. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on development in general and available housing for residents. Mounting threats from climate change and sea level rise may compound housing affordability crisis over time. As less-advantaged neighborhoods are damaged by flooding, they may undergo climate gentrification, being redeveloped for more affluent and advantaged groups. Eventually, as coastal development pressures increase, growth will shift to inland areas and put pressure on agricultural areas.

Homeownership in the Study Area is lower than the State and National average and home values are increasing. Affordable housing remains a challenge for some disadvantaged populations and this trend is expected to continue.

The Gullah/Geechee, a unique subsistence and minority population within the Study Area lives along the coastline in areas particularly vulnerable to sea level rise and storm surge. This community is both physically and socially vulnerable, has some linguistic differences compared to the rest of the Study Area, and is threatened by existing and future land and water use changes over time.

16.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information for the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Groundwater extraction as a source for process water may be problematic within the Study Area. Subsidence has already been shown to exacerbate sea level rise near Savannah, so projects requiring a water source for operations should consider the source of water extraction and its implications.
- Any projects potentially using the Atlantic Intracoastal Waterway as a transportation route will need to account for problems arising from reduced channel depths associated with the nine major shoaling areas reducing channel depths and the insufficient funding for maintenance dredging of

the channel, lack of dredge disposal areas, and environmental concerns associated with dredging. As a result, these shipping routes may be available only under certain tidal conditions.

- Sea level rise projections in combination with storm surge projections could influence future land use planning and population distribution. Future projects in the area will need to take into account both sea level rise, up to four times current amounts, in addition to storm surge for site selection planning. Developers of potential future projects within these areas will need to be cognizant of the projected changes in sea level and storm surge and should plan accordingly to minimize potential impacts from the project to these areas and to minimize potential impacts to planned project activities from these occurrences.
- Based on an analysis of the general land cover within the Study Area, there is a greater concentration of industrial development in Pooler, Port Wentworth, Garden City, and Savannah in Chatman County and Brunswick, Sterling Station and Pennick in Glynn County. These areas would likely be the most suitable counties to accommodate future industrial projects.
- Projects will likely need to evaluate existing and future land use plans and zoning ordinances that are unique to respective communities. In addition to Federal protection for the coastal zone, the State of Georgia has a number of additional State guidelines and policies applicable to development and that will need to be taken into account for site-specific actions within the Study Area.
- Because the of rapid development in coastal Georgia, local land use planning documents should be re-evaluated every five years at minimum.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Future project planning should involve coordination with organizations that support economic development and are designed to help draw businesses to Georgia. Projects that are consistent with planned future development and project developers interested in working in partnership with the communities during the planning and siting process to minimize potential impacts will receive more support for a potential project. There are currently no OCS refining facilities and heavy manufacturing is relatively limited in the coastal area of Georgia. Suitable sites for industrial uses are limited in the Study Area. There was a moratorium on future development activities imposed in Chatham County in the past, but it expired in 2017. Regardless, the moratorium indicates that future development near Savannah may be difficult, even though the Savannah Port is the only port in Georgia capable of handling a large industrial development.
- Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.
- Georgia has a significant number of protections and regulations limiting development, especially in coastal areas. Protected natural resources in the Study Area are generally associated with water resources and protected by various regulations and laws; they include the Savannah Coastal Refuge Complex, floodplains, prime farmland and farmland of statewide importance, critical habitat for threatened and endangered species, and a coastline of wildlife management and recreational refuges. Consequently, additional time may be required for future project permitting and development.
- Cultural resource surveys may be required once site-specific information is known.

- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- Proximity of potentially vulnerable subsistence communities to prospective sites for OCS-related development should be evaluated early in the site selection process. Populations with additional vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and who also depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the State Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 17

FLORIDA

17 Florida

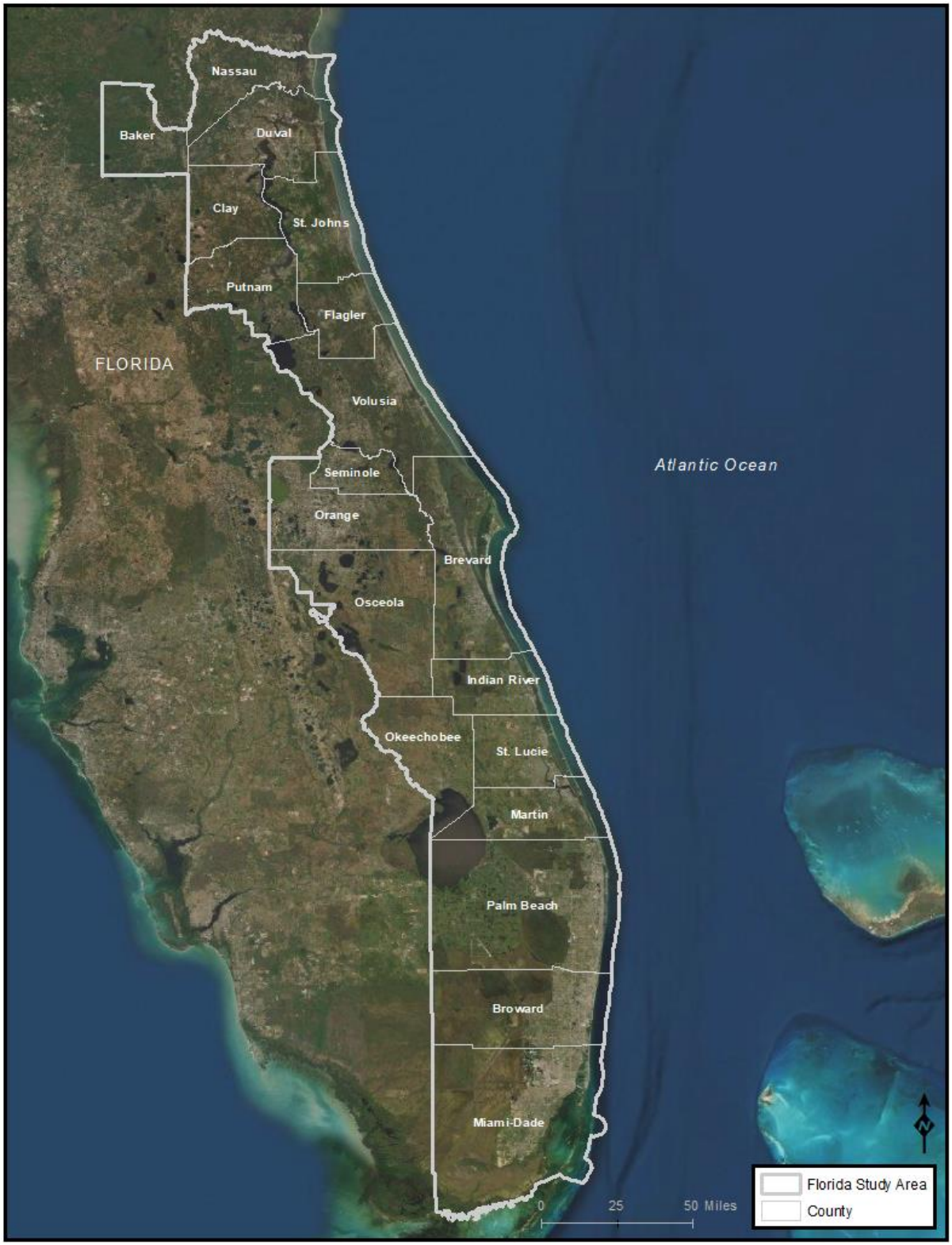
17.1 Introduction

This chapter presents the coastal land use baseline analysis for the State of Florida to support development of future BOEM environmental impact assessments related to prospective development on the Atlantic OCS planning areas. Chapter 1 of this document provides additional background, national, and full Project Area analysis information about each of the resource areas discussed throughout this State-specific chapter. The information in Chapter 1 should be reviewed in conjunction with this State-specific review for the full interpretation of all topics.

Florida is located near three different OCS planning areas managed by BOEM. The OCS planning area analyzed in this chapter is the South Atlantic Planning Area (Figure 1-1 in Chapter 1.1). A total of 19 counties are located within the Florida Study Area (Study Area) along the Florida coastline. Counties range in population size from around 27,537 in Baker County to 2,702,602 in Miami-Dade County. There are three cities in the Study Area with a population over 250,000; they are Jacksonville (886,969), Miami (449,517), and Orlando (283,853). Twelve cities have populations between 100,000 and 250,000, many of which are in the greater Miami/Fort Lauderdale area. Other than Miami/Fort Lauderdale area, other population centers between 100,000 and 250,000 are West Palm Beach (108,505), Port St. Lucie (180,604), and Palm Bay (109,771) (ESRI 2019a). Florida cities and counties include highly diverse populations in regard to demographics (age, income, race/ethnicity, and subsistence populations), exhibit a range of land ownership (Federal, State, local, and private), and include military and commercial/industrial ports, resort and vacation destinations, natural areas, and private property. Florida's location in the South has geographical commonalities with many of the other Atlantic states with open coastlines protected by barrier islands. The Florida coastline includes several major estuaries and a diversity of natural environments similar to those found elsewhere along the Atlantic Coast. Florida's Southern location places it in range of a number of issued, pending, and withdrawn OCS permit applications.

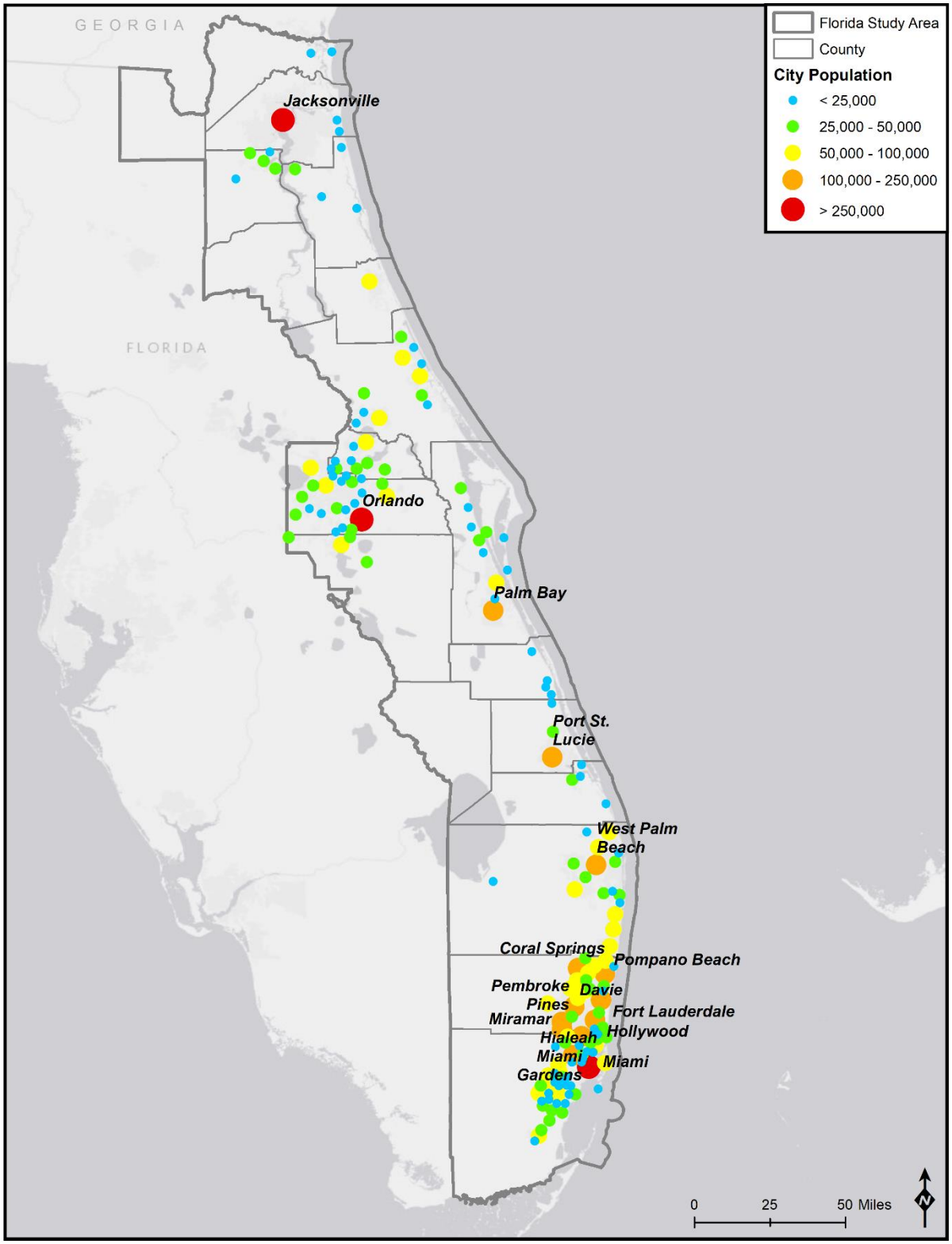
The Study Area includes the overall Project Area counties that are located within the State of Florida. As described in Chapter 1.1, the counties selected for this study are CZM counties and the NOAA's designated coastal shoreline counties located along the Atlantic Coast. The counties with coastline (i.e., polygons that extend into the water and provide complete land coverage from the USCB) were used to define the Study Area. The Study Area is shown in Figure 17-1 and Figure 17-2 and includes the following counties:

- Baker County
- Brevard County
- Broward County
- Clay County
- Duval County
- Flagler County
- Indian River County
- Martin County
- Miami-Dade County
- Nassau County
- Okeechobee County
- Orange County
- Osceola County
- Palm Beach County
- Putnam County
- Seminole County
- St. Johns County
- St. Lucie County
- Volusia County



Source: USCB 2017s

Figure 17-1. State of Florida Study Area



Source: ESRI 2019a

Figure 17-2. Cities in the Florida Study Area

17.1.1 Methodology

National level data collection methodology for each State is the same as was described in Chapter 1.2.1. Data presented in this chapter are from GIS database sources, as stated in Chapter 1.2.2. The original data may include more significant figures than are presented in each table. As the data presented in each table is rounded, the totals may not sum exactly. Specifics related to State, county, and local datasets collected for the State of Florida are described below.

After canvasing nationally available data sources, State, county, and local datasets and information were examined for the Study Area including State data sources such as:

- University of Florida GeoPlan Center/Florida Geographic Data Library
- Florida Department of Environmental Protection (FDEP)
- Florida Water Management Districts: St. Johns River Water Management District and the South Florida Water Management District
- Official State of Florida Geographic Data Portal
- USFWS
- Florida Fish and Wildlife Conservation Commission
- Florida Natural Areas Inventory
- Florida Department of Transportation

Data from relevant county or local data sources such as information from county GIS, planning, assessors, or other departments was also collected. Also, additional data was obtained from relevant State, county and local non-government organizations and agencies, which varied greatly across the Study Area. When information was not available for a county, it is noted.

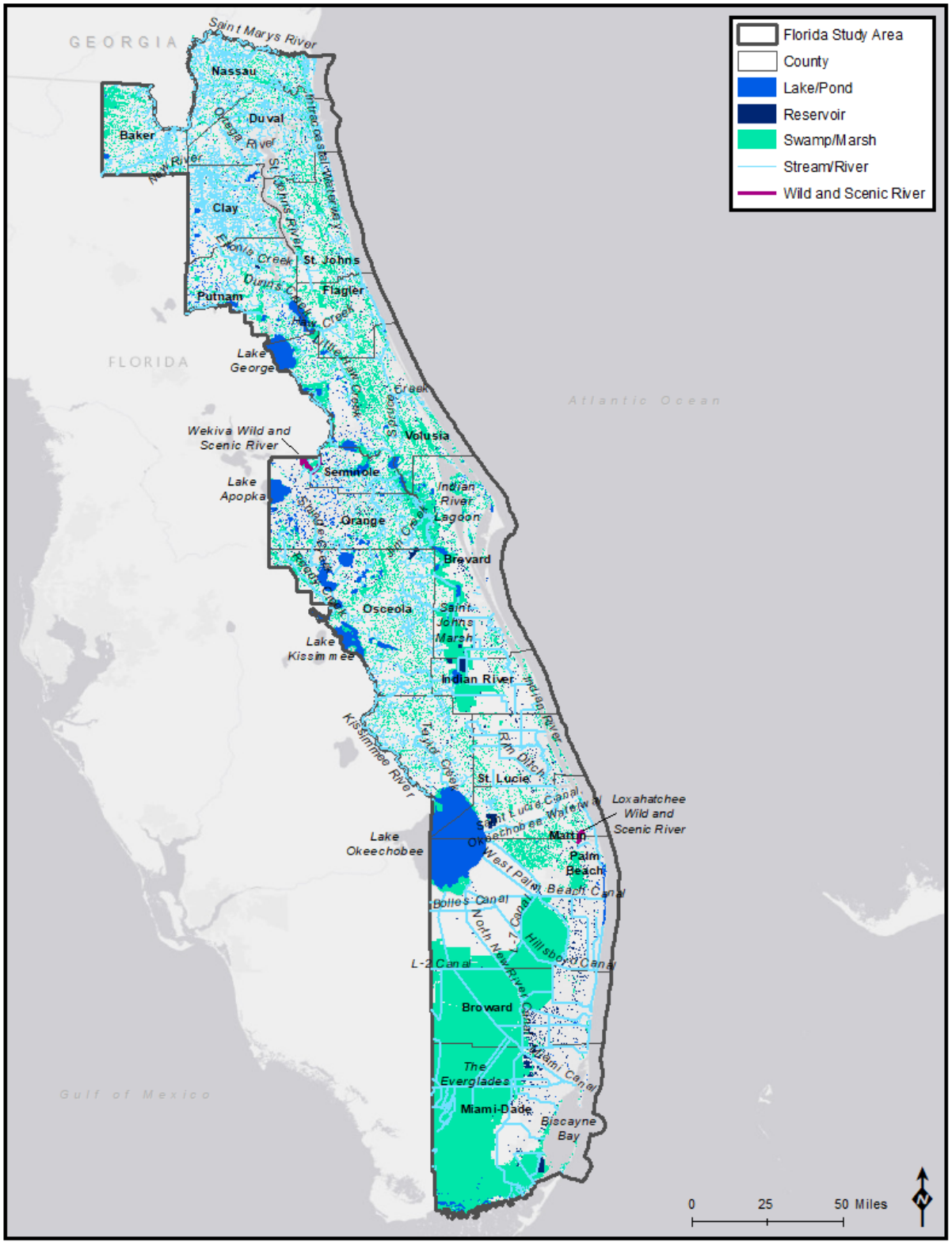
The Metadata database for Florida specific State, county, and local data sources is included in Appendix A.

17.2 Physical Characteristics

This section provides a brief description of the physical characteristics of the land area located within the defined project area. Physical characteristics include water resources and physical vulnerability for the various counties included within the Study Area.

17.2.1 Water Resources

Florida's water resources include lagoons and bays, rivers, floodplains, marshes, wetlands, and groundwater. Water resources may shape existing and future land uses as well as population density. The following sections describe the various water resources within the Study Area. Figure 17-3 shows the major surface water bodies within the Study Area. Many of these water bodies are protected, as discussed in Chapter 17.3.2.5.



Source: USGS 2019e

Figure 17-3. Hydrography in the Florida Study Area

As shown in Figure 17-4, the eastern coastal region of Florida within the Study Area includes designated critical habitat for multiple species onshore and offshore. Onshore, critical habitats have been designated for the frosted flatwoods salamander, Florida leafwing butterfly, Bartram's hairstreak butterfly, Cape Sable seaside sparrow, Everglade snail kite, Cape Sable thoroughwort, Florida brickell-bush, Carter's small-flowered flax, and Florida semaphore cactus. For species that occur in shoreline, estuarine, and marine habitats, critical habitats have been designated for the American crocodile, West Indian manatee, South Atlantic distinct population segment of the Atlantic sturgeon, loggerhead sea turtle, North Atlantic right whale, elkhorn coral, staghorn coral, and Johnson's grass. Critical habitats for the piping plover and loggerhead sea turtle are on beaches and barrier islands along the coastline, and critical habitat for the Atlantic sturgeon is in the St. Marys River at the Georgia border. Critical habitat for the manatee includes the St. Johns River and the coast of the Florida peninsula (USFWS 2019d). Offshore of the coastline from north to central Florida is critical habitat for the North Atlantic right whale (southeastern U.S. calving area). The Everglades provides critical habitat for the Everglade snail kite and the extreme southern end of the Everglades provides critical habitat for the Cape Sable Seaside sparrow (USFWS 2019f, USFWS 2019g). The southern tip of the peninsula provides critical habitat for the American crocodile (USFWS 2019h).

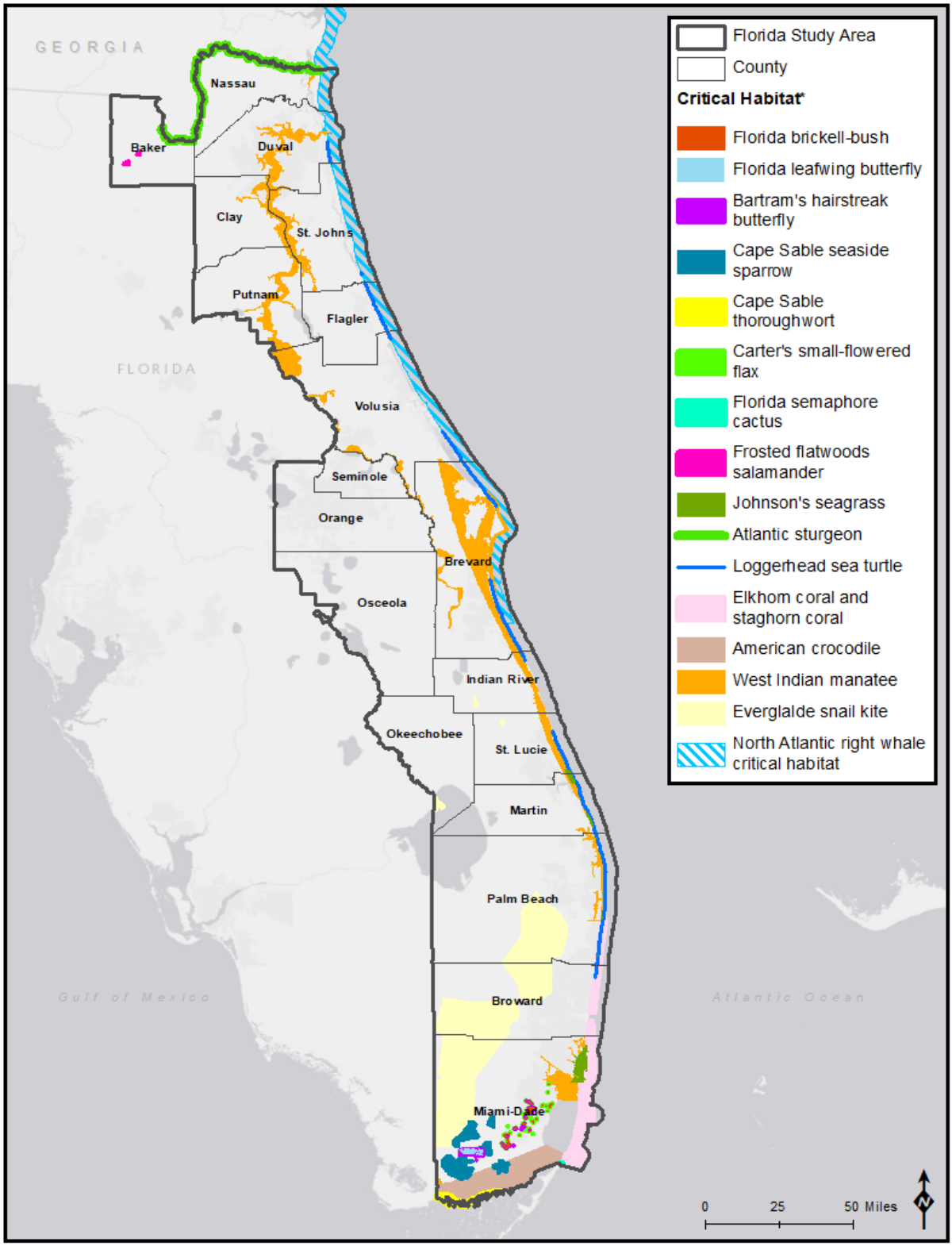
17.2.1.1 Lagoons and Bays

The Study Area includes two bays: the Indian River Lagoon and the Biscayne Bay. Shown in Figure 17-3, these shallow waterbodies are estuaries; bodies of water where fresh and salt water mix. Barrier islands shielding these estuarine lagoons also protect the Florida mainland from the tidal energy of the Atlantic.

The Indian River Lagoon spans 156 miles of Florida's Atlantic Coast from Volusia to Martin County and acts as an estuary where freshwater and seawater combine between mainland Florida and barrier islands. Comprised of three main waterways, the Indian River Lagoon contains Mosquito Lagoon, Banana River, and Indian River. Listed as an Estuary of National Importance, the Indian River Lagoon is one of the most biodiverse estuaries in North America with more than 4,000 species of plants and animals including manatees and dolphins. During storm events, large volumes of freshwater from Lake Okeechobee enter the southern portion of the Indian River Lagoon through the St. Lucie Estuary, bringing contaminants and greatly impacting the lagoon's salinity. Algal blooms and toxic cyanobacterial blooms threaten recreational health and aquatic life in the lagoons. Water circulation is primarily wind-driven and water exchange with the Atlantic is through breaks in the barrier islands; tides are only influential near these inlets. (IRLNEP 2018, IRLNEP 2019, USACE 2019e, FAU 2013).

Spanning almost the entirety of the Miami-Dade coast, the Biscayne Bay is a shallow lagoon between mainland Florida and barrier islands where freshwater and seawater mix. The Biscayne Bay includes vast expanses of seagrass; providing an important habitat for shrimp, crabs, and lobster as well as an important food source for the endangered manatee. Biscayne Bay also includes an extensive mangrove forest, capable of withstanding salt water and tidal fluctuations, mangroves provide coastal protection along with important habitat for many species. Canals deliver large volumes of freshwater from storm events; disrupting the bay's salinity (FDEP 2018, USACE 2019e).

Tropical storm events in Florida can deliver more than 20 inches of rain a day. To help alleviate damage, drainage and flood control canals channel water away. Some of these canals deliver large amounts of freshwater from the Florida mainland to the Indian River Lagoon and Biscayne Bay; disrupting the salinity conducive to their unique biodiversity. Restoration efforts to remove nutrient and pollution loads along with reducing the deluge of water directly into the lagoons includes constructing and rehydrating wetlands. Future projects located within and around the Indian River Lagoon and Biscayne Bay will need to consider current regulatory requirements associated with construction (in-water work, runoff, etc.) and any operational discharge. The protection afforded by the barrier island influences population distribution and land use/land cover along with maritime industry and maritime jobs in the region (UF 2019).



Sources: USFWS 2019i, USFWS 2019j

Figure 17-4. Critical Habitat within the Florida Study Area

17.2.1.2 Rivers and Lakes

Within the Study Area, major drainage areas include the St. Johns River, the Kissimmee River, and the Everglades, all flowing into the Atlantic Ocean. Most of Florida's 7800 freshwater lakes are karst lakes (UF 2019, Means 2015).

St. Johns River Basin

The St. Johns River Basin includes the longest river in Florida; the St. Johns River which runs along the eastern side of the State and through the Study Area. An American Heritage River, the St. Johns River encompasses 310 miles, flowing slowly north through exceptionally flat terrain to the Atlantic. With headwaters less than 30 feet above mean sea level, the St. Johns River begins at the St. Johns Marsh in southern Brevard County, before flowing north to touch Osceola County, then broadly ascribing the edges of Orange and Seminole counties, before diving into Lake County where it widens forming Lake Harney, Lake Jesup, and Lake Monroe. Joined by the Wekiva and the Ocklawaha Rivers, the St. Johns forms Lake George in Lake, Volusia, and Putnam counties. Continuing northward from Putnam County, the St. Johns River ascribes the St. Johns County border with Putnam and Clay counties before turning eastward at Jacksonville to flow into the Atlantic Ocean (Jacksonville EPB 2019).

The St. Johns River System includes many lakes including two of the largest lakes in Florida, Lake Apopka and Lake George. Located in Orange and Lake counties, Lake Apopka is the headwaters of the Ocklawaha Chain of Lakes flowing northward to the Ocklawaha River, which flows into the St. Johns River. A total of 760 acres of constructed wetlands are helping to remove excess phosphorus and suspended matter from Lake Apopka. The St. Johns River widens in Volusia and Putnam counties into Lake George, Florida's second largest lake. Part of the St. Johns navigable waterway, Lake George provides habitat for alligators along with sufficiently saline waters for Atlantic stingray and blue crabs (SJRMD 2019a, SJRMD 2019b, Skolte 2013).

Fed by runoff and springs, the St. Johns River discharges about 8,300 cubic feet a second, or 5.4 billion gallons per day, into the Atlantic. Tidal flow at the mouth of the river at Mayport in Jacksonville, Florida is estimated seven times the volume of outflow, often resulting in flow upriver as far as Lake Monroe 160 miles upstream. Significant saltwater springs flowing into St. Johns River include Blue Springs, Salt Springs, Silver Glen Springs, and Croaker Hole Springs; these salty springs can cause localized areas of salinity in excess of 5 parts per trillion. Low decay of plants from swamps connected to the St. Johns River provide dissolved organic matter coloring the water black and limiting photosynthesis to a shallow layer near the surface. Climate change influenced sea levels are estimated to raise the St. Johns River by 1 inch per decade, or 0.1 inch per year (Jacksonville EPB 2019).

Kissimmee River Basin

Beginning near Orlando, Florida, the 3,000-square mile Kissimmee River Basin includes lakes, floodplains, and the Kissimmee River on its journey to Lake Okeechobee. The headwaters of the Kissimmee River encompass more than two dozen lakes, culminating at Lake Kissimmee in Osceola and Polk counties. Lake Kissimmee becomes the Kissimmee River, flowing south to Lake Okeechobee. Once broadly meandering for more than a hundred miles through central Florida, the Kissimmee River was straightened in the 1960s; replaced with a 300-foot-wide, 30-foot-deep canal (C-38). Since 1992, efforts to restore the river and floodplain ecosystem include oxbow restoration and backfilling more than 21 miles of canal. Restored areas of the Kissimmee River have increased dissolved oxygen levels; helping restore wetlands and providing habitat for aquatic life and waterfowl including largemouth bass and the endangered snail kite. Kissimmee River provides more than 60% of Lake Okeechobee's water (Skolte 2013, USACE 2019a, USACE 2019b, USACE 2019c, FAU 2019).

Lake Okeechobee

Located in Palm Beach, Okeechobee, Martin, Glades, and Hendry counties, Lake Okeechobee is the second largest freshwater lake in the continental United States. About 9 feet deep, Lake Okeechobee is approximately 37 miles long and 30 miles wide. Lake Okeechobee receives most of its water from the Kissimmee River along with Fisheating Creek and Taylor Creek. Historically, Lake Okeechobee spilled south into the Everglades, slowly flowing south, southwest to the Gulf of Mexico and the Atlantic (Skolte 2013, USACE 2012a).

Present day Lake Okeechobee provides navigation, flood control, and recreation along with agricultural, municipal, and industrial water supplies. Construction of canals, dikes, and levees altered the flow of Okeechobee Lake. Canals were constructed between 1880 and 1930 connecting Lake Okeechobee with the Caloosahatchee River and with the St. Lucie River; helping divert overflows from the peat-rich Everglades to the south. Together, the lake and these canals along with several locks (Ortona Lock, W.P. Franklin Lock, Moore Haven Lock, Port Mayaca Lock, and St. Lucie Lock), comprise the Okeechobee Waterway, stretching across Florida from the Gulf of Mexico to the Atlantic Ocean (Skolte 2013, USACE 2012a, USACE 2018a, USACE 2019d).

Water levels in Lake Okeechobee are tightly managed to maintain an optimal 12.5- to 15.5-foot depth through the waterway. Because 3-inches of rain over the watershed can result in a 1-foot increase in lake depth and because 1-foot of rainfall from a tropical storm can produce a 4-foot increase in lake levels within a few days, water levels in and around Lake Okeechobee are highly managed. Flood and flow control are greatly influenced by the Herbert Hoover Dike, which encircles most of the lake. Begun in the 1930s, the Herbert Hoover Dike includes 143 miles of 35-foot embankment, along with culverts, pump stations, spillways, and locks. The direction of water flow, either into or out of the lake, is dependent on the water and flood protection needs of the area at that time. Because the main land use in the Kissimmee River and the Fisheating Creek watersheds feeding into the Okeechobee Lake is agriculture, including citrus and ranching; a ready source for nitrogen and phosphate runoff is available. Huge man-made filter marshes using submergent and emergent aquatic vegetation as stormwater treatment areas to pull nutrients out before the water enters the Everglades ecosystem are located downstream. Because extreme overflows through this shallow natural system could disrupt the cleansing process, flows may be reversed from Lake Okeechobee towards the watersheds in extreme storm events (Skolte 2013, USACE 2012a, USACE 2018a, USACE 2019d).

National Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. §§ 1271 *et seq*.) to preserve certain rivers with outstanding natural, cultural, and recreational values in free-flowing condition for the enjoyment of present and future generations. The State of Florida has approximately 25,949 miles of river; only two rivers, totaling 49.2 miles, are designated as wild and scenic. Both of Florida's designated wild and scenic rivers are located within the Study Area: the Loxahatchee River and the Wekiva River System (NWSRS 2019a).

The Loxahatchee Wild and Scenic River, encompassing 7.6 miles, is located on the southeast Florida coast, flowing through Martin and Palm Beach counties. While currently home to a variety of terrestrial plants and animals, the Loxahatchee River environment continues to strive towards its historical, greater freshwater flow and the return of robust stands of Bald Cypress. The threatened West Indian manatee regularly frequents the Loxahatchee River (NWSRS 2019a, FDEP 2010).

In northern central Florida, the Wekiva Wild and Scenic River System comprised of the Wekiva River along with the Rock Springs Run, the Wekiva Springs Run, and Black Water Creek, encompasses 41.6 miles of waterways reaching to its confluence with the St. Johns River. Located in Orange,

Seminole, and Lake Counties, the Wekiva River system is recharged through surface runoff and springs. This dynamic water flow provides ideal conditions for pine flatwoods, hardwood hammocks, prairies, swamps, and marshes. The threatened West Indian manatee regularly frequents the Wekiva River System (NWSRS 2019a, NWSRS 2019b).

17.2.1.3 Groundwater and Springs

Underlain by several thousand feet of carbonate rock, present day Florida is shaped by its karst topography with a vast network of caves, springs, and lakes; many supplied by karst influenced groundwater. Groundwater supplies 90% of Floridians' drinking water. The Floridan Aquifer System (FAS) underlies much of the Coastal Plain stretching coast-side of the Fall Line from Mississippi through Florida up to South Carolina. In Florida, the FAS lies beneath the thin, unconsolidated sand beds of the surficial aquifer and the confined sand beds and limestone lenses of the intermediate aquifer. The Biscayne Aquifer, another surficial aquifer, supplies water for the southeastern tip of Florida where the FAS is brine. Underlying all of Florida, the FAS is a thick sequence of carbonate rocks ranging from less than 200 feet thick in the northwest, to more than 2,000 feet thick in the northeast, and more than 3,400 feet thick in the Everglades. Confining units for the FAS are highly variable and overburden ranges from less than 50 feet along the Ocala Uplift in the northwestern peninsula to nearly 2,000 feet at the southern tip (FDEP 2000, FDEP 2019a, FGS 2004).

As water passes through the limestone of the Biscayne Aquifer and the limestone and dolostone of the FAS it slowly dissolves the calcium carbonate in the rock resulting in the formation of cracks and voids over time which can eventually grow into caves and sinkholes. The voids, caves, and sinkholes are known as karst features. These karst features may store large volumes of water. The Biscayne Aquifer supplies Miami-Dade County. While not present throughout the State, the Intermediate Aquifer supplies municipal water for Charlotte, Glades, and Sarasota Counties. In Florida, the relatively overburden-free Ocala Uplift is a major recharge area of the FAS. Rain falling along the Ocala Uplift is quickly diverted underground to the Ocala formation, a major contributor in the upper FAS. The FAS Aquifer provides most of Florida's water needs (USGS 1990, Means 2015, FDEM 2018, Walker 2019).

Florida has more than 700 identified springs. Florida classifies springs based on average discharge with Magnitude 1 exhibiting more than 100 cubic feet per second, Magnitude 2 springs discharge an average between 10 and 100 cubic feet per second , and Magnitude 3 discharge 1 to 10 cubic feet per second or, on a daily rate, more than 64.6 million gallons a day, 6.46 to 64.6 million gallons a day, and 0.646 to 6.46 million gallons a day, respectively. Florida has tabulated more than 33 Magnitude 1 springs along with 191 Magnitude 2 and 151 Magnitude 3 springs. The FAS supplies most of Florida's springs. Springs provide water for streams, rivers, and lakes. Springs can also occur in the ocean. The majority of Florida springs are freshwater (FDEP 2000, FDEP 2019a, FGS 2004).

Management of water rights and Florida water necessitates balance between public, commercial, and natural demands. Specifically, in Florida, groundwater extraction is an increasing concern due to the prevalence of spring water bottling plants. According to research by the Florida Springs Institute, average spring flows in Florida declined by 32% between 1950 and 2010 as a result of groundwater extractions increasing by 400%. The same research panel predicted that increased groundwater extractions need to be reduced by 50% or more in North Florida to restore average spring flows to 95% of their previous levels (Howard T. Odum Florida Springs Institute 2018). A recent concern over a groundwater withdrawal permit has made national news in Gilchrist County (outside of the Study Area). A Florida water processor, Seven Springs Water Co., has requested renewal of their expiring 20-year permit to pump 1.152 million gallons a day from the Ginnie Springs complex in Seven Springs, primarily due to acquisition of the bottling plant by Nestle Waters North America (Nestle), who plan to expand operations. Previous operations pumped significantly less water than was permitted; however, Nestle's planned operations include the full permitted extraction amount. Opponents to the project are concerned that the

additional extraction will impact adjacent wetlands and rivers fed by the source spring (Olexa et al. 2017, Borisova and Rogers 2018, Borisova and Wade 2017, Swirko 2019, NWNA 2019). This example is provided for consideration since future developments may require large amounts of water and management of water rights will be necessary. As aquifers in question may extend beyond the Study Area, future OCS-related projects may need to consider or at least be aware of groundwater related concerns in adjacent areas. As per the Florida Water Resources Act, Chapter 373, all water in Florida, whether surface water or groundwater, is a public resource managed by FDEP and the local water management districts. Early involvement of the public, the local water management district, and FDEP is critical to garnering their support in accessing this public resource for the life of the project. Alternative water sources to groundwater and methods for minimizing possible impacts from industrial water usage must be considered in project design (Olexa et al. 2017, Borisova and Rogers 2018, Borisova and Wade 2017, Swirko 2019, NWNA 2019, Geosyntec Consultants 2019).

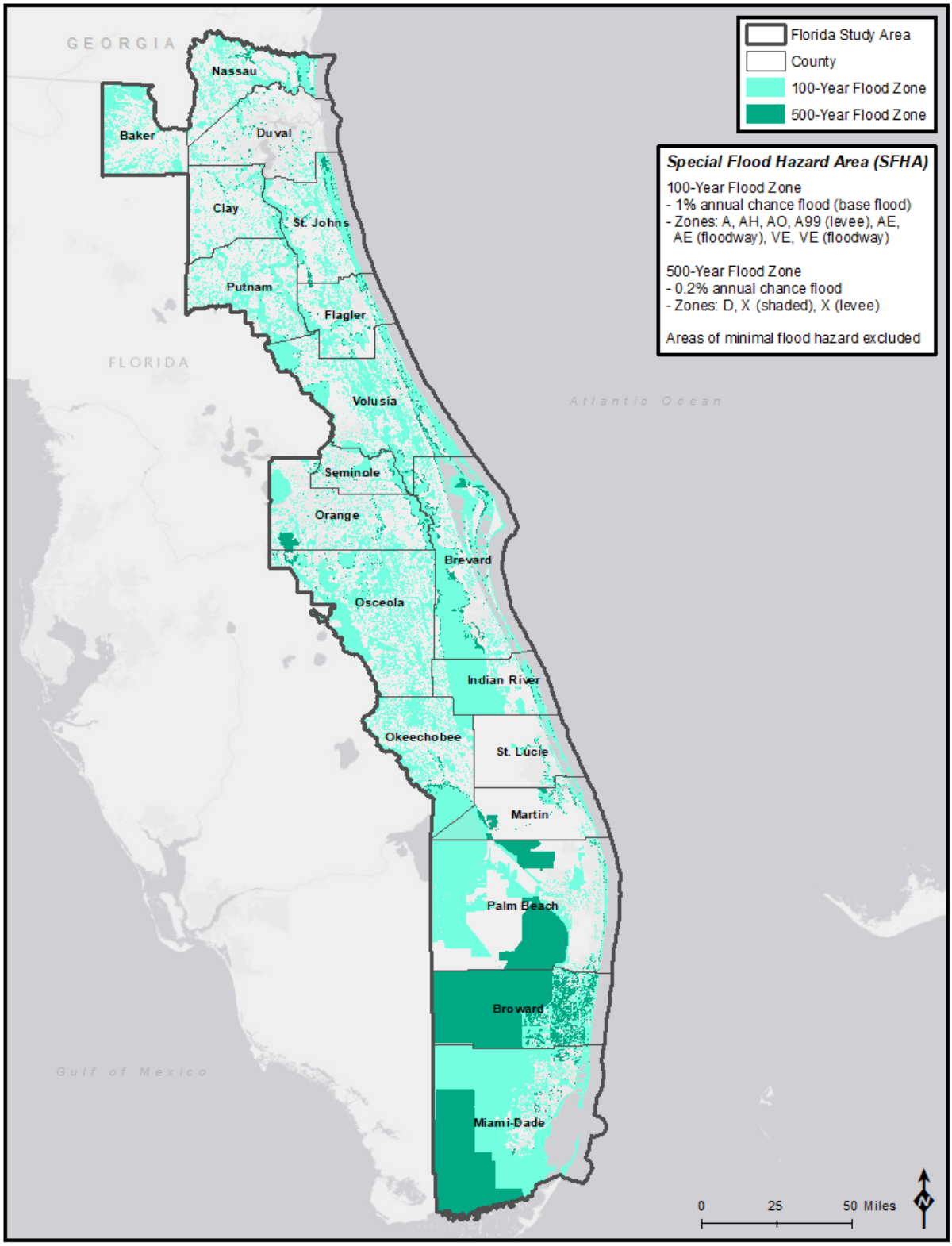
17.2.1.4 Floodplains

Low-lying areas near coasts or rivers subject to flooding are floodplains. The elevation of the maximum flood level with a 1% chance of occurring within any given year is the 100-year flood zone. Areas with a 0.2% chance of flooding in any given year are identified as the 500-year flood zone (FEMA 2019a). Chapter 1.4.1.5 describes EO 11988 Floodplain Management and Federal agencies responsibilities regarding development within floodplains. Future projects within the Study Area would be subject to EO 11988. Therefore, the locations of floodplains contribute to the understanding of land use in the Study Area and will likely shape site selection for proposed future OCS-related projects.

As seen in Figure 17-5, floodplains are a large part of the land area of many counties in the Study Area. Table 17-1 details the flood zone acreage within the Study Area. The Study Area is 37.5% 100-year flood zone and additional 2.8% 500-year floodplain. Management of floodplains includes proper siting of communities and infrastructure to minimize exposure. Promoting and protecting wetlands in floodplains can also help minimize adverse consequences from flooding.

17.2.1.5 Wetlands

Inundated with water, wetlands are areas that support a prevalence of vegetation adapted to saturated conditions. Chapter 1.4.1.1.3 describes Section 404 of the CWA (33 U.S.C. § 1344), EO 11990 (Protection of Wetlands), and Federal agencies responsibilities related to wetlands under these regulations. As seen in Figure 17-6, wetlands are a large part of the land area in the Study Area. The Study Area contains a total of 6,027,149 acres of wetlands and surface waters regulated by the CWA. Of these, there are 260,808 acres of estuarine/marine wetlands, 1,972,048 acres of emergent wetlands, 1,517,470 acres of freshwater forested/shrub wetlands, and the remaining 3,750,326 acres account for lakes, rivers, ponds, and other open waters. As described in more detail in Chapter 1.4.1.6, the FGDC groups wetlands by hydrology (or the degree of soil saturation), vegetation type (wetland specific species), and soil (hydric soils being most common in wetlands). Table 17-2 details the wetland acreage in the Study Area along with other water resources. (FGDC 2013, USFWS 2019c).



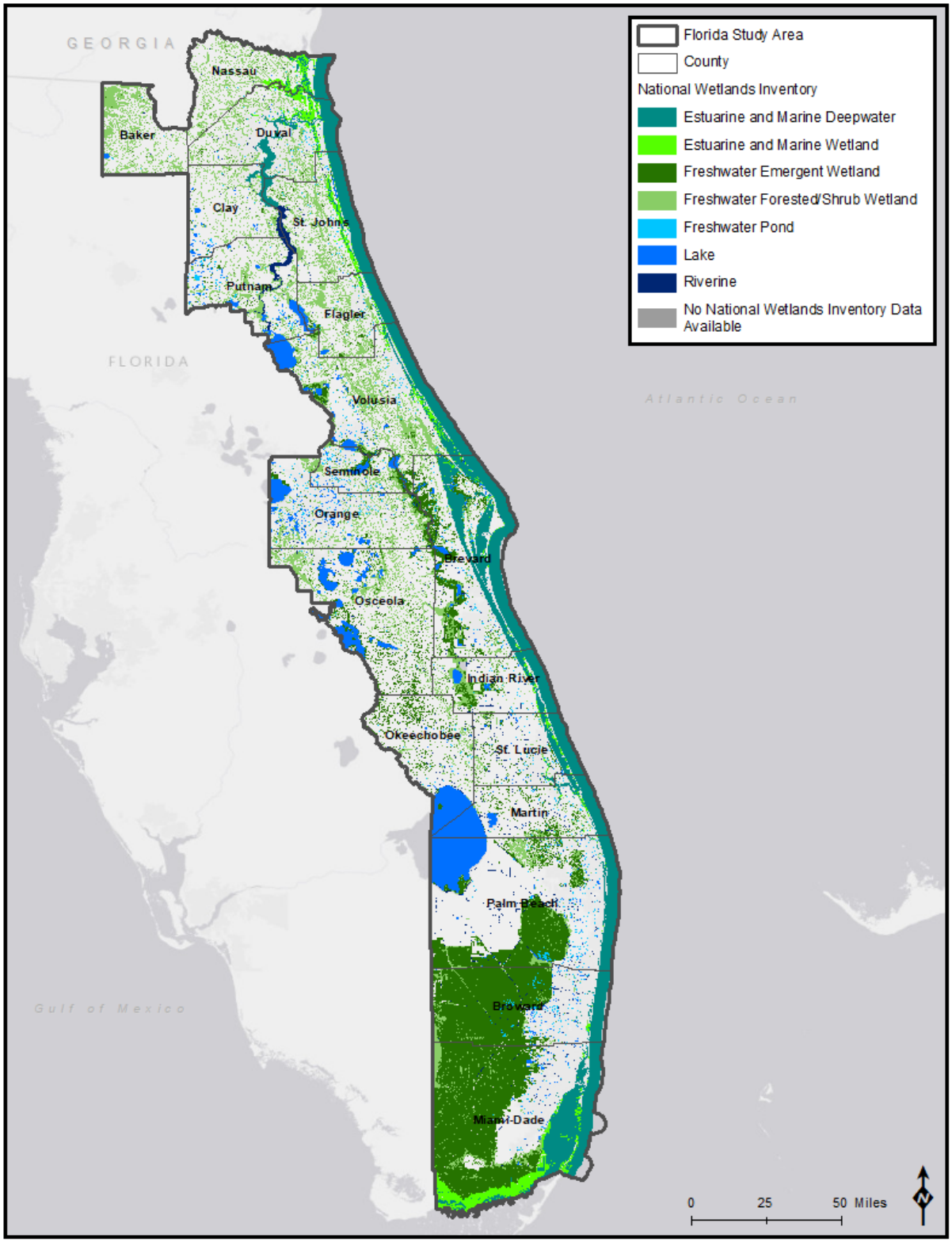
Source: FEMA 2019b

Figure 17-5. Floodplains of the Florida Study Area

Table 17-1. Floodplains in the Florida Study Area (acres)

Geographic Unit	Floodplains (100 year) (acres)	Floodplains (100 year) (%)	Floodplains (500 year) (acres)	Floodplains (500 year) (%)
Baker	157,882	42.2	851	0.2
Brevard	525,586	80.9	54,215	8.3
Broward	111,516	14.5	118,220	15.4
Clay	100,007	25.8	3,755	1.0
Duval	154,682	31.7	17,286	3.5
Flagler	125,159	40.3	10,150	3.3
Indian River	222,200	69.1	3,322	1.0
Martin	43,592	12.5	22,194	6.4
Miami-Dade	715,558	58.9	15,363	1.3
Nassau	166,012	40.0	9,688	2.3
Okeechobee	304,837	62.0	9,747	2.0
Orange	210,125	36.4	9,806	1.7
Osceola	493,096	58.0	10,212	1.2
Palm Beach	505,963	40.2	15,788	1.3
Putnam	220,717	47.4	2,690	0.6
Seminole	75,379	38.1	6,202	3.1
St. Johns	176,206	45.8	18,523	4.8
St. Lucie	34,740	9.5	3,947	1.1
Volusia	418,712	59.4	21,431	3.0
Study Area Total	**4,761,969**	45.0	**353,393**	3.3

Source: FEMA 2019b
Note: Due to the vast quantity of data involved, floodplain totals are not provided at the State or national level. Floodplain acreage calculations include small bodies of water such as creeks, streams, rivers, and small ponds and lakes because these areas can fluctuate with water levels. Floodplain acreage calculations do not include large bodies of open water such as reservoirs and the ocean.



Source: USFWS 2018a

Figure 17-6. Wetlands in the Florida Study Area

Table 17-2. Wetlands in Florida Study Area (acres)

Geographic Unit	Total Wetlands	Estuarine and Marine Wetland	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Estuarine and Marine Deepwater	Lake	Freshwater Pond	Riverine
Baker	129,703	0	2,794	124,128	0	1,805	387	589
Brevard	567,978	9,463	131,413	76,480	310,889	21,583	10,400	7,751
Broward	602,377	1,300	470,874	40,721	58,166	8,789	14,798	7,728
Clay	92,665	251	3,887	59,279	10,080	9,460	2,517	7,191
Duval	234,229	36,464	5,078	95,187	90,543	1,242	4,048	1,668
Flagler	160,697	4,210	9,056	92,736	42,310	9,296	1,938	1,150
Indian River	161,618	4,152	30,829	42,542	66,273	8,860	3,707	5,255
Martin	199,894	3,112	33,681	21,236	62,485	68,690	3,836	6,854
Miami-Dade	1,180,426	128,583	694,980	78,883	260,876	8,321	4,554	4,228
Nassau	175,865	26,464	3,339	92,059	50,728	244	1,359	1,673
Okeechobee	175,739	0	63,947	29,457	0	72,700	2,433	7,201
Orange	204,970	0	31,959	101,289	0	55,705	11,743	4,274
Osceola	322,207	0	86,197	135,478	0	93,102	2,721	4,708
Palm Beach	693,248	961	310,934	73,991	110,156	156,296	18,178	22,732
Putnam	176,922	0	10,752	98,665	0	36,551	8,885	22,068
Seminole	88,876	0	16,798	44,628	0	20,133	5,549	1,768
St. Johns	263,330	21,666	7,790	99,110	113,530	2,147	3,412	15,675
St. Lucie	128,178	6,488	15,939	16,172	72,483	4,155	3,989	8,951
Volusia	468,227	17,695	41,802	195,429	136,277	63,347	9,053	4,624
Study Area Total	6,027,149	260,808	1,972,048	1,517,470	1,384,796	642,430	113,508	136,090

Source: USFWS 2018a

Note: Due to the vast quantity of data involved, wetland totals are not provided at the State or national level.

Of particular importance in the Study Area are the Everglades, a flat river of grass stretching from Lake Okeechobee to the southern tip of the Florida peninsula that was once a vast wetland area; filtering water, protecting against floods, and providing habitat. Minor variances in elevation resulted in areas of sawgrass marshes, flood tolerant cypress trees, hardwood hammocks, mangrove swamps, and fire-tolerant slash pines. Canals, roads, and levees have changed the landscape, moving the primary Lake Okeechobee waterflow from the Everglades to the Caloosahatchee River and the St. Lucie River. Additionally, four more canals (West Palm Beach Canal, the Hillsboro Canal, the North New River Canal, and the Miami Canal) provided further drainage for the 700,000-acre Everglades agricultural area directly south of Lake Okeechobee, further altering the water flow to primarily east, southeast into the Atlantic (USACE 2012a, USACE 2018a, Florida Museum 2018, Florida Oceanographic Society 2013).

The South Florida Ecosystem Restoration Plan, restoring the Everglades and over 2.4 million acres of south and central Florida, is underway. Planned improvements under South Florida Ecosystem Restoration include restoring the Kissimmee River transit and filter time by rebuilding much of its previous meanders; thus improving the health of Lake Okeechobee, while increasing the volume of stormwater treatment areas to funnel a much larger portion of the lake overflow south to the Everglades. Diminishing the flow to the Caloosahatchee River and the St. Lucie River will reduce the sediment and freshwater stress on their estuaries. Increasing flow to the south through the Everglades will aid in providing enough water flow and retention through the Everglades; ultimately providing freshwater to Florida Bay (USACE 2012a, USACE 2018a).

Recognizing that wetlands provide habitat, reduce flood impacts, and improve water quality, counties in the Study Area are taking an active role to promote and protect these wetlands. Protected areas are discussed in Chapter 17.3.2.5. The extensive network of interconnected marshes, streams, rivers, and lakes located within and immediately adjacent to the Study Area are natural features shaping land use and population distribution throughout the coastal region. The impacts of water resources on current and future land use are discussed in Chapter 17.3.2.1.

17.2.2 Physical Vulnerability

Coastal communities are increasingly vulnerable to climate driven effects such as sea level rise and storm surge from hurricanes. Major disaster declarations in Florida are primarily due to Hurricanes (38%) and a combination of storms, flood, and tornados (39%) (FDEM 2018). NOAA has conducted data gathering and modeling to assist communities in developing vulnerability assessments to facilitate planning and future decision making. Global sea level has been steadily rising for the past several decades and has two primary causes: thermal expansion caused by warming of the ocean (driven by atmospheric warming) and increased melting of land-based ice, including both ice sheets and glaciers. At present, sea level is rising approximately 1/8 inch per year on average, although rates vary greatly depending on local geography (Lindsay 2019).

Long before sea level rise permanently submerges new land, it will make its presence felt through higher and more frequent coastal floods because of increased nuisance flooding from higher tides and because higher seas raise the launch pad for storm surge (Strauss et al. 2014). According to NOAA reports, high tide flooding has increased between 300 and 900% along U.S. coasts since 1960 (Sweet et al. 2014). The vulnerability of coastal communities from increasing coastal hazards is important for planning because population density in Florida coastal areas reflects the national trend for increasing population growth in the coastal areas. The socioeconomic impacts of this relationship are discussed in Chapter 17.4.

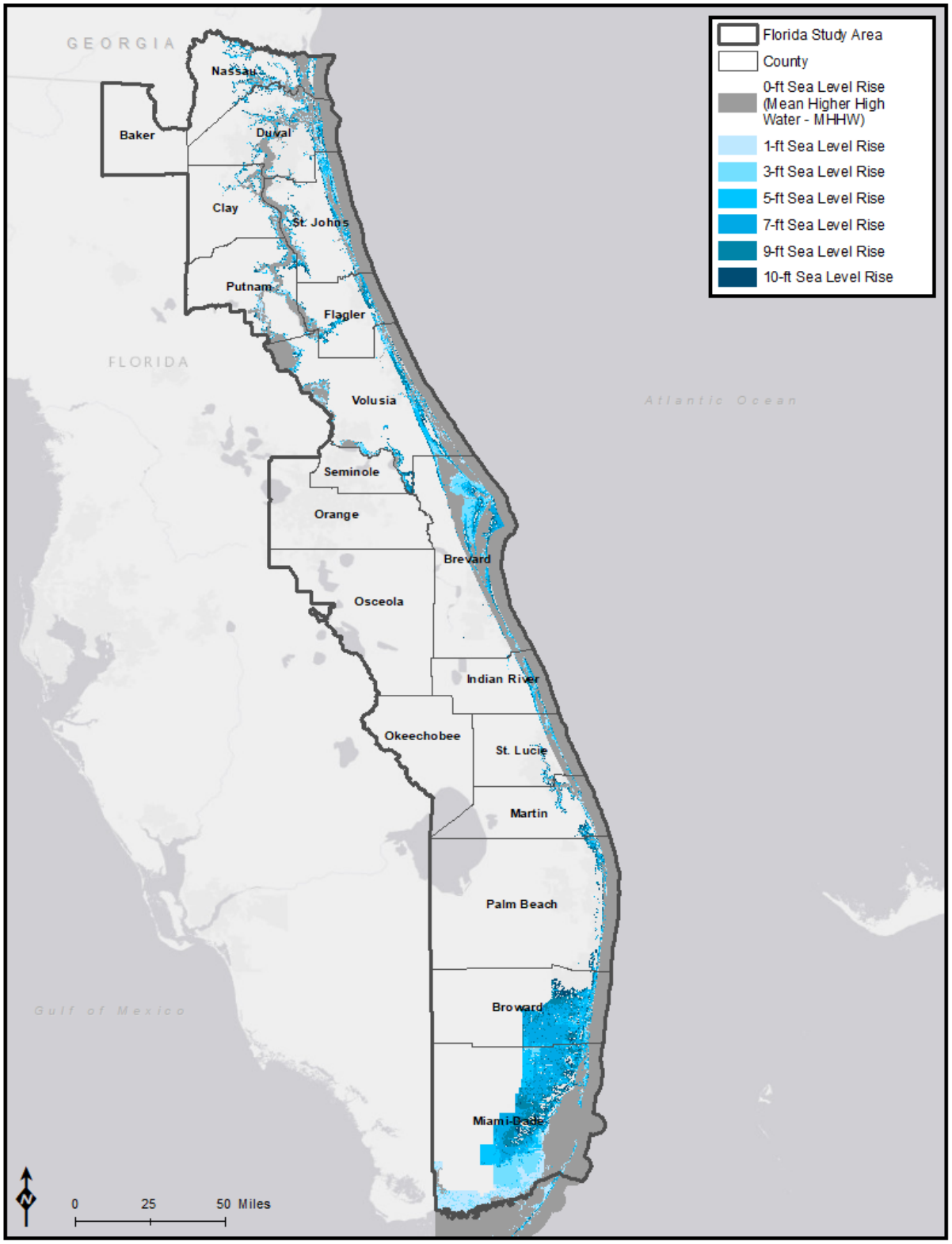
17.2.2.1 Sea Level Rise

Florida is vulnerable to sea level rise given its extensive shoreline and low elevation. Rising sea levels would result in gradual coastal inundation, increased height of high tides, further inland reach of tidal influence (including groundwater intrusion), and landward expansion of coastal flood zones. Through a combination of direct inundation and erosion, rising sea levels also cause recession of both beaches and coastal wetlands (FDEM 2018). In 2012, NOAA scientists conducted a review of the research on global sea level rise projections and concluded that there is very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches (0.67 feet) but no more than 6.6 feet by 2100 (Church and White 2011, Lindsay 2019). Exposure to sea level rise and coastal flooding is spread throughout the entire State of Florida but is most pronounced in Southeast Florida. Sea level analysis projects a main range of local sea level rise in Florida from 8-15.6 inches (0.6-1.3 feet) by 2050 and 20.4-56.4 inches (1.7-4.7 feet) by 2100 at Key West (as a general proxy for Southeast Florida) using sea level in 2012 as the baseline (Strauss et al. 2014). According to NOAA measurements of relative sea level trends using tide gauges throughout the US, the average Linear Relative Mean Sea Level rate for the Florida Study Area is 0.10 inches/year (NOAA 2019b).

Figure 17-7 shows the NOAA results for projected sea level rise in the Study Area. These sea level rise data depict the potential inundation of the coastal areas as a result of 0- to 10-foot rise in sea level above current mean higher high-water conditions and do not take into account rates of sea level rise, either current or projected, either at global or local levels. It also does not take into account local effects from geology (subsidence or vertical land movement) or physiological effects like erosion. Sea level rise is projected to impact areas in Florida primarily along the immediate coastline, barriers islands, and along the St. Johns River. Miami-Dade and Broward Counties are projected to experience the greatest aerial extent of impacts within the Study Area (NOAA 2018a). This projected rise does not take into account other potential factors that can influence sea level such as subsidence and hydrography changes. The Study Area includes three counties determined to have property and housing exposure rates disproportionately higher than the statewide averages; they are St. Johns, Miami-Dade, and Broward Counties (Strauss et al. 2014).

17.2.2.2 Storm Surge

Along most of the Atlantic Coast of Florida, a narrow continental shelf, or one that drops steeply from the shoreline, tends to produce a lower surge but higher and more powerful storm waves, with the exception of south Miami-Dade County due to Biscayne Bay (FDEM 2018). Storms and storm surges are predicted to increase in frequency, duration, and destructive impacts with climate change (Climate Central 2018).



Source: NOAA 2018a

Figure 17-7. Projected Sea Level Rise throughout the Florida Study Area

The National Hurricane Center forecasts storm surge using the SLOSH model, which stands for Sea, Lake, and Overland Surges from Hurricanes. The model considers hurricane characteristics as well as local physical characteristics on land and in the water (FDEM 2018). Figure 17-8 shows the NOAA projections for storm surge throughout the Study Area associated with a Category 4 hurricane. This Figure presents the worst-case scenario for storm surge that was available in the current data; however, a Category 5 hurricane could feasibly strike the Florida coastline. It is assumed that storm surge under that worst-case scenario would be incrementally further inland in certain areas as compared to the Category 4 scenario. Storm surge is projected to impact areas in Florida primarily along the western and northeastern coasts. Of the counties included in this study, Miami-Dade County is projected to experience impacts over the largest area. Other storm surge impacts are projected to be limited to the immediate coast, barrier islands, and along the St. Johns River system in the northeast (NOAA 2019e).

17.2.2.3 Hazard Planning and Mitigation

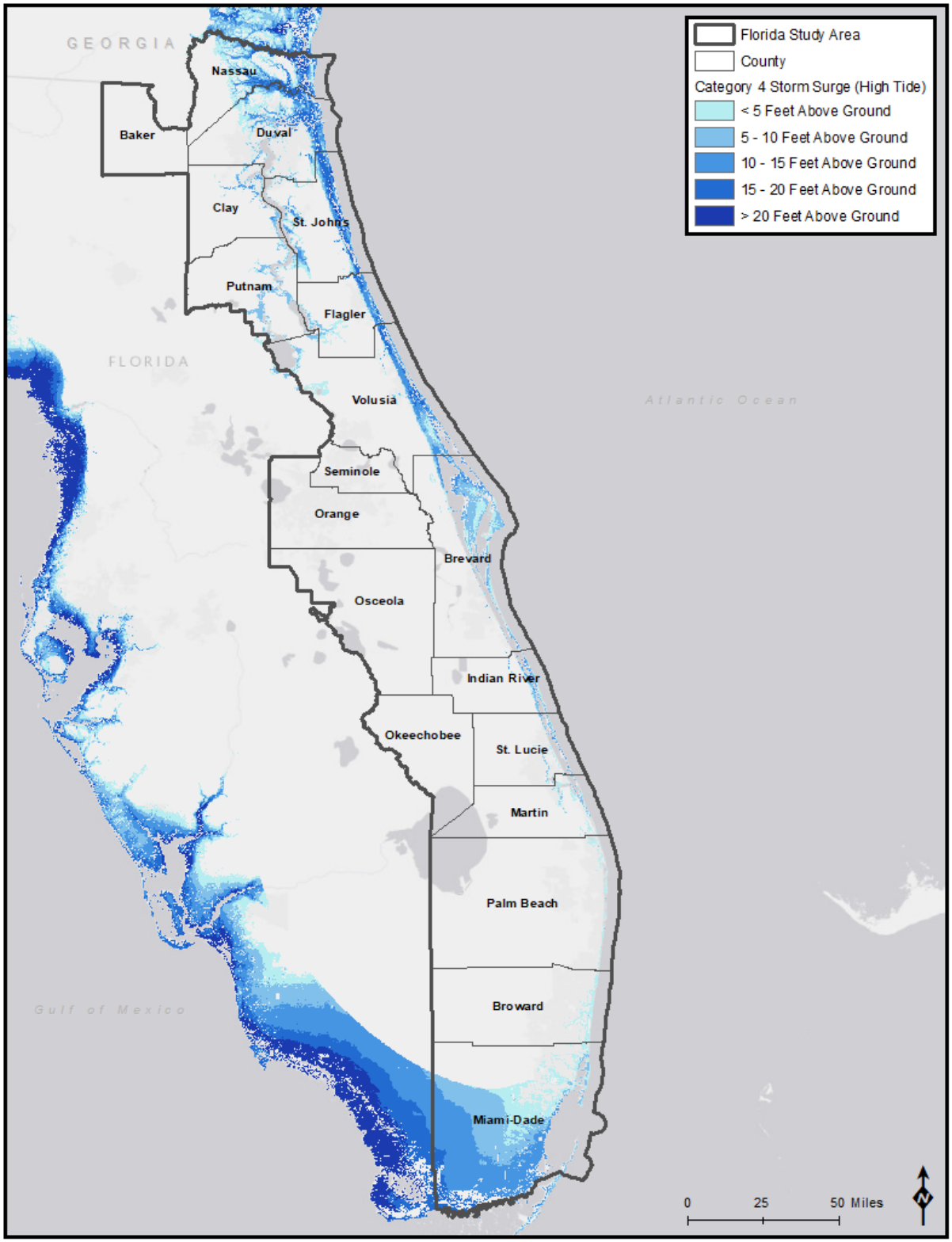
In its mission to plan for and respond to both natural and man-made disasters, the Florida Division of Emergency Management prepares and implements a statewide Comprehensive Emergency Management Plan (FDEM 2018). Additionally, all Florida counties have a multi-jurisdictional, multi-hazard local mitigation strategy. Because of the interrelationship among coastal development, increasing populations in hazardous areas, and the loss of natural protective buffers to hazards, State and local hazard mitigation plans should be considered for any coastal development.

Florida Division of Emergency Management has prepared a County Hazard Ranking Matrix in which they rank counties for common threats at four subjective hazard ranking levels, High (H) for one or more occurrences a year, Medium High (MH) for one occurrence every three years, Medium (M) for one occurrence every 5-7 years, and Low (L) for one occurrence every 10 years. Using this County Hazard Ranking Matrix, Table 17-3 shows that counties in the Study Area are more likely to experience severe storms, flooding, and hurricanes than other threats (FDEM 2018).

17.2.3 Summary – Physical Characteristics

In summary, physical characteristics of the Florida Study Area influence land use and land cover, demographics and socioeconomics, and therefore are a contributing element to gaining a complete understanding of coastal land use with respect to potential future OCS-related projects in the Atlantic Region. The Study Area is characterized by relatively flat lowlands that transition from a little over 80 feet above mean sea level down to 0 feet above mean sea level at the coast (USGS 2019d). The topography of the Study Area, including the location of major rivers, lakes, marshes, and estuaries, has influenced where cities and towns as well as natural areas have been established. Though there are not extensive deposits of prime farmland in the Study Area, there are more widespread unique farmlands or farmlands of statewide importance. Some of these farmlands shape the locations of citrus plantations, a major export product for the State and, therefore, a significant contributor to the State's economy.

Florida's karst topography contributes to the occurrence of subsidence incidents which are most likely to occur in Volusia, Orange, St. Johns, Flagler, Putnam, Clay, and Seminole Counties within the Study Area. Reports of sinkholes in Florida have been increasing in recent years and can have an impact on local economies due to the damages that can occur and associated mitigation costs. Karst topography can also shape existing and future land use as landowners and developers seek to avoid subsidence issues. Because of the relationship among climate change (cyclic drought and heavy rain events) and the formation of sinkholes, we can expect sinkholes to continue with increasing occurrence.



Source: NOAA 2020a

Figure 17-8. Projected Storm Surge throughout the Florida Study Area for a Category 4 Hurricane

Table 17-3. County Hazard Ranking Matrix

Geographic Unit	Severe Storm	Flood	Hurricane/ Tropical Storm	Wildfire	Tornado	Drought	Extreme Heat	Erosion	Technological Incidents	Winter Storm	Freeze	Sinkholes	Terrorism	Seismic Events	Mass Migration	Dam Failure
Baker	H	H	H	H	M	H	H			L	L	L				
Brevard	H	H	H	MH	H	M	L	MH	M	L				L		L
Broward	H	H	MH	MH	H	M	MH	MH	H						L	
Clay	H	H	M	H	M	M	M		M	M	M	M	L	L		
Duval	H	H	H	H	L	L	L		M		L		L			
Flagler	H	H	H	H	H	L	H	MH	L				L			
Indian River	H	H	H	M	M	H	M	H	M	M	M	L	L	L		L
Martin	H	H	M	M	M	L	L	M	M			L	L	L	L	L
Miami-Dade	H	H	H	L	H	M		M		M						
Nassau	M		L	L	L	L	L	L	L		L					
Orange	H	H	H	H	H	H	H		H	M	M	H	M			
Osceola	H	H	H	H	H				L			L	H			
Palm Beach	H	H	H	L	L	M	L	L	M		L		L		L	
Putnam	H	MH	M	MH	M	MH	MH		L		M	M	L	L		L
Seminole	MH	H	H	MH	H	H	MH		H	L	L	M	M	L	L	
St. Johns	H	H	H	H	M	L	L	M	M	M	H		L			
St. Lucie	H	H	H	M	M	H	M	H	L		M	L			L	
Sumter	H	H	M	H	M	M	M		M		M					
Volusia	H	H	H	H	H	M	M	H		L	L	L				

Hazard Ranking Levels	H = High	MH = Medium High	M = Medium	L = Low	Not Identified

Source: FDEM 2018

Karst topography also allows for the prevalence of groundwater springs throughout Florida. While karst topography helps make Florida aquifers highly productive, it may also increase the vulnerability of these aquifers to contamination. By quickly funneling water from the surface into the aquifer, karst conduits bypass much of the filtering performed during a slower infiltration through sediments and rocks; thus allowing the runoff water to enter the aquifer more intact. This quick transport through karst enhanced waterways makes Florida aquifers and springs vulnerable to contaminants from the surface. Groundwater extraction for spring water bottling is an issue of growing concern in Florida. Any projects requiring groundwater extraction will require early involvement of the public, the local water management district, and FDEP in order to garner support to access Florida's water resources. Alternative water sources to groundwater and methods for minimizing possible impacts from industrial water usage must be considered in project design (Olexa et al. 2017, Borisova and Wade 2017, Borisova and Rogers 2018, Swirko 2019, NWNA 2019).

Water resources are a significant component of the Study Area and these resources shape existing and potential future land uses, population distribution, transportation corridors, and contribute to the State's economy. Florida's waters also provide critical habitat for the West Indian manatee, loggerhead sea turtle, Atlantic sturgeon, North Atlantic right whale, and American crocodile. Recognizing that wetlands provide habitat, reduce flood impacts, and improve water quality, counties in the Study Area are taking an active role to promote and protect these wetlands. Future OCS-related projects will need to make special note of the South Florida Ecosystem Restoration Plan, restoring the Everglades and over 2.4 million acres of south and central Florida. This restoration will have long-term impacts on land use within the region.

Because of its physical characteristics, in particular it's relatively flat and low-lying topography and extensive water resources, the Study Area is vulnerable to sea level rise, storm surge, and the combined effects of both. Projections for sea level rise impacts vary across the Study Area; south Florida has the potential to experience the most significant effects with a projected sea level rise of at least 20-56 inches (1.7-4.7 feet) by 2100, which is more than double the projected global sea level rise in that same period (Lindsay 2019, Strauss et al. 2014). Sea level rise and storm surge are projected to impact areas in Florida primarily along the immediate coastline, barriers islands, along the St. Johns River, and especially in Miami-Dade and Broward Counties. In St. Johns, Miami-Dade, and Broward Counties, property and housing exposure rates are disproportionately higher than the statewide averages due to the amount of development in low-lying areas. As a result of higher sea levels, storm surge would push further inland, resulting in more flooding in areas that have previously experienced flooding, and new flooding in areas that had not previously experienced flooding. Southern Florida, as will be shown in Chapter 17.4, has a large population that is growing at twice the national average. Florida also has a robust economy with a strong tourism component; therefore, the projected rise in sea level, storm surge impacts, and combined effects of the two could have a significant effect on the social systems and economy of southern Florida in the future. Over time, it is possible that significant flooding events could contribute to out-migration of residents and relocation of businesses from areas that are hardest hit by these phenomena.

17.3 Land Cover and Land Use

This section describes existing land cover and land use within the Study Area. These characteristics will shape how new OCS-related activity could influence life in coastal communities.

17.3.1 Land Cover

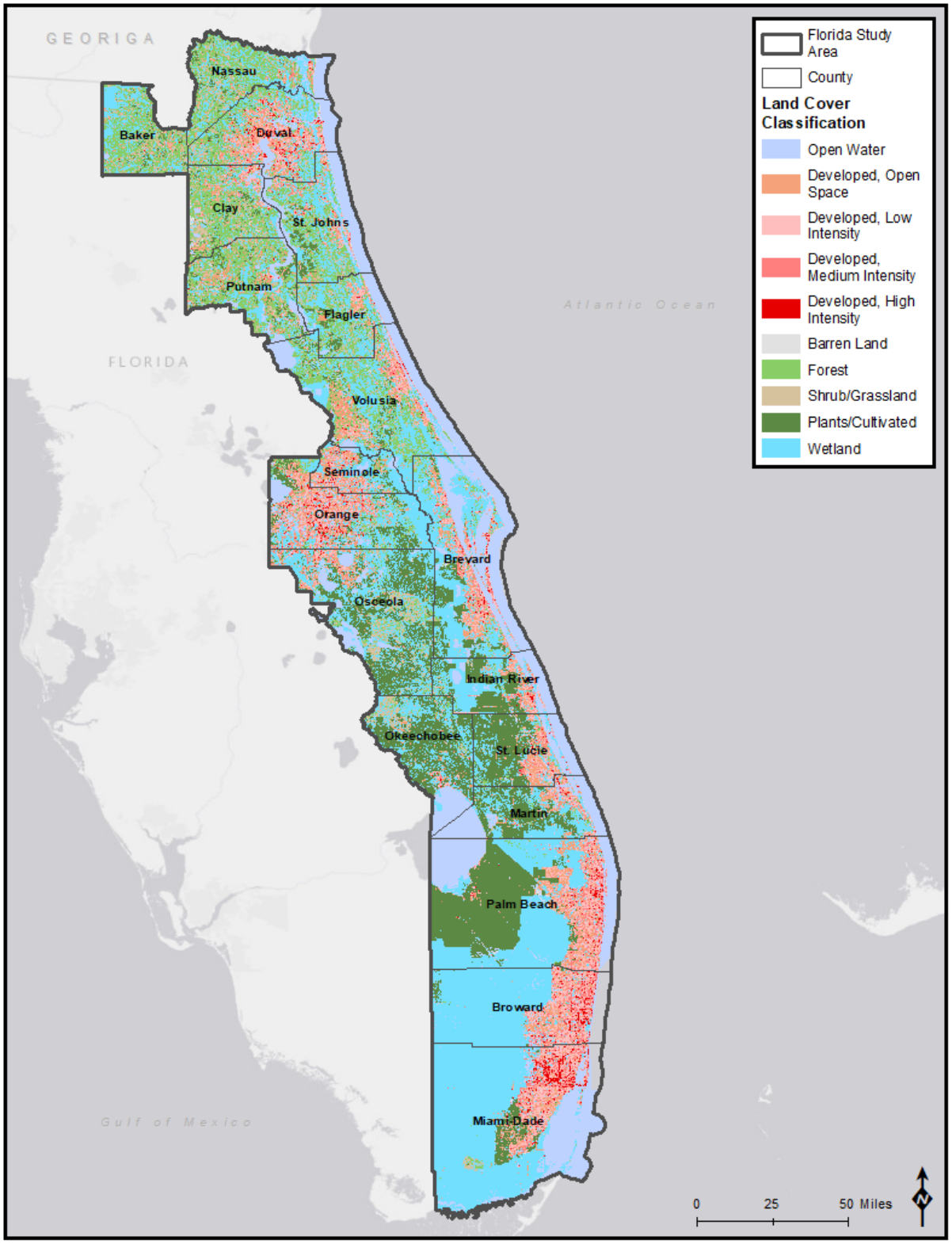
Land cover information assists in the identification of issues related to ecosystem health and patterns of landscape use, the derivation of landscape pattern metrics, the recognition of patterns of biodiversity, and the development of land management policies. The NLCD is a comprehensive dataset based on decadal

Landsat satellite imagery and supplemental information from a variety of Federal agencies. As a national dataset, the NLCD allows for consistent analysis across broad areas of the United States, including the Study Area (NLCD 2016a). This dataset is updated on a periodic basis; therefore, analysts for potential OCS-related projects should check https://www.mrlc.gov/data to determine if new data is available.

The general land cover within the Study Area varies greatly. Some counties are largely urban, whereas others are undeveloped or agricultural. It is important to note that because the NLCD is based largely on satellite data, the data classifications are generalized and may not reflect with complete accuracy the actual land use conditions. However, the NLCD data serves as a baseline to begin making an overall land cover assessment. The nature of the NLCD data must be factored into the Study Area analysis. For example, although some areas of Florida may be classified as forest, they could actually range from forested suburban areas to national forests. Therefore, the classification of "Forest" could be very broad.

Figure 17-9 displays the 2016 NLCD data for the Study Area. Table 17-4 presents the 2016 NLCD data for each county within the State by acreage. Table 17-5 presents the same NLCD data by percentage and overall land cover classification for each county (NLCD 2016a). Open water land use was excluded in Table 17-5 because this type of land cover would not be considered in future industrial development. A visual representation of land cover from Table 17-5 are presented in Figure 17-10. The following section discusses the key findings of this analysis.

As shown in Table 17-6, of the 19 counties within the Study Area, most (17) include wetlands as predominant land cover types and only three (Duval, Orange, and Seminole) had urban development cover over 40%. Six counties are predominantly covered by agricultural development or a mix of agricultural development and other land cover types (NLCD 2016a). Remaining counties are either covered predominantly by wetlands or a mix of wetlands and agricultural development.



Source: NLCD 2016a

Figure 17-9. National Land Cover in the Florida Study Area

Table 17-4. Acres of Land Cover by NLCD Classifications in Florida Study Area

Geographic Unit	Total Acres (land and water)	Developed, Open Space (Acres)	Developed, Low Intensity (Acres)	Developed, Medium Intensity (Acres)	Developed, High Intensity (Acres)	Total Developed (Acres)	Barren Land (Acres)	Forest (Acres)	Shrub/ Grassland (Acres)	Planted/ Cultivated (Acres)	Wetland (Acres)	Open Water (Acres)
Baker	376,941	19,802	4,452	613	184	25,052	627	153,500	47,003	19,093	129,463	2,203
Brevard	977,458	74,229	60,937	28,988	7,570	171,723	3,250	38,051	14,405	83,533	329,353	337,142
Broward	789,226	54,580	92,626	61,901	19,398	228,505	540	538	1,791	11,692	520,624	25,537
Clay	411,870	34,312	20,639	6,727	1,484	63,161	7,668	166,713	61,340	21,466	67,458	24,063
Duval	587,809	76,011	75,117	35,945	16,651	203,724	3,735	114,145	29,361	10,470	131,322	95,054
Flagler	365,326	19,267	13,275	3,348	589	36,478	1,163	97,621	31,079	24,773	120,643	53,568
Indian River	394,817	27,682	18,947	6,604	1,495	54,727	1,137	8,771	6,287	121,049	119,885	82,962
Martin	481,995	27,607	20,924	8,181	1,852	58,565	840	10,883	6,390	145,633	125,508	134,176
Miami-Dade	1,525,308	62,500	103,390	62,678	31,436	260,004	2,806	7,240	9,107	64,301	892,127	289,724
Nassau	464,584	25,612	8,399	2,742	676	37,429	2,045	171,630	51,254	18,277	131,270	52,679
Okeechobee	570,826	17,434	6,085	1,602	427	25,549	333	16,416	35,356	262,689	159,009	71,474
Orange	642,050	93,631	82,638	48,414	16,434	241,117	3,091	46,496	18,916	75,184	195,078	62,168
Osceola	963,864	46,386	24,709	12,237	2,393	85,725	922	55,277	82,064	313,284	332,839	93,752
Palm Beach	1,507,682	103,816	111,835	61,922	14,375	291,948	4,293	3,873	5,226	480,260	463,313	258,768
Putnam	529,229	50,472	9,821	2,261	653	63,206	2,021	193,963	50,724	43,284	119,140	56,891
Seminole	221,017	42,460	30,129	13,695	3,577	89,861	205	13,592	2,728	13,762	79,296	21,573
St. Johns	525,776	28,533	25,403	10,072	1,804	65,812	3,813	123,123	26,957	29,485	138,285	138,301
St. Lucie	440,214	44,606	31,304	11,372	3,186	90,467	994	8,845	4,070	185,622	72,560	77,656
Volusia	916,754	77,158	52,849	16,494	3,983	150,483	4,538	197,958	33,869	41,830	281,920	206,156
Study Area Total	**12,692,747**	**926,096**	**793,477**	**395,797**	**128,167**	**2,243,536**	**44,022**	**1,428,633**	**517,928**	**1,965,689**	**4,409,092**	**2,083,847**

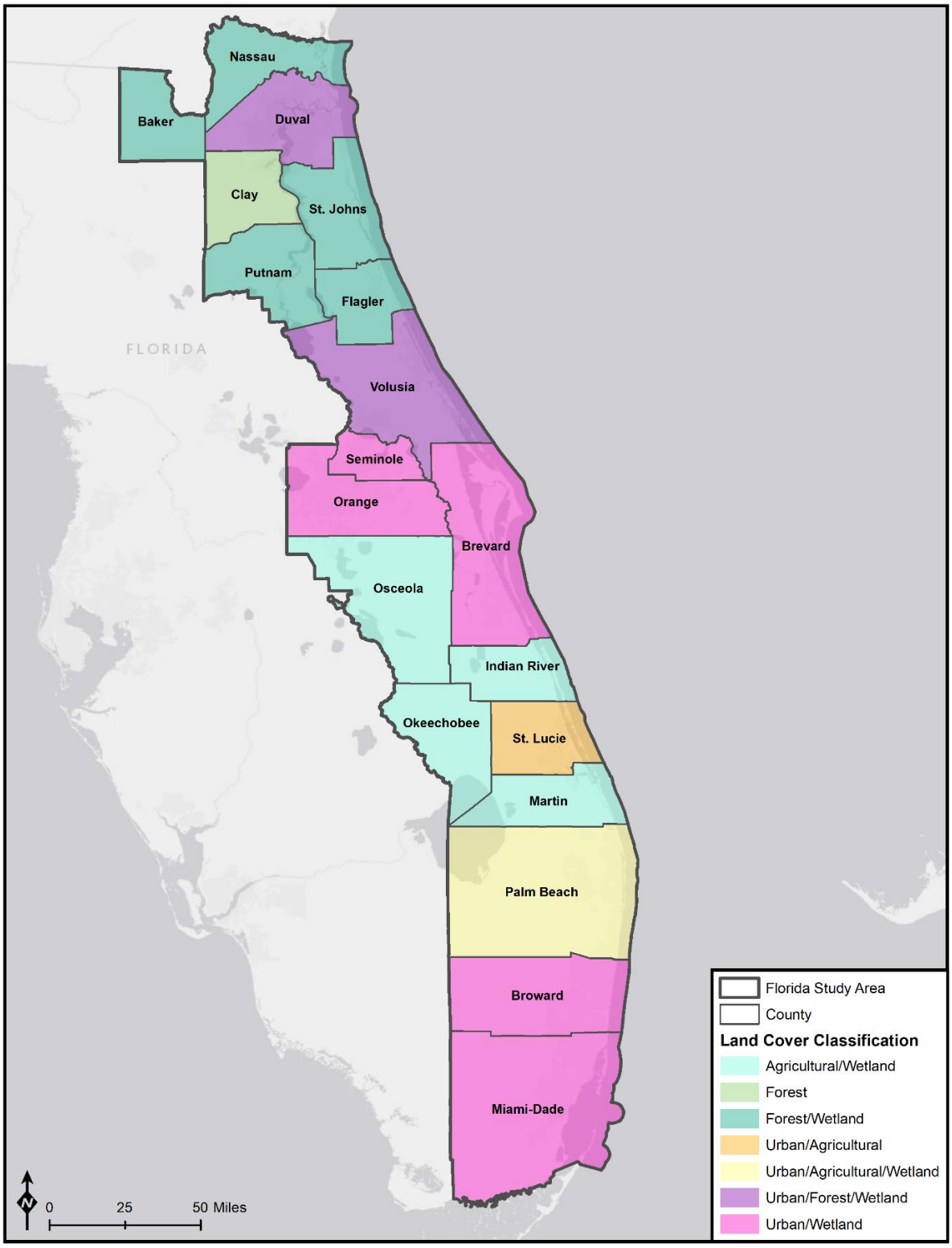
Source: NLCD 2016a
Note: Due to the vast quantity of data involved, land cover totals are not provided at the State or national level.

Table 17-5. Percentage of Land Cover by NLCD Classification and Predominant Classification for Counties/Cities in the Florida Study Area (Excluding Open Water)

Geographic Unit	Percent Developed, Open Space (%)	Percent Developed, Low Intensity (%)	Percent Developed, Medium Intensity (%)	Percent Developed, High Intensity (%)	Percent Total Developed (%)	Percent Barren Land (%)	Percent Forest (%)	Percent Shrub/ Grassland (%)	Percent Planted/ Cultivated (%)	Percent Wetland (%)	Predominant Land Cover Type(s)
Baker	5.3	1.2	0.2	0.0	6.7	0.2	41.0	12.5	5.1	34.5	Forest/Wetland
Brevard	11.6	9.5	4.5	1.2	26.8	0.5	5.9	2.2	13.0	51.4	Urban/Wetland
Broward	7.1	12.1	8.1	2.5	29.9	0.1	0.1	0.2	1.5	68.2	Urban/Wetland
Clay	8.8	5.3	1.7	0.4	16.3	2.0	43.0	15.8	5.5	17.4	Forest
Duval	15.4	15.2	7.3	3.4	41.4	0.8	23.2	6.0	2.1	26.7	Urban/Forest/Wetland
Flagler	6.2	4.3	1.1	0.2	11.7	0.4	31.3	10.0	7.9	38.7	Forest/Wetland
Indian River	8.9	6.1	2.1	0.5	17.6	0.4	2.8	2.0	38.8	38.4	Agricultural/Wetland
Martin	7.9	6.0	2.4	0.5	16.8	0.2	3.1	1.8	41.9	36.1	Agricultural/Wetland
Miami-Dade	5.1	8.4	5.1	2.5	21.0	0.2	0.6	0.7	5.2	72.2	Urban/Wetland
Nassau	6.2	2.0	0.7	0.2	9.1	0.5	41.7	12.4	4.4	31.9	Forest/Wetland
Okeechobee	3.5	1.2	0.3	0.1	5.1	0.1	3.3	7.1	52.6	31.8	Agricultural/Wetland
Orange	16.1	14.3	8.3	2.8	41.6	0.5	8.0	3.3	13.0	33.6	Urban/Wetland
Osceola	5.3	2.8	1.4	0.3	9.9	0.1	6.4	9.4	36.0	38.3	Agricultural/Wetland
Palm Beach	8.3	9.0	5.0	1.2	23.4	0.3	0.3	0.4	38.5	37.1	Urban/Agricultural/Wetland
Putnam	10.7	2.1	0.5	0.1	13.4	0.4	41.1	10.7	9.2	25.2	Forest/Wetland
Seminole	21.3	15.1	6.9	1.8	45.1	0.1	6.8	1.4	6.9	39.8	Urban/Wetland
St. Johns	7.4	6.6	2.6	0.5	17.0	1.0	31.8	7.0	7.6	35.7	Forest/Wetland
St. Lucie	12.3	8.6	3.1	0.9	25.0	0.3	2.4	1.1	51.2	20.0	Urban/Agricultural
Volusia	10.9	7.4	2.3	0.6	21.2	0.6	27.9	4.8	5.9	39.7	Urban/Forest/Wetland
Study Area Total	**8.7**	**7.5**	**3.7**	**1.2**	**21.1**	**0.4**	**13.5**	**4.9**	**18.5**	**41.6**	**Urban/Wetland**

Percent	0-20	21-40	41-60	61-80	81-100

Source: NLCD 2016a



Source: NLCD 2016a

Figure 17-10. Summary of Major Land Cover Classification for the Florida Study Area

Table 17-6. Major Land Cover within each County in the Florida Study Area

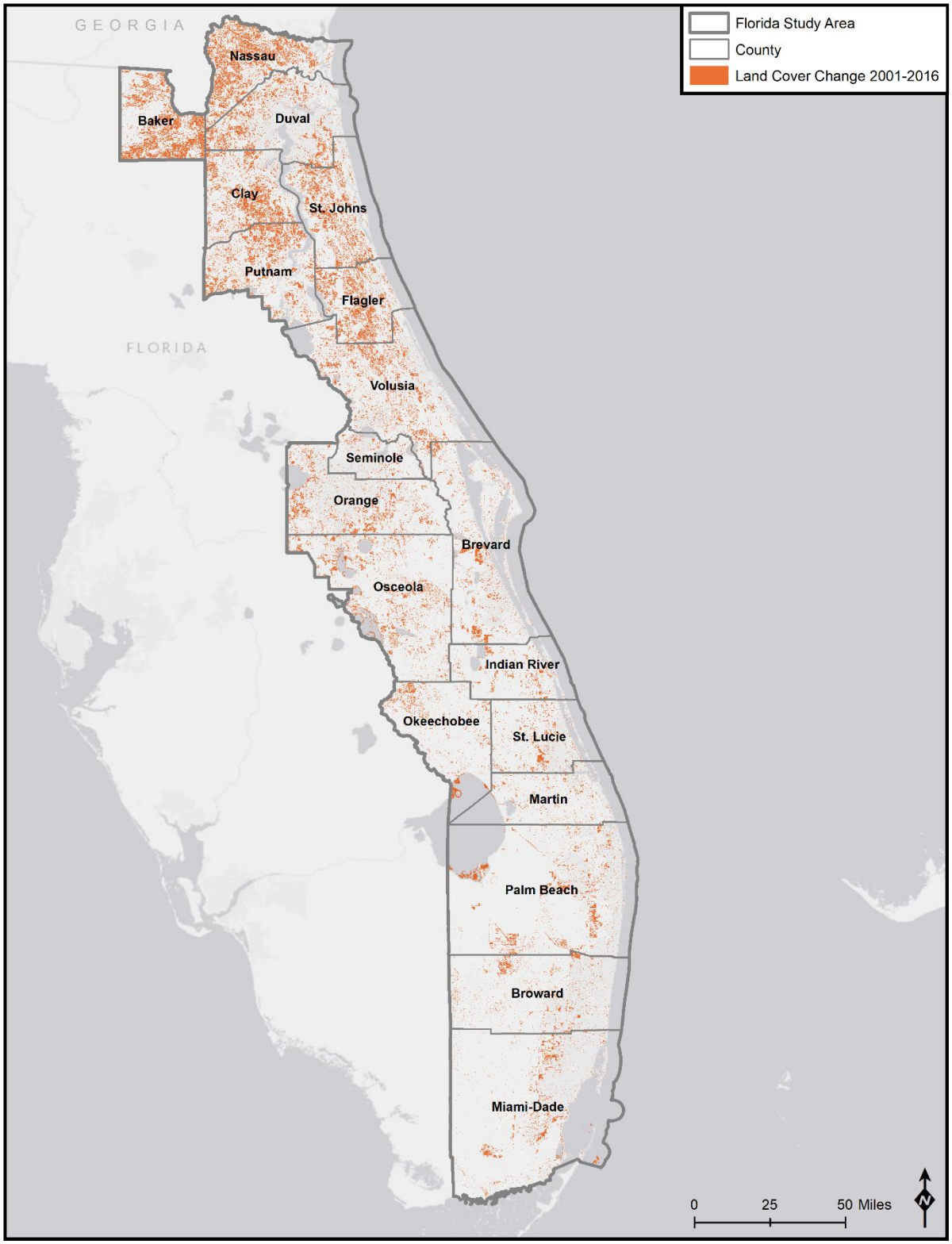
Predominant Land Cover Type(s)	Count	Geographic Units
Forest/Wetland	5	Baker, Flagler, Nassau, Putnam, St. Johns
Urban/Wetland	5	Brevard, Broward, Miami-Dade, Orange, Seminole
Agricultural/Wetland	4	Indian River, Martin, Okeechobee, Osceola
Urban/Forest/Wetland	2	Duval, Volusia
Forest	1	Clay
Urban/Agricultural/Wetland	1	Palm Beach
Urban/Agricultural	1	St. Lucie

Source: NLCD 2016a

Several counties with higher proportions of urban development as compared to other land use types may be limited from urban expansion because the remaining undeveloped areas are dense with sensitive resources. For example, 68.2% of Broward County are wetlands, which may be difficult to develop. Similar wetland situations occur in Miami-Dade (72.2%) and Seminole Counties (39.8%). Okeechobee, Osceola, and Martin are significantly underdeveloped (under 20%) with a large proportion of agricultural and wetland land covers. Many of these wetlands are protected areas such as the St. Johns Marsh, primarily in Indian River and Brevard Counties, the Everglades, primarily in Broward, Dade, and Palm Beach Counties, and the Loxahatchee NWR in Palm Beach County.

Based on an analysis of the general land cover within the Study Area, it seems most likely that counties including Baker, Clay, Flagler, Nassau, Orange, Putnam, St. Lucie, St. Johns, and Volusia would be the most suitable counties to accommodate future industrial coastal projects.

The NLCD 2016 documents land cover change in the Lower 48 states from 2001 to 2016. During this 15-year period, 7.6% of the conterminous U.S. changed land cover at least once (USGS 2019h). In Florida, 9.9% of the land cover in the Study Area changed at least once. Figure 17-11 and Table 17-7 show the land cover change within the Study Area from 2001 to 2016. Baker County experienced the most significant land cover change at 30.3% followed closely by Nassau County at 27.3%. These were largely changes from or to any one of the forested land cover types. Miami-Dade County experienced the least land cover change at only 3.3% followed closely by Martin County at 3.7%. In Miami-Dade County the change was primarily from or to any of the developed classes. In Martin County the change was primarily from or to Herbaceous or Woody Wetland.



Source: NLCD 2001-2016

Figure 17-11. Land Cover Change in the Florida Study Area

Table 17-7. Land Cover Change in the Florida Study Area

Geographic Unit	Total Acres (land and water)	Change Acres (land and water)	Percent Changed Land (%)
Baker	376,941	114,072	30.3
Brevard	996,492	55,100	5.5
Broward	846,601	40,404	4.8
Clay	411,870	94,632	23.0
Duval	587,814	80,380	13.7
Flagler	365,330	80,266	22.0
Indian River	394,821	20,461	5.2
Martin	482,002	17,769	3.7
Miami-Dade	1,555,953	51,677	3.3
Nassau	464,590	126,702	27.3
Okeechobee	570,826	36,533	6.4
Orange	642,050	71,548	11.1
Osceola	963,864	88,733	9.2
Palm Beach	1,525,225	71,004	4.7
Putnam	529,230	98,691	18.6
Seminole	221,017	13,035	5.9
St. Johns	525,781	84,769	16.1
St. Lucie	440,218	27,207	6.2
Volusia	916,759	95,709	10.4
Study Area Total	**12,817,384**	**1,268,691**	**9.9**

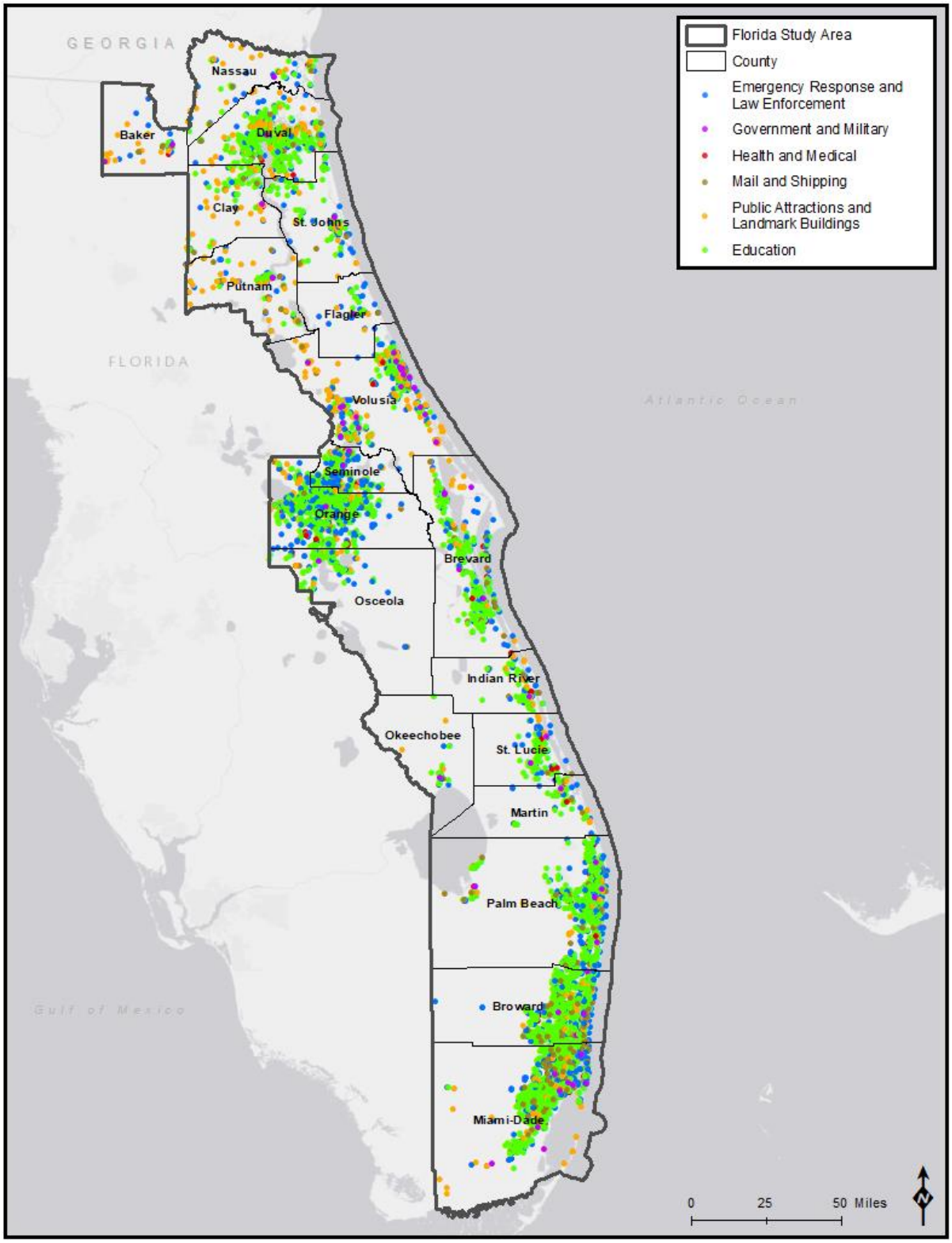
Source: NLCD 2001-2016

17.3.2 Land Use

Land use is defined as the way people use and develop land, including uses such as undeveloped, agricultural, residential, and industrial uses. Patterns of land use, zoning, industrial incentives, industry, protected areas, cultural and historic resources, recreation, and transportation resources will shape how new OCS-related activity will influence life in coastal communities. The following sections describe these land uses, within the Study Area.

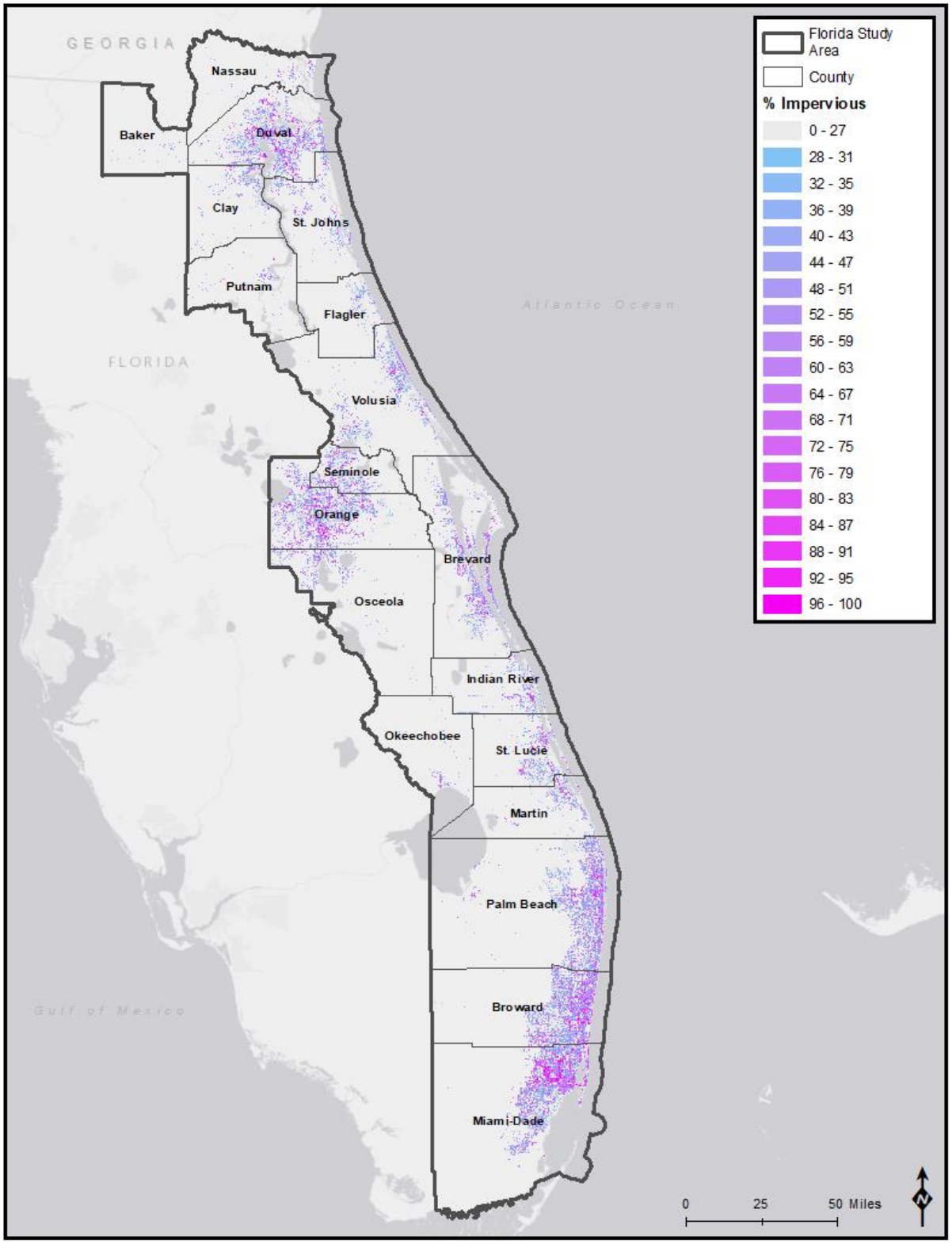
17.3.2.1 Existing and Future Land Use

The land cover data provides an initial assessment of potential land uses within a project area; however, as described previously, because it is based on satellite data, it may have some inaccuracies as compared to actual ground-based data. Land cover data is enhanced by the application of more detailed ground-based information. Figure 17-12 presents existing land uses at the broad scale of the Study Area (USGS 2016a). Figure 17-13 shows impervious areas across the Study Area (NLCD 2016a). These figures show the relationship between land cover analysis which identified developed areas in Chapter 17.3.1 and the specific identified land uses and impervious areas associated with the structures, parking, and pavement areas utilized in developed areas.



Source: USGS 2017

Figure 17-12. Select Existing Land Uses within the Florida Study Area



Source: NLCD 2016b

Figure 17-13. Impervious Surfaces within the Florida Study Area

Agriculture makes up a large part of land use in Florida. As of 2015, the State had over 47,000 commercial farms that utilized roughly 9.45 million acres. Also, because of a long history of land conservation, the State has approximately 10.1 million acres in conservation land, discussed in detail in Chapter 17.3.2.5 (FDEM 2018). Okeechobee, St. Lucie, Osceola, Indian River, Martin, Palm Beach Counties were identified as counties with relatively greater agricultural land cover in Chapter 17.3.1. In general, throughout the Study Area, agricultural land use is located inland and urban development located along the coast, with the exception of the Orlando urban center in Orange and Seminole Counties.

Based on infrastructure maps, urban land use is concentrated centrally in Duval, Seminole, Orange Counties and along the coast in Palm Beach, Broward, and Miami-Dade Counties (USGS 2016a) These areas correspond to Florida's large urban centers; Jacksonville in Duval County, Orlando in Seminole and Orange, and a large urban complex containing Miami, Fort Lauderdale, and Boca Raton in Miami-Dade, Broward, and Palm Beach Counties. Counties with large urban centers and more impermeable surface tend to also have large areas of wetland but not agriculture, indicating that urban development tends to encroach upon agricultural areas (NLCD 2016a). The presence of extensive wetlands throughout Florida serves to concentrate urban development and reduce uncontrolled urban development.

According to some calculations of growth rates for Florida, the population of Florida was increasing by approximately 1,000 people per day as of 2015. Impacts to existing agricultural and natural landscapes from continued development and land use changes are likely to result as populations continue to increase and lead to significant reduction in acreage of agricultural and other undeveloped lands. Additionally, researchers at the University of Florida predict coastal developments may need to relocate inland in response to sea level rise, compounding the development pressure and impacts on existing undeveloped agricultural and natural landscapes (Volk et al. 2017).

Most of counties within the Study Area have developed a comprehensive plan, land use map, master plan, or combination thereof with regard to future development activities within their specific boundaries. Typically, these planning documents cover a range of 5-10 or more years and tend to discuss topics such as population, economy, housing, transportation, community and public facilities, and overall land use. Such planning documents are developed to help cities, counties, and other entities lay out goals for future growth and development. This allows these entities to identify and target opportunities as well as maximize existing community features. Such documents may determine patterns of new development or redevelopment, specify targeted locations for new businesses or industry, identify road and utility improvements, and identify locations for new public features such as schools, hospitals, and parks. Community input is essential in the development of the plans and is usually sought through a series of community planning meetings and/or workshops. These planning documents are meant to be both dynamic and long-term with the goal being to benefit the entire community over time. Most planning documents of this type include maps developed to showcase proposed future changes in land use. Some, though not all, of these include publicly available GIS data that support the plan. Given the scale of these maps and variation of plan format, it is not possible to represent these on a single map of the Study Area. Appendix B includes links to relevant planning documents.

East Central Florida Regional Planning Council is one of Florida's ten regional planning councils and includes Brevard, Orange, Osceola, Seminole, Volusia Counties within the Study Area. Based on a cursory view of project planning documents available at their website, issues of concern in central Florida include emergency preparedness, housing, transportation, food production in Orange and Seminole Counites, sea level rise along the Space Coast, and urban landscapes designed to connect communities while avoiding sprawl (ECFRPC 2018). Individual plans appear to reflect the predicted trends of development further moving inland and compounding the development pressure and impacts on existing undeveloped agricultural and natural landscapes, and the community plans have been formulated to discourage these trends.

Florida is participating in the Opportunity Zone community development program, a Federal program that encourages private investment in low-income urban and rural communities. There are 427 Qualified Opportunity Zones designated in the State. Maps of opportunity zones in Florida are located online https://efl.giswebtechrecruit.com/?sorting=featured%20desc,%20name%20asc&showpropertyonmap=true&mapextent=-12683236.00016128,1537224.7220647616,-5981237.360118808,4912683.891137248 (FDEO 2019b).

17.3.2.2 Zoning

As the Study Area covers multiple municipalities, within multiple counties, there are also a variety of zoning ordinances specific and unique to the municipalities interspersed throughout generally larger areas with no zoning. Thus, zoning information cannot be generalized across the scale of the Study Area. Additionally, although a municipality may have a zoning ordinance, in some cases there are no maps associated with the ordinance or the maps may not be available in GIS formats. Individual municipalities must often be contacted regarding a certain property to ascertain its current zoning. Zoning maps at the municipality level also tend to be at a scale finer than the resolution of the Study Area and, based on the variety of differences that may be present in zoning between municipalities, it is not feasible to produce a single map to display all zoning data for the Study Area.

Zoning can influence the potential land uses for any individual land parcel or group of parcels within a certain area. Although it may be possible to petition an individual governing body for a change in a zoning classification, this process can add time, cost, and complexity to a project. Therefore, adherence to existing zoning ordinances may facilitate future OCS-related project development. When present, zoning ordinances may influence where industrial facilities and supporting structures can be constructed. Worker housing, multifamily dwellings, and other kinds of housing that project workers may need (which would be installed on a permanent or temporary basis by individual projects) may be disallowed by local zoning. The lack of zoning ordinances does not necessarily eliminate the need for approvals or coordination with the local governing bodies. Some zones may overlap with each other, and further consultation with local government bodies would be needed to determine the ordinances for those overlapping areas.

17.3.2.3 Industrial Incentives

Florida offers tax credits, refunds, and other incentives to promote business development and job creation within the State (FDR 2019a). Most of these incentives are restricted to certain industries, not including OCS-related ventures. However, waivers may be available under certain circumstances. The following are statewide incentive programs in Florida that could support commercial or industrial development (EFI 2019a).

The Capital Investment Tax Credit is used to attract and grow capital-intensive industries in Florida. It is an annual credit, provided for up to twenty years, against the corporate income tax. Eligible projects are those in designated high-impact portions of the following sectors: advanced manufacturing, clean energy, biomedical technology, financial services, information technology, silicon technology, transportation equipment manufacturing, or be a corporate headquarters facility. Projects must create a minimum of 100 jobs and invest at least $25 million in eligible capital costs (FDR 1998).

In the Rural Job Tax Credit Program Florida encourages growth throughout the State by offering increased incentive awards and lower wage qualification thresholds in its rural counties. Additionally, a Rural Community Development Revolving Loan Fund and Rural Infrastructure Fund exist to meet the special needs that businesses encounter in rural counties (EFI 2019a). To be eligible for a tax credit, a business must be physically located within one of the Qualified Rural Areas and be predominately engaged in (or headquarters for) activities classified in one of the following Standard Industrial Classifications (212.098, F.S.) (FDR 2019b):

- Agriculture; Forestry; and Fishing
- Manufacturing
- Hotels and Other Lodging Places
- Public Warehousing and Storage
- Motion Picture Production/Allied Services
- Research and Development
- Public Golf Courses
- Amusement Parks
- Call Center
- Customer Service Center (serving a multistate or international market)

Although OCS-related ventures generally do not qualify for these rural incentives, waivers may be available for Rural Areas of Opportunity, defined as rural communities, or a region composed of rural communities, that have been adversely affected by extraordinary economic events or natural disasters. Rural and Economic Development Initiative agencies may allow the Governor to waive criteria of economic development incentives in Rural Areas of Opportunity (FDEO 2019a). Baker, Okeechobee, Putnam Counties are designated as Rural Areas of Opportunity within the Study Area.

The Urban Job Tax Credit Program offers an incentive for eligible businesses located within 1 of the 13 designated urban areas to create new jobs. Florida offers increased incentive awards and lower wage qualification thresholds for businesses locating in many urban core/inner city areas that are experiencing conditions affecting the economic viability of the community and hampering the self-sufficiency of the residents (212.097, F.S.) (FDR 2019b). To be eligible for a tax credit, a business must be physically located within 1 of the 13 designated urban high-crime areas and be predominately engaged in (or headquarters for) activities classified in one of the following Standard Industrial Classifications:

- Agriculture; Forestry; and Fishing
- Manufacturing
- Retail: Gen. Merchandise.; Food; Apparel, etc.
- Misc. Retail (No Eating/Drinking)
- Hotels and Other Lodging Places
- Public Warehousing and Storage
- Motion Picture Production and Allied Services
- Research and Development
- Public Golf Courses
- Amusement Parks
- Call Center
- Customer Service Center (serving a multistate or international market)

The following urban areas within the Study Area are eligible for the urban job tax credit (FDR 2019b):

- Miami-Dade County
  - Florida City
  - Homestead
  - Leisure City
  - Naranja
  - Hialeah
  - Miami
  - Opa Locka
  - Carol City
  - Miami
  - Goulds

- Palm Beach County
  - Delray Beach
  - Lake Park
  - Mangonia Park
  - Riviera Beach
- Duval County
  - Jacksonville
- Broward County
  - Fort Lauderdale
  - Pompano Beach
- Orange County
  - Orlando

Contaminated Site Rehabilitation Tax Credit (also known as the Voluntary Cleanup Tax Credit or Brownfields Incentive) is available to taxpayers that voluntarily rehabilitate brownfield sites or sites contaminated with dry-cleaning solvent. The credit must be approved by the FDEP. The credit is for 50% of rehabilitation costs, up to $500,000 per site per year. The credit may be carried forward for 5 years (FDR 2019b, FDEO 2019a).

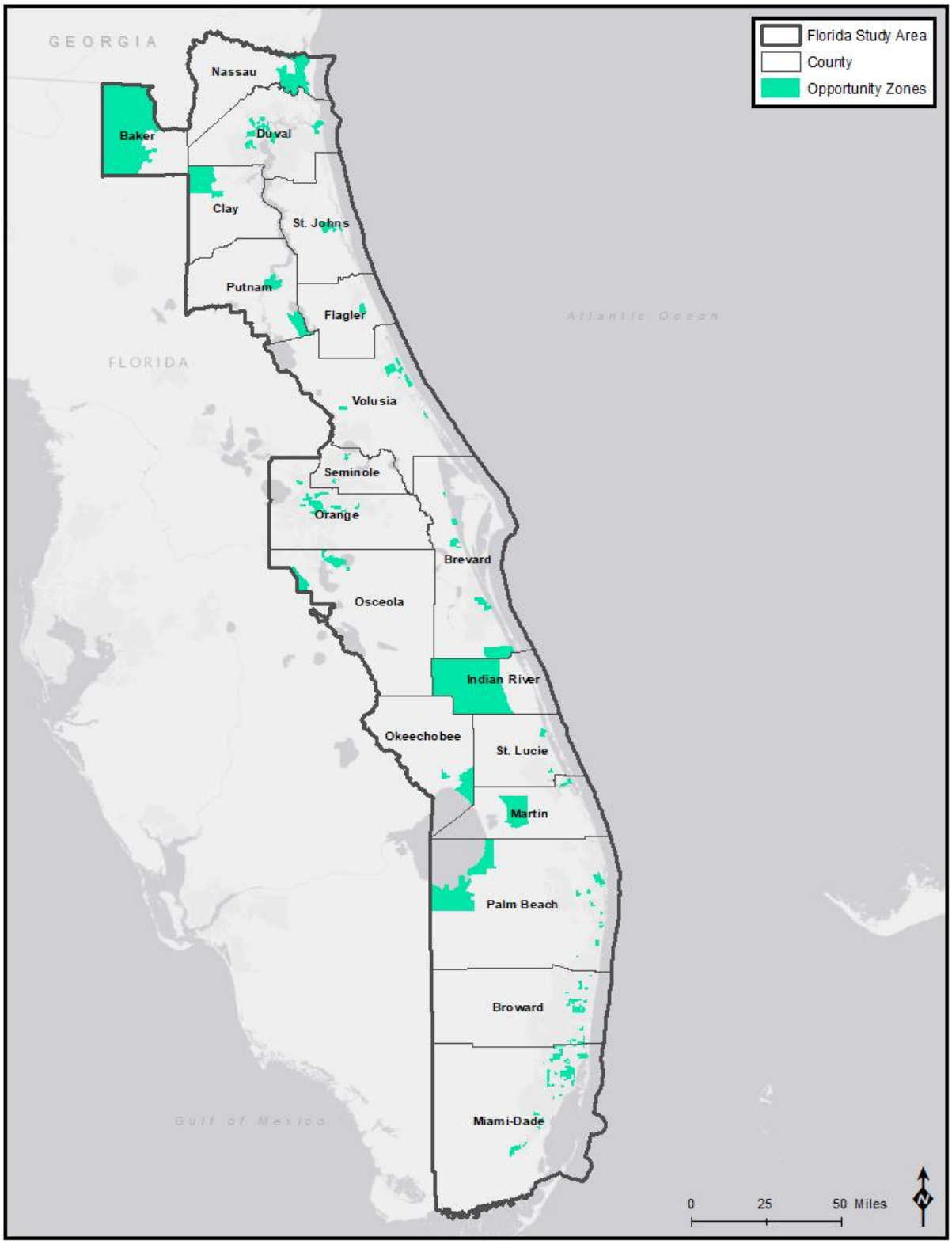
Florida Alternative Minimum Tax Credit is a credit equal to the excess of the Florida Alternative Minimum Tax paid over the amount of regular corporate income tax. The amount of the Florida Alternative Minimum Tax credit, which can be taken in a given year is limited to the excess of Florida corporate income tax over Florida Alternative Minimum Tax computed in that year (FDR 2019b).

The Florida Department of Economic Opportunity has outlined regions, or Opportunity Zones, within the State of Florida to help businesses interested in development within the State in their site selection process. The program encourages private investment in Opportunity Zones by providing a tax incentive for investors who invest in qualified businesses and property in these areas, contributing to each county's economic development plan and bringing jobs and capital investment into Opportunity Zones. Although Opportunity Zones are defined to encourage future development, their individual characteristics help define the most common types of land use at present within these areas (FDEO 2019b).

Figure 17-14 shows Opportunity Zones for the Study Area. All 19 of the counties in this study contain Opportunity Zones, which are defined by census tracts (FDEO 2019b). There are large opportunity zones located on the west half of Baker County and west half of Indian River County. Significant opportunity zones are also located in the northwest corner of Clay County, along the I-95 corridor in Nassau County, and around Lake Okeechobee in Okeechobee, Martin, and Palm Beach Counties. Other opportunities are scattered throughout Study Area counties.

The following is a list of Florida Counties containing Opportunity Zones and the number of Census Tracts within each county.

- Baker (1)
- Brevard (9)
- Broward (30)
- Clay (2)
- Flagler (1)
- Indian River (1)
- Martin (2)
- Miami-Dade (67)
- Nassau (2)
- Osceola (2)
- Orange (24)
- Osceola (5)
- Palm Beach (26)
- Putnam (3)
- Seminole (4)
- St. Johns (2)
- St. Lucie (4)
- Volusia (12)



Source: FDEO 2019b

Figure 17-14. Opportunity Zones for the Florida Study Area

17.3.2.4 Industry

The USEPA tracks facilities, sites, and places of interest that are subject to Federal regulation with their Facility Registry Service. Figure 17-15 presents the USEPA-tracked facilities within the Study Area. Other industrial facilities not tracked by USEPA may be present in these areas; however, because industrial facilities are frequently concentrated in industrial zoned areas, this Figure gives a good representation of the distribution of industrial properties across the Study Area. Because this information can change fairly quickly, the database is updated monthly. Updated information should be considered when conducting future analyses and once site-specific information is known. Types of facilities shown on this Figure include:

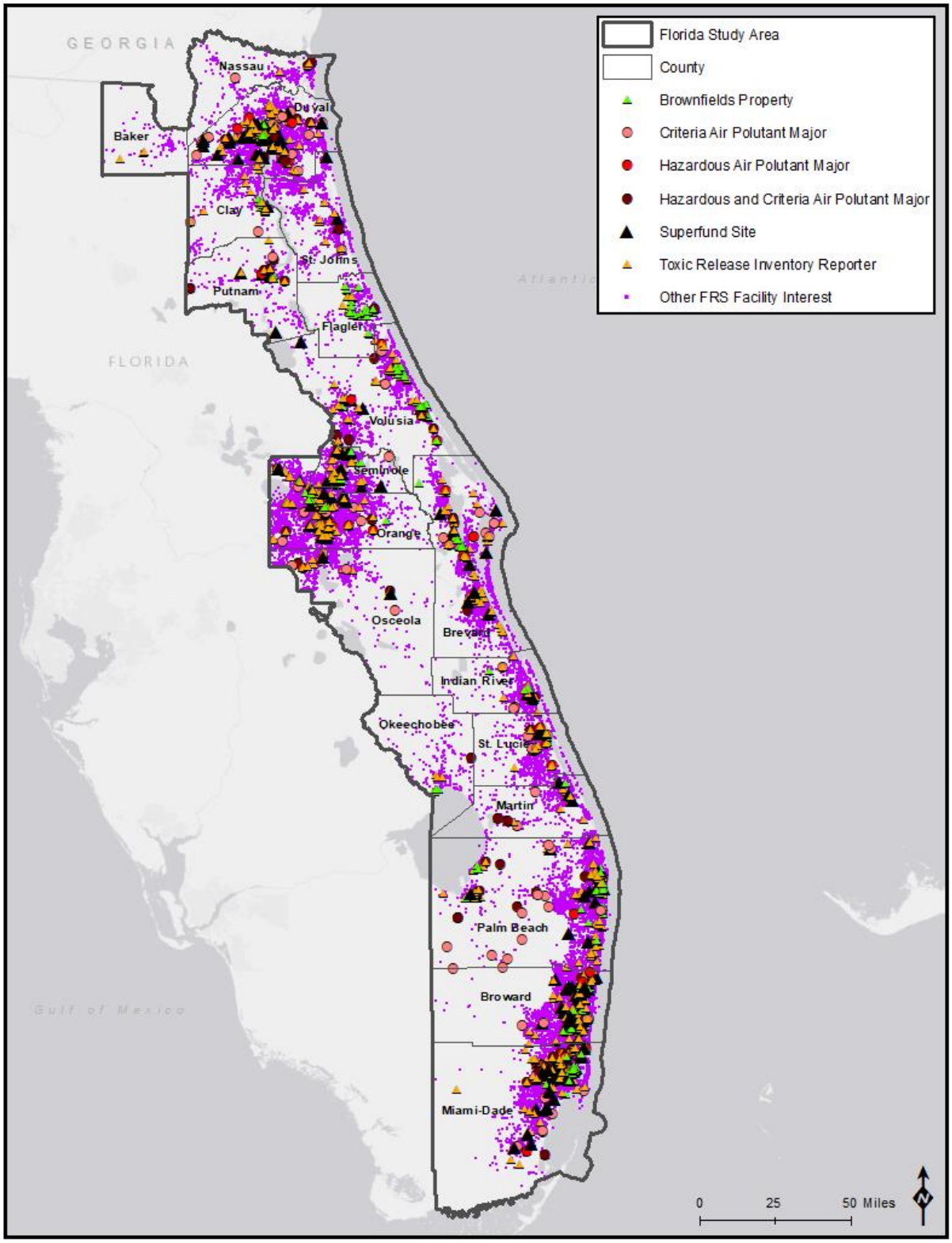
- *Brownfields Properties*: A hazardous substance, pollutant, or contaminant may be present which could complicate the expansion, redevelopment, or reuse of these properties.
- *Criteria Air Pollutant Major*: Facility emits criteria air pollutants.
- *Hazardous Air Pollutant Major*: Facility emits hazardous air pollutants.
- *Hazardous and Criteria Air Pollutant Major*: Facility emits both hazardous and criteria air pollutants.
- *Toxic Release Inventory Reporter*: Facility is of a specific industry type and manufactures, processes, or otherwise uses a toxic release inventory listed chemical.
- *Superfund Site*: Where there is no viable responsible party to perform cleanup or reimburse the government for USEPA-led cleanup work of contaminated sites, the Comprehensive Environmental Response, Compensation and Liability Act applies, and the site is known as a Superfund site.
- *Other Facility Registry Service Facility*: Registry includes the facilities described in Chapter 1.5.2.4.

According to the location of USEPA-tracked facilities shown in Figure 17-15, industry is concentrated in the major urban centers of Jacksonville, Orlando, and Miami and along the Space Coast. Chapter 17.4.4, Employment, describes the employment industry categories and job distribution across the Study Area.

17.3.2.5 Protected Areas

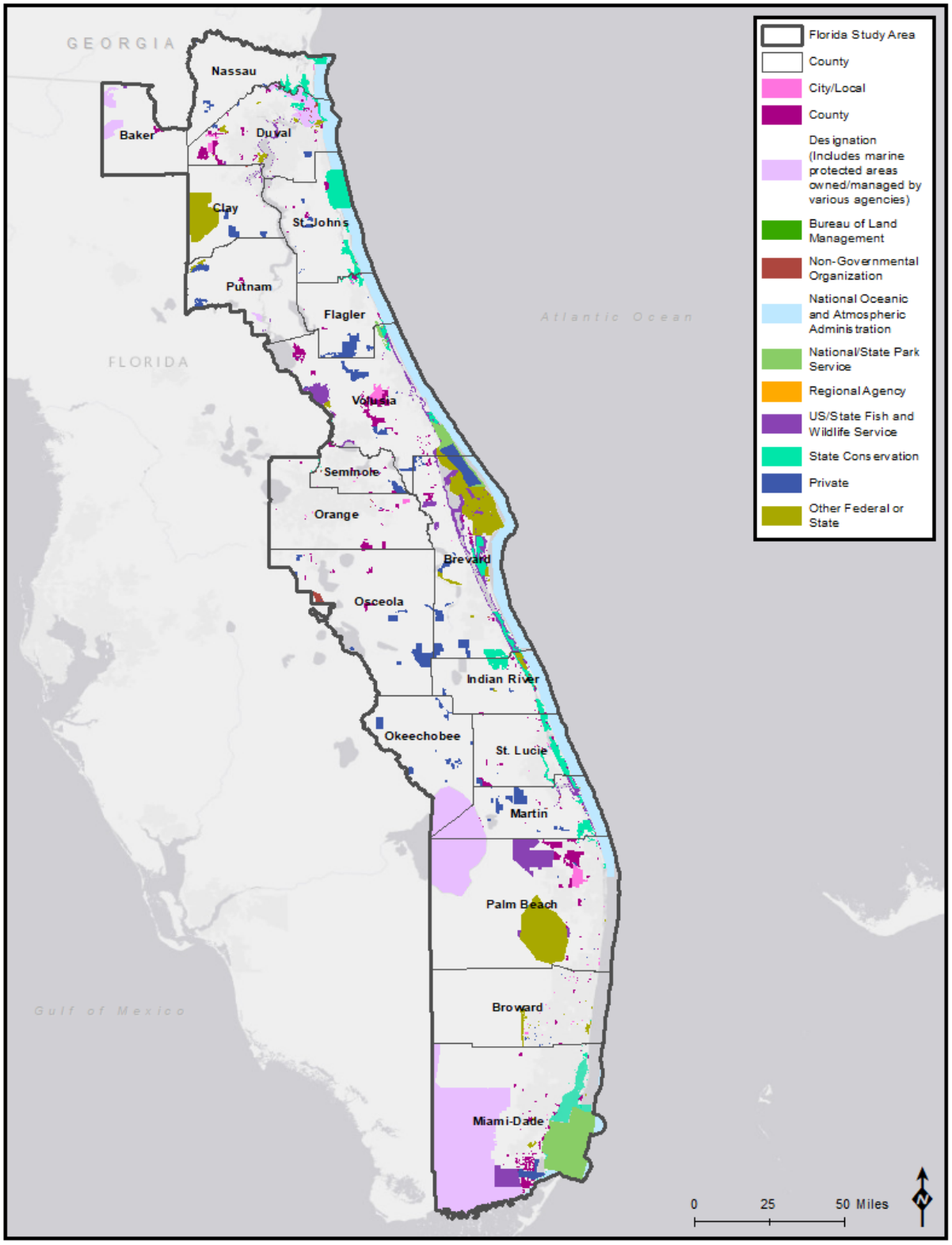
Florida has a long history of conserving the natural lands that the State needs in order to preserve the ecosystems that create clean air, clean and sufficient water, and recreational opportunities. The FDEP, through the Division of State Lands, manages one of the largest and most successful land conservation programs in the Nation (FDEM 2018).

The PAD-US produced by the USGS is the official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and other natural, recreation, and cultural uses, managed for these purposes through legal or other effective means. The purpose of the PAD-US is to aid and inform decision makers considering conservation, recreation, or land use planning by providing a comprehensive database of existing protected lands. The goal is to make accurate land use planning and acquisition planning easier as well as providing a more complete picture of recreational opportunities. This will also aid in better understanding land use change over time. Figure 17-16 and Table 17-8 present the protected areas within the Study Area (USGS 2019f). The “designation” category in the PAD-US database includes marine protected areas which are owned/managed by a variety of agencies including NOAA, U.S. Fish and Wildlife Service, and the National Park Service.



Source: USEPA 2018

Figure 17-15. USEPA Facility Register Service Record for the Florida Study Area



Source: USGS 2019f

Figure 17-16. Protected Areas within the Florida Study Area

Table 17-8. Protected Areas in the Florida Study Areas (acres)

Geographic Unit	Total Local (City, County, Municipal, Regional Water Districts)	Total Federal (BLM, USFS, USFWS, NOAA, NPS)	Total State (Aquatic Preserves, State Parks, State Forests, DNR)	Private	American Indian Lands	Other	Protected County Totals
Baker	2,516	125,152	37,786	0	0	31,461	362,367
Brevard	88,844	313,056	130,818	57,389	0	141,083	1,263,908
Broward	14,201	5,038	431,726	1,831	137,639	1,156	1,042,556
Clay	13,880	0	110,244	12,097	0	74,164	334,507
Duval	34,588	89,668	88,142	4,841	0	58,709	488,345
Flagler	13,965	42,192	15,460	23,215	0	0	166,450
Indian River	85,094	58,021	38,960	3,612	0	6,086	373,849
Martin	73,458	54,887	54,550	23,106	0	62,401	451,296
Miami-Dade	82,906	905,981	241,798	13,453	778	934,268	3,409,868
Nassau	15,427	36,903	34,196	6,176	0	582	179,810
Okeechobee	27,120	0	53,652	20,102	0	72,886	254,531
Orange	49,008	0	46,603	226	0	264	191,711
Osceola	61,130	0	80,904	29,854	0	5,293	319,215
Palm Beach	165,955	30,857	171,706	1,097	0	298,865	1,036,997
Putnam	29,449	24,388	56,666	10,945	0	3,214	235,166
Seminole	31,761	490	5,209	6,131	0	658	81,709
St. Johns	34,236	98,976	173,925	3,960	0	6	618,239
St. Lucie	20,894	49,023	35,375	2,618	54	15	213,272
Volusia	94,719	177,693	121,539	30,681	0	15,660	834,242
Study Area Total	**939,150**	**2,012,325**	**1,929,257**	**251,333**	**138,471**	**1,706,770**	**11,858,038**

Source: USGS 2019f
Note: Due to the vast quantity of data involved, protected area totals are not provided at the State or national level.
USFS = U. S. Forest Service
DNR = Department of Natural Resources

A total of 6,977,306 acres of protected lands are located within the Study Area; however, this calculation may be an overestimation due to overlap in ownership and/or management that duplicates some results. Protected lands in the Study Area include those owned and/or managed federally, such as NWR Refuges and National Parks, those owned/managed by the State, such as State Parks, Aquatic Preserves, State Forests, and Wildlife Management Areas, and otherwise protected lands including regional water management Districts, Natural Areas, Conservation Easements, Mitigation Areas, Preserves, Conservation Areas, Sanctuaries, Wilderness Areas, Nature Trails, Reservoirs, Fish Hatcheries, Manatee Protection Zones, Greenways, Wetlands, Swamps, and Marshes, Private Lands, Recreation Areas, Wildlife Habitats, Campground, and Beaches (USGS 2019f).

Within the Study Area, there are 2,012,325 acres of federally owned/managed lands. There are eight NWRs located within the Study Area; they are Archie Carr NWR, Arthur R. Marshall Loxahatchee NWR, Hobe Sound NWR, Lake Woodruff NWR, Merritt Island NWR, Okefenokee NWR, Pelican Island NWR, and St. Johns NWR. There are seven properties owned/managed by the National Park Service (NPS); they are Biscayne National Park, Canaveral National Seashore, Castillo de San Marcos National Monument, Everglades National Park, Fort Caroline National Memorial, and Fort Matanzas National Monument. There are 86 acres of Bureau of Land Management (BLM) protected land in Palm Beach County. Disturbance, including utility crossings, of BLM land should be avoided to avoid additional time-consuming permitting processes.

The Guana Tolomato Matanzas National Estuarine Research Reserve is located in the northern part of the Study Area. A total of 580 plant, 358 bird, 303 fish, 44 mammal, 41 reptile, and 21 amphibian species are protected within this reserve. Of which species, 48 are protected animals, eight are protected plants, 16 are fished or harvested commercially, and 18 are fished recreationally. This reserved is one of only 29 National Estuarine Research Reserves in the Nation (FDEP 2020).

There are 1,929,257 acres of State owned/managed lands within the Study Area. State-protected lands include 53 State parks covering 335,960 acres, 18 State forests covering 192,627 acres, 49 Wildlife Management Areas covering 1,736,658 acres, and 15 Aquatic Preserve Systems covering 276,088 acres (FDEP 2019e, OSFGDP 2018, OSFGDP 2019). Within the Study Area, there are 939,150 acres of locally owned/managed lands, 138,471 acres of tribal lands, and 251,333 acres of private lands (USGS 2019f).

Miami-Dade County has the largest area of protected lands, which is primarily due to the presence of the Everglades National Park on the west side of the County. Second in aerial coverage of protected lands is Palm Beach County, seemingly due to the presence of Lake Okeechobee and Arthur R. Marshall Loxahatchee NWR. Also notable is Brevard County, seemingly due to the Federal complex associated with the Kennedy Space Center and Cape Canaveral Air Force Station. NOAA has additional protection over State Atlantic waters from Palm Beach to the northern State border. Although not shown on the map, the entire Study Area is protected by the Coastal Zone Management Act.

As shown in Figure 17-16, many of the protected areas in the Study Area overlap with the wetland and floodplain areas identified in Chapter 17.2. Other protected areas overlap with important cultural and historic resources discussed in the following section. The location of these protected areas will likely drive future land use changes and would be expected to experience less industrial or urban development in the future.

17.3.2.6 Cultural and Historic Resources

The regulatory guidance associated with the NHPA, 54 U.S.C. §§ 306108 *et seq*., is described in detail in Chapter 1.5.2.6.

The early inhabitants of the region, now referred to as Florida, resided in the area long before the era of European exploration as nomadic hunters and gatherers. At the time, the sea level was lower and there was less annual rainfall than today, and as a result, the Florida peninsula was more than twice as large as it is now. Uses of pottery and burying the dead along with other goods in earthen mounds became more popular as populations increased (FDS 2019a). Today, the only evidence of these first Floridians is contained in those remaining archeological sites, such as the Shields Mounds (Duval County) and Mount Royal Indian Mounds (Putnam County), that represent dozens of distinctive Indian cultures (Daniels 2007). Florida's early settlers (e.g., Timucua, Ais, Jeaga, and Tekesta tribes) were nearly decimated by exposure to deadly diseases and eventually war that was brought by European settlers when they first arrived in the early 1500s. By 1800, the Timucua tribe had been eliminated (FDS 2019f).

The first Europeans to explore Florida were Spanish explorers (Juan Ponce de Leon) in 1513 looking for the Fountain of Youth and a desirable place for explorers, missionaries, and treasure seekers. Ponce de Leon returned in 1521, but was attacked by American Indians and died (Nelson 2020e). The first attempt for colonial settlements in Florida was by the French in 1564 at Fort Caroline (now Jacksonville in Duval County). In 1565, the Spanish had also built a fort at St. Augustine (St. Johns County) and there was constant conflict between the French and Spanish. Jean Ribault (a French settler of Fort Caroline) set sail to attack the Spanish in St. Augustine, but his ships were scattered by a hurricane and beached. At the same time, Menendez (Spanish settler at St. Augustine) marched to Fort Caroline and attacked. Because, of disease, starvation, conflicts with American Indians and, ultimately, the attach by the Spanish, the colony at Fort Caroline did not survive more than a year, and St. Augustine is considered to be the oldest permanent settlement in Florida and the United States (Nelson 2020e, NPS 2017d).

Slavery in Spain was also different from other European Nations in that Spanish slave laws granted enslaved people certain rights and protections. Therefore, slaves from the Carolinas fled to Florida and, by 1738, there were so many former slaves in Florida that governor of Florida granted them a plot of land a few miles north of St. Augustine in Fort Mose. Fort Mose was the first legally established free African settlement in North America (NPS 2020c). Throughout the 1700’s, Florida was consistently fought over by Spain, France, England, and eventually American colonists (FDS 2019b). The British gained control of Florida from the Spanish in 1763; however, the Spanish recaptured Pensacola in 1781 and regained control of the rest of the State by 1784 (FDS 2019b).

Florida was not part of the original 13 colonies, and at the start of the American Revolutionary War (1775-1783), Florida remained loyal to King George III. However, this was an issue because food, clothing, and supplies for British-owned sugar plantations in the Caribbean were being supplied by the southern colonies that were not loyal to Britain. Regardless, the British attacked Americans from St. Augustine and Pensacola. St. Augustine was important because the British could utilize the Spanish-built stone fortress (Castillo de San Marcos) in the war. The Castillo de San Marcos is the oldest masonry fortress in the United States and is a National Historic Monument (NPS 2020d).

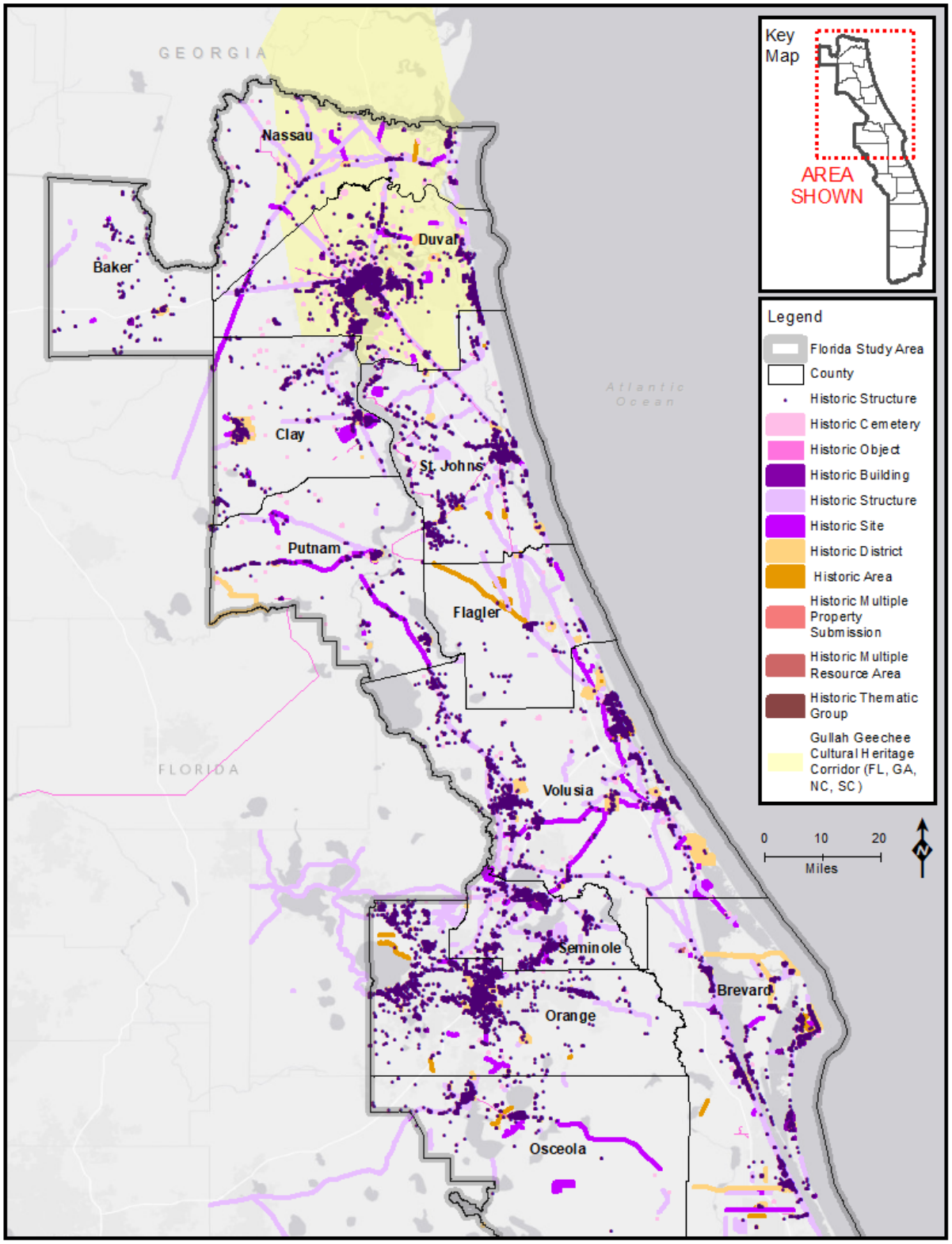
The Seminole Wars occurred between 1817 and 1858 prior to the Civil War. In the first Seminole War (1817-1818) the colonists invaded the Seminole Indians, in part, because the Seminoles were helping runaway slaves escape and the Americans wanted to recapture the slaves. In the second and third wars (1835-1842 and 1855-1857), the Americans were forcing the Seminoles to give up their lands. By the end of the second Seminole War, most of the Seminole population had been killed from starvation, disease, or conflicts. By the end of the third war, some were forcibly moved to Oklahoma while others moved to the Everglades to live on unwanted lands (Nelson 2020e, Britannica 2020).

During the Civil War (1861-1865), Florida had seceded from the Union and joined the Confederacy, although some Floridians (white and African American) joined the Union army. Small battles fought on Florida soil, but no major battles were fought there. The only notable battle was the Battle of Olustee (or Battle of Ocean Pond) fought on February 20, 1864, in Baker County (FDS 2019d, Nelson 2020e).

Today, there are many historic attractions associated with American Indian history, colonialism, European expansion, plantations, and trade routes in the Florida Study Area. Figure 17-17, Figure 17-18, and Figure 17-19 presents a summary of these locations as identified by the National Park Service and Florida Geographic Data Library. Some of the sites are maritime sites located in Biscayne Bay (Miami-Dade County), St. Johns River (Duval County) and other areas in the Atlantic Ocean. As shown in Figure 17-17, the Gullah/Geechee Cultural Heritage Corridor is the area within which the Gullah culture in the Carolinas and the Geechee culture in Georgia and Florida primarily reside. The Corridor extends from Wilmington, North Carolina to Jacksonville, Florida. The Gullah and Geechee are cultural groups descended from enslaved peoples from West and Central Africa. The geographic isolation of the region has contributed to both cultures being able to preserve their linguistic, artistic, and societal traits while simultaneously assimilating aspects of other cultures in the area (NPS 2017a).

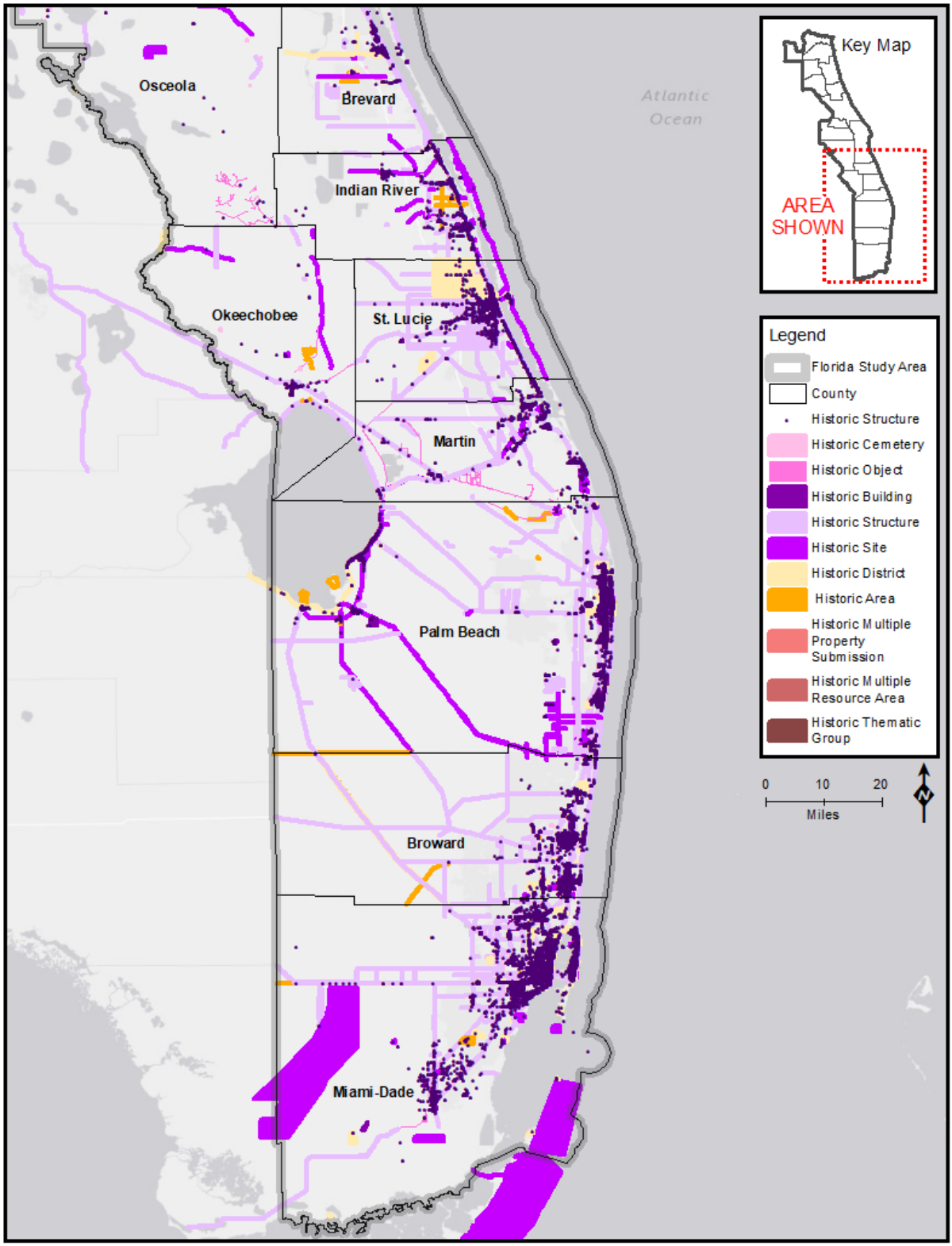
Impacts to cultural resources/historic properties located near the OCS have long been a focus of BOEM, and one of the most important concerns is the possible impacts that structures and lighting may have on onshore cultural resources or historic properties. In a previous evaluation conducted for BOEM (Klein et al. 2012), over 9,100 cultural resources and historic properties along the Atlantic Coast in 13 coastal states (including Florida) were noted to have historically significant maritime settings with over 1,100 of those resources considered to have a historically significant view toward the open sea. Within a defined visual areas of potential effect, concern for these sites focus on specific attributes such as identity, location, status, size, ownership, type, age, function, accessibility, public visitation, and setting (Klein et al. 2012). Historic districts associated with a history of maritime commerce may also fall within the category of resources that derive their significance in part from associated seascapes. It is possible that Klein et al. (2012) identified additional resources that may be affected by OCS-related project that are not covered herein. Therefore, future OCS-related project analysis should also consider data collected in BOEM's *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al. 2012) once site-specific information is known.

In summary, many cultural sites in the Study Area are identified in Figure 17-17, Figure 17-18, and Figure 17-19; however, any site over 50 years old could be considered a potential historic resource. There is a high potential for archaeological, architectural, marine cultural resources and historic properties throughout the Study Area, many of which cannot be shown at the scale of the figures or are not publicly available. Many sites have yet to be evaluated as historic resources. New archaeological sites are frequently found when new construction projects are undertaken. Humans typically settle near water sources for use as a drinking, food, and transportation resource; therefore, based on the number of rivers and other water bodies, there are numerous high probability areas for potential archaeological resources within the Study Area. Such sites could be potentially impacted by future projects and would need to be evaluated under the NRHP criteria and in compliance with Section 106 of the NHPA to determine if there would be any effects. Because of the importance of Florida's cultural and historical resources, detailed cultural resource surveys of proposed future OCS-related project sites and their immediate vicinity will be essential to determine potential effects to these resources. These surveys should also incorporate potential visual impacts to historic properties.



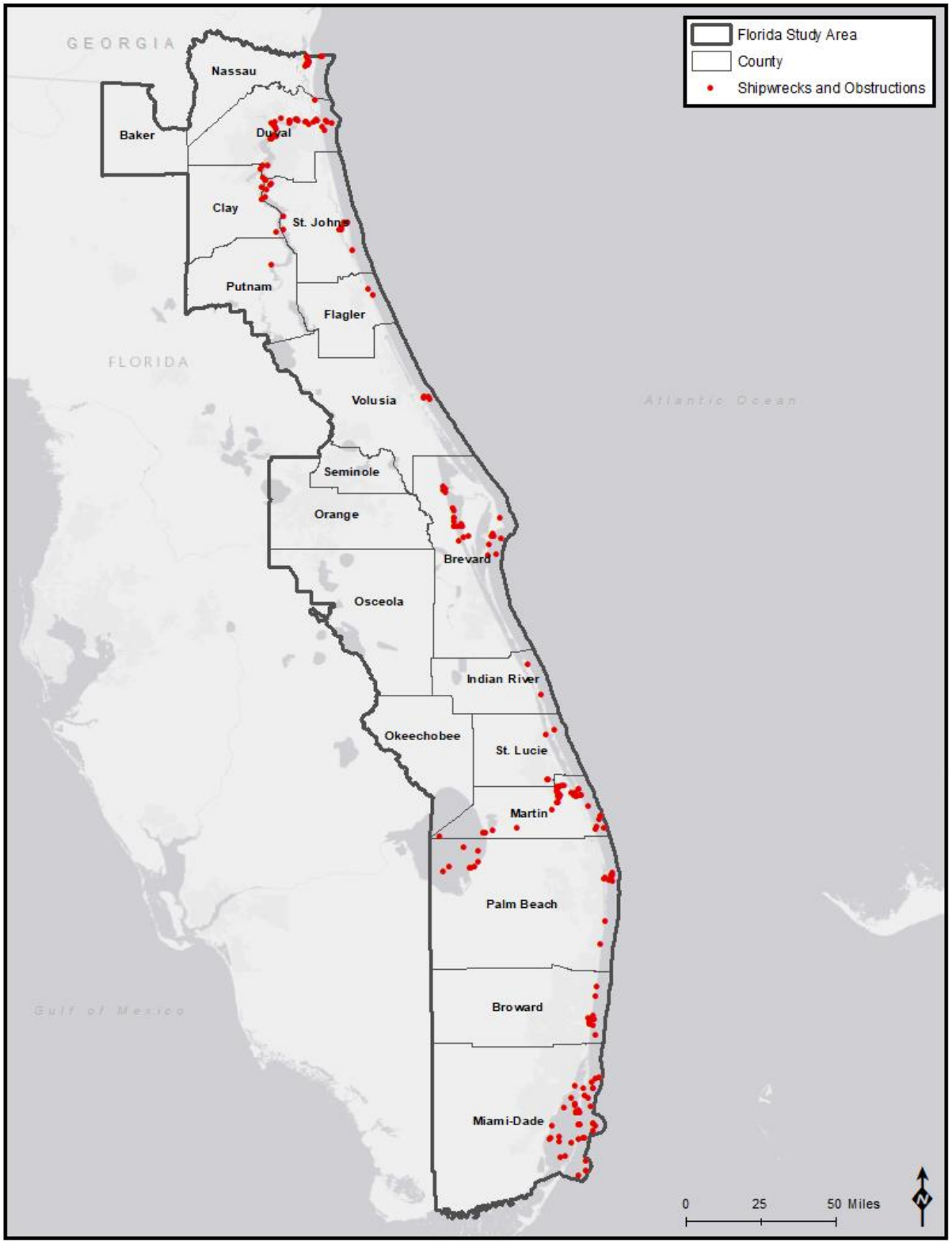
Sources: NPS 2014, FGDL 2019a

Figure 17-17. Cultural and Historic Sites within the Northern Florida Study Area



Sources: NPS 2014, FGDL 2019a

Figure 17-18. Cultural and Historic Sites within the Southern Florida Study Area



Source: NOAA 2016a

Figure 17-19. Shipwrecks and Obstructions within the Florida Study Area

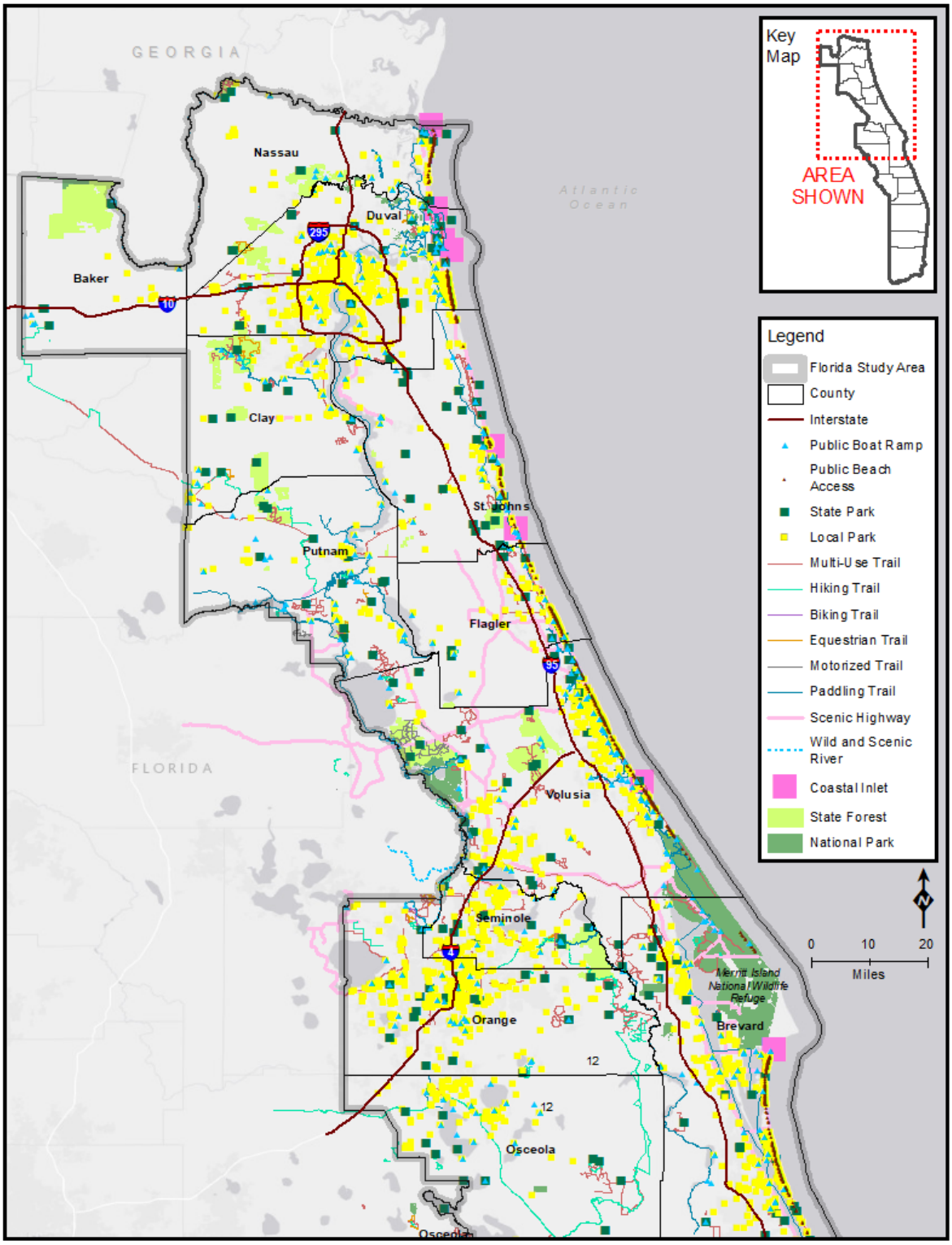
17.3.2.7 Recreation

The Study Area has diverse recreational opportunities. Some of the top outdoor recreational activities in Florida include bicycling, freshwater and saltwater fishing, saltwater beach activities, boating, canoeing, kayaking, paddle boarding, outdoor fitness (walking/jogging), viewing wildlife, and picnicking. Other activities include visiting National Parks, State Forests, State Parks, Wildlife Management Areas, historical and cultural resources, and modern built experiences, including theme parks and golf courses. A selection of major recreation resources in the Study Area is shown in Figure 17-20 and Figure 17-21. The cultural and historic resources shown in Figure 17-17, Figure 17-18, and Figure 17-19 can also be considered potential recreational resources as can many of the protected areas shown in Figure 17-16. The regions located within the Study Area are addressed below for general recreation characteristics. Additional resource areas which may be associated with recreation include cultural and historic resources (Chapter 17.3.2.6), transportation (Chapter 17.3.2.8), tourism employment (included in Chapter 17.4.4), and rental housing (included in Chapter 17.4.3).

Northeast Region (Nassau, Baker, Duval, Clay, St. Johns, Putman, and Flagler Counties)

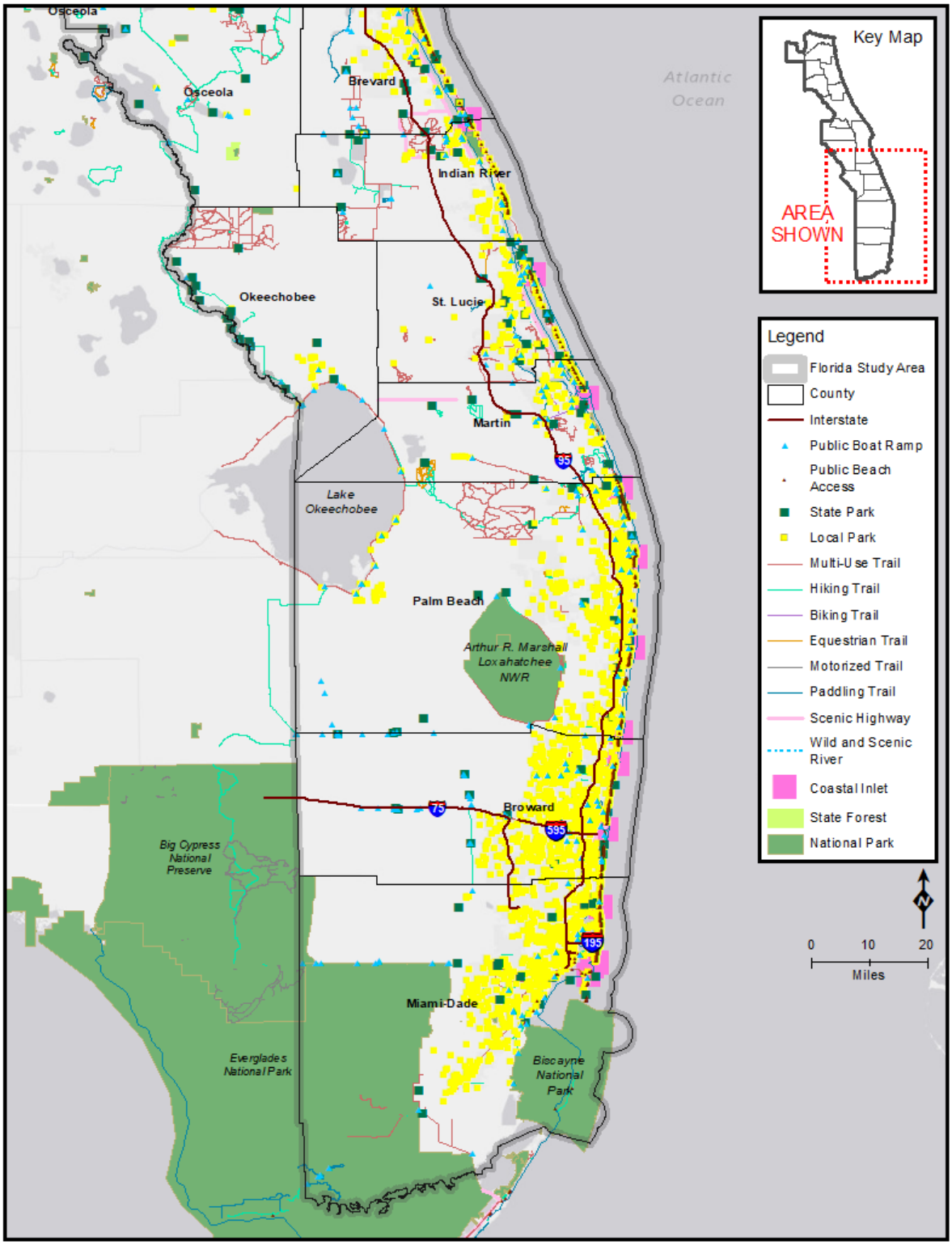
In the Northeast Region (Nassau, Baker, Duval, Clay, St. Johns, Putman, and Flagler Counties), the largest city for tourism is Jacksonville (Duval County), which is also the geographically largest city in the State (Cubit Planning 2019). Tourism in the Jacksonville area generates approximately $3.2 billion annually, with March being reported as the best month for tourism (Ghabour 2018). Jacksonville has 22 miles of beaches with the three main beaches areas being Jacksonville Beach, Atlantic Beach, and Neptune Beach (Only in Your State 2016). Amelia Island in Nassau County is also very popular, attracting more than 690,000 overnight visitors in 2018, with an economic impact of $678 million (AITDC 2019). The beaches attract recreators who like to surf, snorkel, dive, fish, and view sea turtles. In addition to the beaches, there are several options for shopping, theaters and museums, and local parks (Visit Jacksonville 2019a). Several meetings and conventions are also held in the Jacksonville area throughout the year (Ghabour 2018).

Popular annual festivals in this region of the Study Area include the Jacksonville Boat Show (January), Jazz Festival (May), WasablCon (October), Collective Con (March), Springing the Blues (April), Gate River Run (March), Spartan Race (motorcross) (February), Community First Seawalk Music Festival (February), Jax Greek Festival (May), Porchfest (free live music festival) (May), and Kingfish Tournament and Festival (July). Additional festivals in the area are listed on the Visit Jacksonville website (Visit Jacksonville 2019b). There are several National Parks, State Forests, beaches, and State Parks in this region. National Parks include Timucuan Ecological and Historic Preserve (Duval County), which had 1.13 million visitors in 2018, Fort Caroline National Memorial (Duval County), which had 203,000 visitors in 2018, and Fort Matanzas National Monument (St. Johns County), which had 608,000 visitors in 2018 (NPS 2018a). Some of the State Forests in this region of the Study Area include Four Creeks (13,106 acres), Cary (13,385 acres), John M. Bertha (37,735 acres), Belmore (12,262 acres), Jennings (25,300 acres), and Etoniah Creek (8,876 acres). An interactive map with additional information on each State forest can be found on the Florida Department of Agriculture and Consumer Services' website (FDACS 2019) and Florida's tourism website (Visit Florida 2019b). The Guana Tolomato Matanzas National Estuarine Research Reserve (76,760 acres) is also a significant recreational resource for the area. (FDEP 2020). State parks in the Florida study are can be found on the FDEP website (Florida State Parks 2019).



Sources: NPS 2014, USFS 2019b, FGDL 2016, FGDL 2018, FGDL 2019b, FGDL 2019c, FDEP 2019f, FDOT 2019a, USFWS 2018b, FNAI 2019

Figure 17-20. Select Recreational Resources within the Northern Florida Study Area



Sources: NPS 2014, USFS 2019b, FGDL 2016, FGDL 2018, FGDL 2019b, FGDL 2019c, FDEP 2019f, FDOT 2019a, USFWS 2018b, FNAI 2019

Figure 17-21. Select Recreational Resources within the Southern Florida Study Area

East Central Region (Volusia, Seminole, Orange, Brevard, and Osceola Counties)

In the East Central Region (Volusia, Seminole, Orange, Brevard, and Osceola Counties), there are several beaches including Daytona Beach and Cocoa Beach which both have a boardwalk and pier, Ormond Beach, Palm Bay, Melbourne Beach, and the Canaveral National Seashore. It was estimated that, in 2017, there were over 10 million visitors to Volusia County with spending at almost $6.1 billion allowing for 55,200 jobs overall (Fishman 2018). In Brevard County, tourists spend over $2.1 billion annually allowing for about 26,000 jobs in the community (Berman 2019, Space Coast Daily 2019). Canaveral National Seashore spans Volusia and Brevard Counties and is a very popular tourist destination, with an estimated 1.66 million visitors in 2018 (NPS 2018a). It was also estimated that tourists spent $62.5 million in communities near the park (Palfrey 2016). Visitors can swim, surf, walk on the boardwalk at Playalinda Beach, and view rocket launches. At the southern end of the Canaveral National Seashore is the Kennedy Space Center, which spreads across 219 square miles on Merritt Island and attracts approximately 1.5 million visitors annually (Wall 2018). However, the City of Orlando is the most popular tourist destination in Florida and the second most visited destination in the U.S., behind Las Vegas (VOA News 2019). In 2018, over 75 million people visited Orlando primarily because of the many theme parks including Walt Disney World (Magic Kingdom, Epcot, Hollywood Studios, Animal Kingdom), Universal Studios, Harry Potter World, Sea World, Legoland, Discovery Cove, Wonder Works Orlando, Gatorland Orlando, Aquatica Park, Blizzard Beach water park, and Typhoon Lagoon water park (Hotels.com 2019). There are several annual events that occur in the Orlando area theme parks throughout the year. Additional popular annual events throughout the region, include the NASCAR races at Daytona (year round with the Daytona 500 in February), Florida Film Festival (a 10-day event) (April), Orlando Film Festival (8-day event) (October), Whiskey Business (February), Orlando Fringe (a 2-week event of theatrical performances) (May 18-31), MegaCon (four-day comic convention) (March), Bite 30 (a month long food festival) (July-August), Greek Fest (November), Beer Festival (November 14), Buffalo Wild Wings Citrus Bowl (January), Florida Strawberry Festival (February-March), and the Central Florida Fair (February-March) (OW Staff 2019).

Select State Forests in the East Central Region include Lake George (21,473 acres), Tiger Bay (27,395 acres), Little-Big Econ (10,236 acres), and Charles H Bronson (10,940 acres). An interactive map with additional information on each State forest can be found on the Florida Department of Agriculture and Consumer Services' website (FDACS 2019) and Florida's tourism website (Visit Florida 2019b). NWRs in the East Central Region include Lake Woodruff NWR (22,000 acres), Merritt Island NWR (140,000 acres), and Archie Carr NWR (258-acre refuge stretching 20.5 miles between Melbourne Beach and Wabasso Beach in Brevard and Indian River Counties). Additional information on each refuge in the Study Area can be found on the USFWS's interactive website (USFWS 2019l).

Central Region (Okeechobee County) and Treasure Coast Region (Indian River, St. Lucie, Martin, and Palm Beach Counties)

In the Central (Okeechobee County) and Treasure Coast (Indian River, St. Lucie, Martin, and Palm Beach Counties) Regions of the Study Area, the most visited tourist destinations include Port St. Lucie and the Palm Beaches. It was estimated that nearly 1.2 million people visited St. Lucie County in 2017, creating almost 8,000 jobs and an economic impact of almost $802 million of direct and indirect spending (St. Lucie Florida 2019). It was estimated that 7.89 million people visited the Palm Beaches in 2018, allowing for nearly 70,000 jobs and providing $7.1 billion in economic impact (Svarney and Ledford 2018). Attractions include beaches (e.g., Vero Beach, Delray Beach, and West Palm Beach), Palm Beach Zoo, South Florida Science Center and Aquarium, Mounts Botanical Gardens, Port St. Lucie Botanical Gardens, Rapids Water Park, Lion Country Safari, and Arthur R Marshall Loxahatchee NWR (144,188 acres). Like the Northeastern Region of the Study Area, the beaches draw people who like to surf, snorkel, dive, fish, and view sea turtles. There are no State Forests in this region.

South Region (Broward and Miami-Dade Counties)

The South Region of the Study Area includes Broward and Miami-Dade Counties, in which the Miami metropolitan area is a popular area for tourists. It was estimated that more than 23 million tourists visited Miami in 2018, contributing $18 billion to the local economy (Portero 2019). There are several beaches and islands in this region, including Hollywood Beach which has a 2.5-mile boardwalk, Sunny Isles Beach, Bal Harbour, Surfside Beach, North Beach, Mid Beach, South Beach, and Key Biscayne (GMCVB 2019a). Annual events in the Miami area include Art Deco Weekend (January), Miami International Boat Show (February), Coconut Grove Art Festival (February 15-17), Gay8 Festival (February 16), Carnival Miami (October), Coconut Grove Food and Wine Festival (August), Miami Beach Pride (April), Ultra Music Festival (March), Outshine Film Festival (April), Miami Beach Polo World Cup (April), American Black Film Festival (June), Miami Funkshion Swim Week (July), Miami International Auto Show (November 1-10), Miami Book Fair (November), and multiple NASCAR events all year (GMCVB 2019b).

National Parks in Miami-Dade County include Biscayne National Park and Everglades National Park. Biscayne National Park is a 173,000-acre park which has aquamarine waters, emerald Islands, and coral reefs. People can go fishing, boating, diving, snorkeling, paddling, hiking, camping, and watch wildlife (NPS 2017b). In 2018, it was estimated that there were 469,000 visitors to Biscayne National Park. There is no entrance fee for Biscayne National Park, but there is a $25 camping fee for overnight stays at Elliott Key or Boca Chita Key in the park (NPS 2019f). The Everglades National Park estimated approximately 597,000 visitors in 2018 (NPS 2018a). The Everglades National Park is 1.5 million acres and spans three counties (Monroe, Collier, and Miami-Dade) (NPF 2019), of which only Miami-Dade County is in the Study Area. Entrance fees range from $15 to $30 for a 7-day pass for private vehicles, motorcycles and pedestrians and up to $200 for commercial tour busses carrying 26 or more people (NPS 2019g). There are no State Forests in Broward or Miami-Dade Counties.

Summary

Other noteworthy recreational activities throughout the Study Area include professional sporting events for various professional sports teams including the Jacksonville Jaguars (National Football League), Orlando Magic (basketball), Miami Dolphins (National Football League), Miami Heat (basketball), Florida Marlins (baseball), and Florida Panthers (ice hockey) (50 States 2019), as well as the spring training camp for the New York Mets (baseball). There are also several cruise ships cruises that dock in Jacksonville (Duval County), Cape Canaveral (Brevard County), and Miami (Miami-Dade County).

There are recreational activities year-round in the Study Area, but peak tourist season is typically from mid-December through April because people enjoy the warm temperatures during the winter and for spring break. Some tourists choose to visit Florida in late spring or early fall for cheaper, off-season vacations because there are less crowds and the warm weather. The summer months are considered off-season because the weather is very hot and muggy, especially in South Florida (Tingley 2017). There are numerous beaches to visit in the Study Area. Some of the more popular areas include Duval County (Jacksonville), Orange County (Orlando), Volusia County (Daytona Beach and Canaveral National Seashore) Palm Beach County (Palm Beach), and Miami-Dade County (Miami metropolitan area and Everglades National Park). Therefore, future developers should consider the potential impacts on the counties, events, and attractions (e.g., festivals and fishing tournaments) during the planning phase and site selection process.

17.3.2.8 Transportation Resources

There are a variety of transportation resources throughout the Study Area, including major Interstate and State highways; national, international, regional, and local public airports; interstate railroads and some

local railroad spurs; and ports. Figure 17-22 and Figure 17-23 show the transportation resources throughout the Study Area.

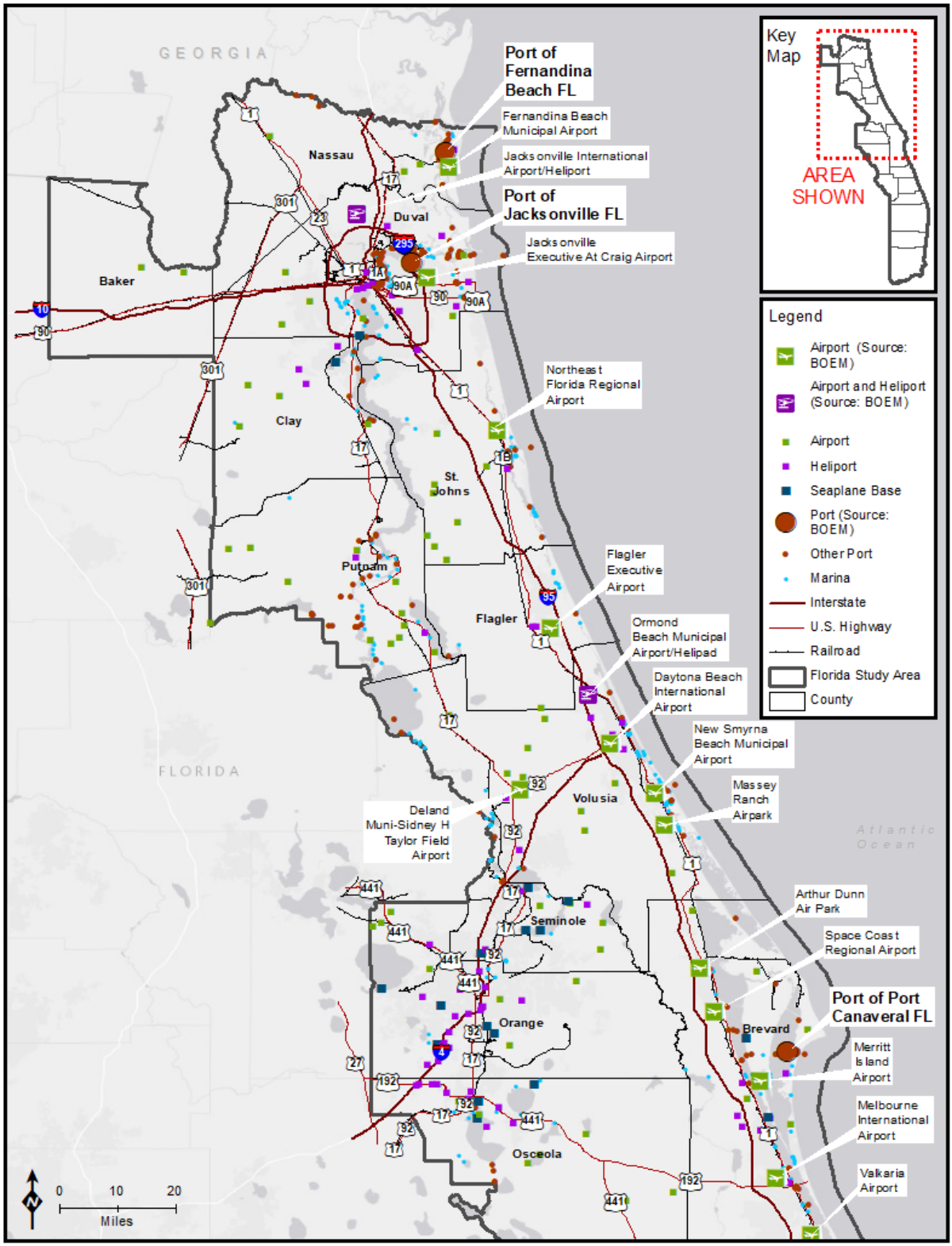
Florida has one of the largest and most complex transportation systems in the United States, including 12,099 miles of State road, 2,753 miles of rail, 53 transit systems, 780 airports, 15 public seaports, and two spaceports (FTP and SIS 2015). Within the Study Area, there are 31 airports, air parks, and/or heliports (BOEM 2019).

There are two major north/south roadway transportation corridors in the Study Area, Interstate-95 to the east and Highway 17 to the west. In addition, Scenic Highway 1 skirts the coast. Interstate 295 allows bypass of Jacksonville and connects northeast Florida to the panhandle via Interstate-10. Interstate 4 connects Interstate-95 to the Orlando Area. Interstate 75 connects the Miami area to southwest Florida via Interstate 595. These major roadways connect the major urban centers, industrial locations, and recreation destinations throughout the Study Area. There are six ports throughout the Study Area, Port of Palm Beach, Port of Port Everglades, Port of Miami, Port of Port Canaveral, Port of Jacksonville, Port of Fernandina Beach (BOEM 2019). The State of Florida's seaports play a critical role in Florida's economy. Within Florida, seaports generate nearly 900,000 direct and indirect jobs and contribute $117.6 billion in economic value to the State through cargo and cruise activities. Florida maritime activities account for approximately 13% of Florida's Gross Domestic Product while contributing $4.2 billion in State and local taxes (FPC 2019a). Due to recent storm events that severely impacted seaport infrastructure and an increase in the modeling data and understanding of projected sea level rise, seaports are addressing these potential effects to improve seaport resiliency for years to come (FPC 2019b).

Waterways and ports are a significant part of the transportation and commerce network in Florida. Ports throughout the Study Area are centers of import goods which are then distributed throughout the U.S. and export of goods produced in the U.S. that are then transported to global destinations. Waterways also serve as transportation routes for passenger travel to local, state, national, and international destinations.

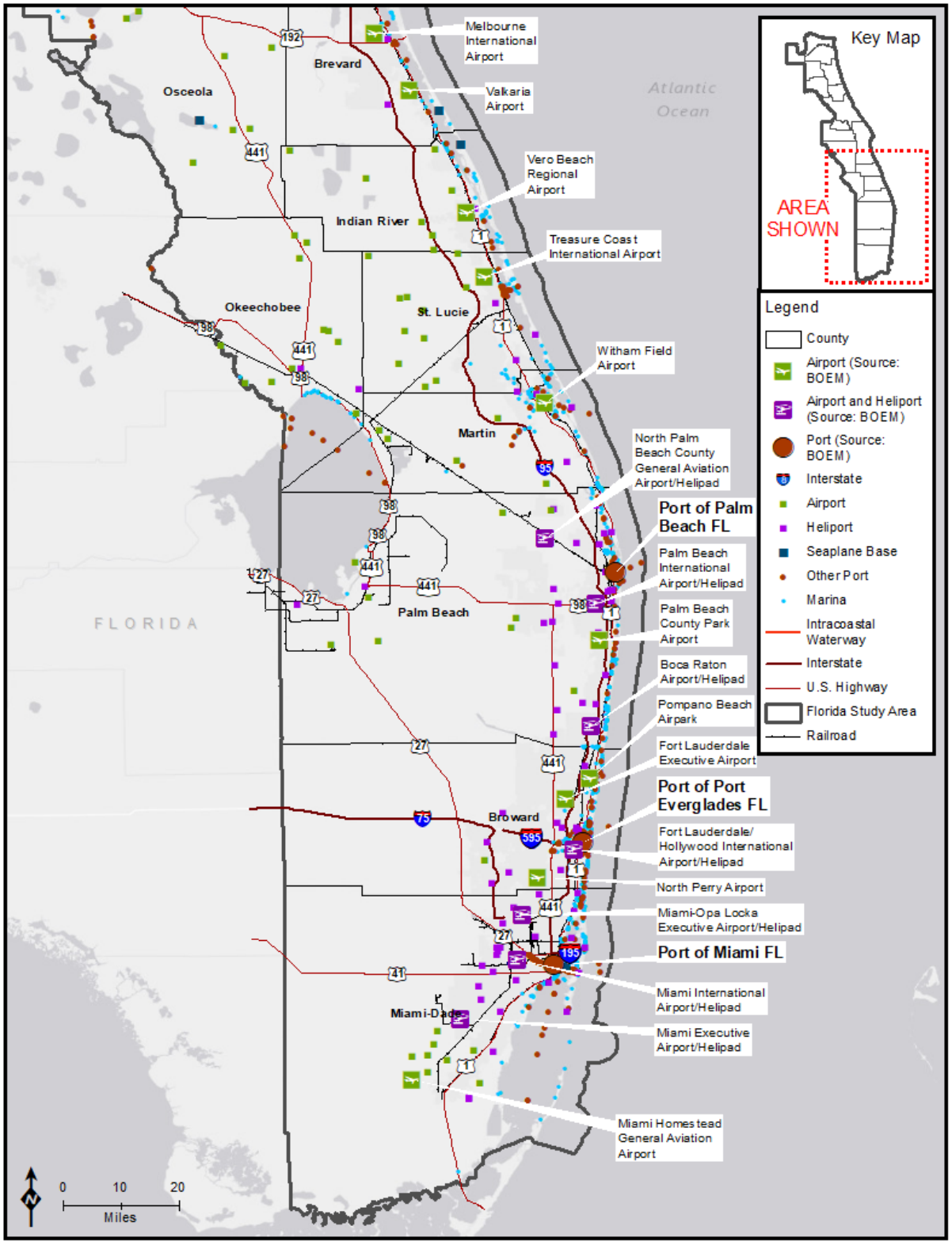
17.3.3 Summary – Land Cover and Land Use

Land cover across the Study Area varies greatly; however, in general, agricultural land use is located inland and urban development located along the coast, with the exception of the Orlando urban center in Orange and Seminole Counties. Typically, as would be expected, the metropolitan areas are primarily comprised of developed land uses (developed open space, developed low intensity, developed medium intensity, or developed high intensity); however, several counties with higher proportions of urban development are limited from future development because the remaining undeveloped areas are dense with sensitive resources (usually water resources). The developed high-intensity areas are the urban downtown centers where there are higher concentrations of impervious surfaces, more buildings, more development, and more transportation resources (road, rail, air, and port). Metropolitan areas with a larger population size also tend to have a larger surface area covered by developed land uses and tend to have more advanced transportation networks or serve as transportation hubs. There are higher concentrations of business, commercial, and industrial facilities near the metropolitan centers as would be expected. Based on an analysis of the general land cover within the Study Area, it seems most likely that Baker, Clay, Flagler, Nassau, Orange, Putnam, St. Lucie, St. Johns, and Volusia Counties would be the most suitable counties to accommodate future industrial coastal projects. Because of the common balance of urban and wetland land cover, it appears that the presence of extensive wetlands throughout Florida serves to concentrate urban development and reduce uncontrolled urban development.



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 17-22. Transportation Resources within the Northern Florida Study Area



Sources: BOEM 2019, ESRI 2019b, USDOT 2019a, USDOT 2019b, East Coast Greenway 2019

Figure 17-23. Transportation Resources within the Southern Florida Study Area

Most of the counties within the Study Area have future land use plans, and many have zoning ordinances. These future land use plans and ordinances often consider preservation of existing protected areas, cultural and historic areas, and recreation resources and may plan for expansion of such land uses in the future. There are several organizations that support economic development and are designed to help draw businesses to Florida. These organizations are presumably experienced in helping businesses coordinate with local and State governments and regulatory bodies during the project planning and site selection phases. Based on a cursory review of project planning documents available at their website, issues of concern in central Florida include emergency preparedness, housing, transportation, food production in Orange and Seminole Counites, sea level rise along the Space Coast, and urban landscapes designed to connect communities while avoiding sprawl (ECFRPC 2018). Individual plans appear to reflect the predicted future trends of development moving farther inland to escape coastal hazards, which will compound the development pressure and impacts on existing undeveloped agricultural and natural landscapes. Industry is currently concentrated in the major urban centers of Jacksonville, Orlando, and Miami and along the Space Coast. Corporate incentives focus on development of rural and urban areas and are restricted to certain industries that do not include OCS-related ventures.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. Much of the Study Area is protected from development. The entire State of Florida is regulated under Florida's CMP. All wetlands and water bodies are protected by the CWA and most within the Study Area have multiple additional protections within the State. As such, any development will undergo additional scrutiny by multiple agencies, especially when any water resources are involved, which is likely to occur given their prevalence. Protected areas in Florida generally overlap with the immediate coasts and other water bodies. These specific land uses, and potential impacts to these land uses, tend to have deep emotional connections for certain members of the population. Floridians and visitors attach emotional significance to such sites. As such, community members may be resistant to the idea of future development that would change or alter the experience of that site in any way. Given the prevalence of protected areas within the Study Area, it is unlikely that future development associated with OCS-related activity could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, project developers would need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

Transportation resources are abundant in the Study Area, though most are located along the eastern most side of the Study Area adjacent to the coast. Any potential future development will depend on the integrated transportation network during both the construction and operational phases. Potential future projects will need to consider their transportation needs as part of the site selection process. For example, some projects may need to utilize railroads and barges to transport large or heavy equipment because such loads may be oversized and thus cannot be transported on local roadways, or because the weight of the loads could cause damage to roads and bridges. Airport locations could be essential depending on the nature of the project. Additionally, projects may require the development of new roadways or railroads for specific project locations. Therefore, an understanding of the integrated transportation network will be essential for future project development.

17.4 Demographics and Socioeconomics

This section includes a description of the general population demographics, housing utilization and vacancy rates, employment, and vulnerable populations that could require attention in environmental impact assessment analyses. These characteristics will provide insights into the local population with respect to potential future OCS-related projects.

17.4.1 Population

After decades of rapid growth, Florida's population is increasing, and at a rate nearly double that of the national population. According to the USCB, Florida's estimated population was 20.2 million in 2017. As shown in Table 17-9, the State grew 7.9% since the 2010 Census, having added approximately 1.4 million people. During the same period, the population of the United States grew just 4% from 308.7 million to 321.0 million (USCB 2017a, USCB 2017d). These values are USCB estimates. As estimates they contain "residuals," which necessitate margins of error in the USCB calculations. Therefore, these values may not match the overall population sums exactly.

Population change occurs as a result of natural increase (the difference between births and deaths) and net migration (the difference between people moving in and moving out). Net migration includes domestic and international changes of residence. Population growth in the U.S. has slowed over the last decade, and recently hit an 80-year low. According to 2018 estimates, the Nation's annual rate of population growth was 0.62% for the year ending July 2018, a result of declines in the number of births, gains in the number of deaths, and aging population (USCB 2019a, Brookings Institute 2018).

While Florida is affected by the nationwide trend of aging population, the State continues to grow due to in-migration, both domestic and international. As estimated by University of Florida's Bureau of Economic and Business Research, migration accounted for 85.1% of Florida's population increase between 2010 and 2017. Natural population increase, defined as the difference between births and deaths, accounted for 14.9% of Florida's population gain during the same period (BEBR 2017).

For years, northern States, most notably New York and New Jersey, have lost a steady stream of residents to southern States. This trend is in stark contrast to national migration trends, which are at historic lows. Reasons for relocations, derived from the USCB survey data for 2015-2017, include a change in marital status, work related reasons (new job or transfer) and desire for better housing. Retirees accounted for only about 8% of out-migration from the Northeast (Governing.com 2018). Of the approximately 600,000 people who left northern States between 2015 and 2017, an estimated 412,000 moved to the South. The top destination in the south was Florida. The USCB's 2017 American Community Survey suggests that all parts of the Northeast, with the exceptions of Maine and Rhode Island, lost more residents to Florida than they received from Florida. More New Yorkers, in fact, moved to Florida than to neighboring New Jersey (Governing.com 2018).

17.4.1.1 Study Area Trends

Figure 17-24 shows the demographic regions comprising the Study Area, adapted from the Florida Regional Councils Association, an alliance of regional planning councils serving the State, local government and citizens (Florida Regional Councils Association 2019). The counties within the Study Area are located within five demographic regions defined as Central, East Central, Northeast, South and Treasure Coast. (Note: The Central Region contains only one county (Okeechobee) included in the Study Area). These regions are different from the various regions described in Chapter 17.2. According to 2017 population estimates, the Study Area represented 56.4% (11,439,302 residents) of the overall State population of 20,278,447 (USCB 2017d). Table 17-9 shows population growth of the 19 Study Area counties, as well as their location within the demographic regions. Between 2010 and 2017, 18 of the 19 counties experienced growth. During the same period, the population of the Study Area grew 8.3%, faster than the State (7.9%), and significantly faster than the Nation (4.0%). Population estimates are based on permanent residents and exclude those residing in Florida part-time as winter visitors or colloquially known as "snowbirds" (USCB 2017a, USCB 2017d, USCB 2018b, BEBR 2018).

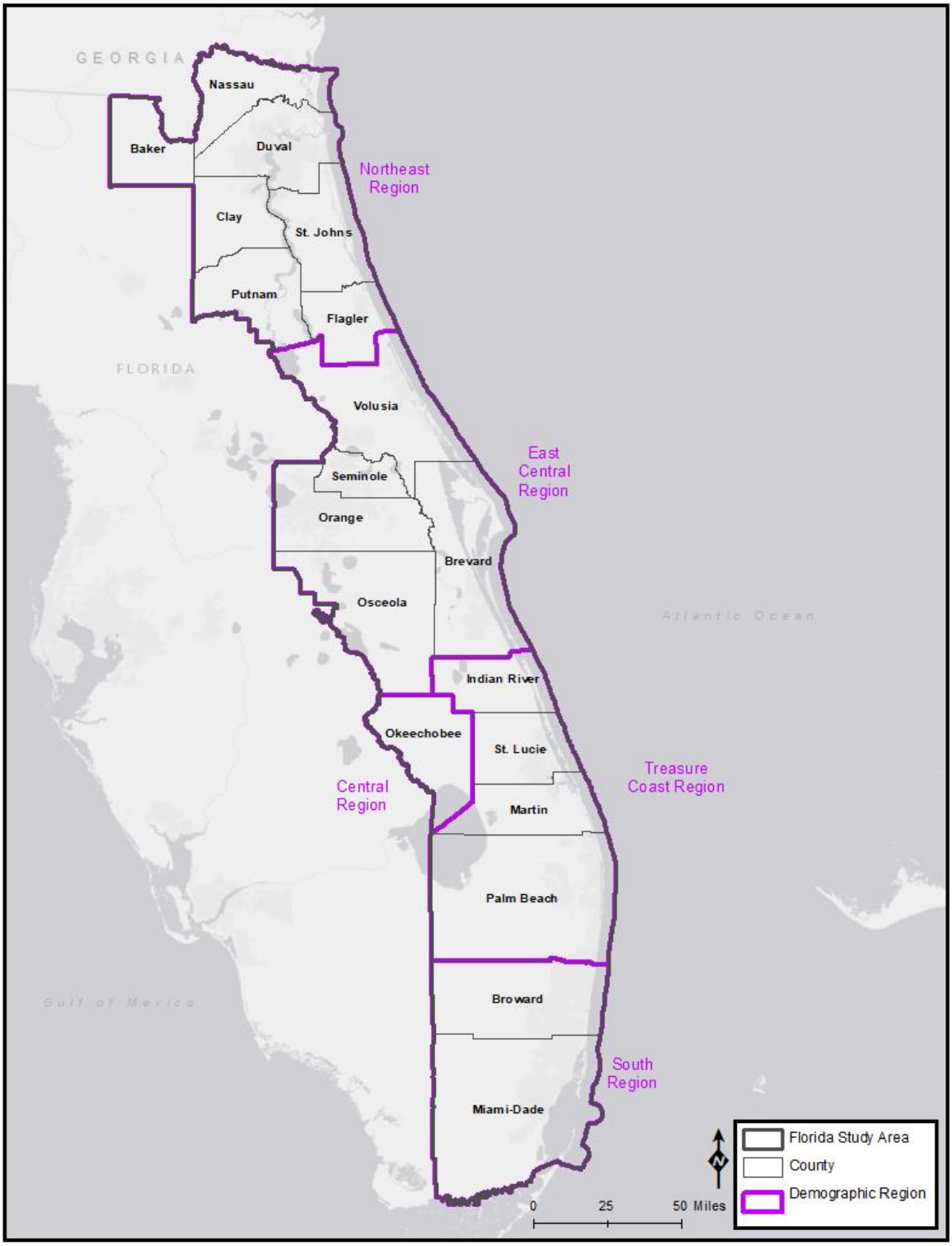
Table 17-9. 2010 and 2017 Total Population and Population Projections Through 2040 in the Florida Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
Central	**Okeechobee**	39,996	40,228	41,545	43,074	44,155	0.6	9.8
	Total Central Region	***39,996***	***40,228***	***41,545***	***43,074***	***44,155***	***0.6***	***9.8***
East Central	**Brevard**	543,376	568,183	598,486	656,288	698,681	4.6	23.0
	Orange	1,145,956	1,290,216	1,415,511	1,693,977	1,891,845	12.6	46.6
	Osceola	268,685	325,168	380,703	500,204	590,986	21.0	81.7
	Seminole	422,718	449,260	477,792	533,481	573,666	6.3	27.7
	Volusia	494,593	518,660	544,093	594,289	629,946	4.9	21.5
	Total East Central	***2,875,328***	***3,151,487***	***3,416,585***	***3,978,239***	***4,385,124***	***9.6***	***39.1***
Northeast	**Baker**	27,115	27,537	28,266	30,557	32,178	1.6	16.9
	Clay	190,865	203,291	220,221	255,695	281,715	6.5	38.6
	Duval	864,263	912,043	981,852	1,095,165	1,177,578	5.5	29.1
	Flagler	95,696	105,015	112,463	134,359	151,613	9.7	44.4
	Nassau	73,314	78,435	86,416	102,124	113,930	7.0	45.3
	Putnam	74,364	72,435	73,109	73,312	73,545	-2.6	1.5
	St. Johns	190,039	226,578	256,127	329,487	384,648	19.2	69.8
	Total Northeast	***1,515,656***	***1,625,334***	***1,758,454***	***2,020,699***	***2,215,207***	***7.2***	***36.3***
South	**Broward**	1,748,066	1,890,416	1,942,686	2,120,334	2,238,307	8.1	18.4
	Miami-Dade	2,496,435	2,702,602	2,861,579	3,190,242	3,427,202	8.3	26.8
	Total South	***4,244,501***	***4,593,018***	***4,804,265***	***5,310,576***	***5,665,509***	***8.2***	***23.4***
Treasure Coast	**Indian River**	138,028	147,981	157,200	179,407	194,699	7.2	31.6
	Martin	146,318	155,719	159,129	173,908	185,807	6.4	19.3
	Palm Beach	1,320,134	1,426,772	1,473,738	1,640,998	1,763,237	8.1	23.6
	St. Lucie	277,789	298,763	313,070	359,468	395,143	7.6	32.3
	Total Treasure Coast	***1,882,269***	***2,029,235***	***2,103,137***	***2,353,781***	***2,538,886***	***7.8***	***25.1***

Table 17-9. 2010 and 2017 Total Population and Population Projections Through 2040 in the Florida Study Area

Region	Geographic Unit	Historic Population (2010)[1]	Total Population (2017)[2]	Population Projection (2020)[3]	Population Projection (2030)[3]	Population Projection (2040)[3]	Population Change (2010-2017) (%)	Projected Population Change (2017-2040) (%)
	Study Area Total	10,557,750	11,439,302	12,123,986	13,706,369	14,848,881	8.3	29.8
	Florida	18,801,310	20,278,447	21,517,610	24,340,457	26,373,603	7.9	30.1
	United States	308,745,538	321,004,407	332,639,000[4]	355,101,000[4]	373,528,000[4]	4.0	16.4

Sources: 1 - USCB 2017a; 2 - USCB 2017d; 3 - BEBR 2018; 4 - USCB 2018b



Source: Florida Regional Councils Association 2019

Figure 17-24. Demographic Regions of the Florida Study Area

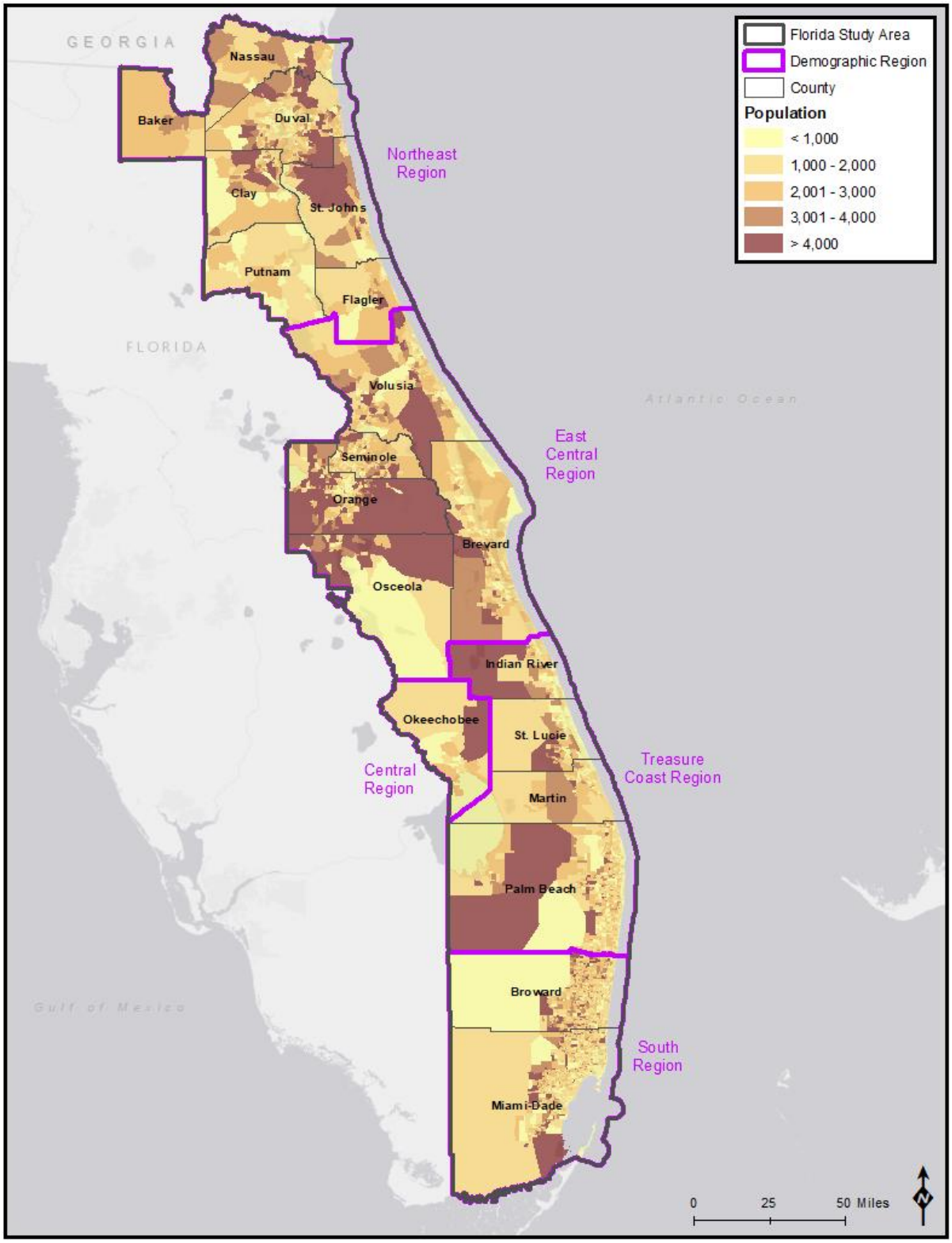
Between 2010 and 2017, population increased in each region in the Study Area, but at different rates. As shown in Table 17-9, the fastest growing regions were East Central (9.6%) and South (8.2%). The slowest growing regions were Central (0.6%) and Northeast (7.2%). These regions contain rural and qualified economically distressed rural counties (FDEO 2019c). The Central Region contains one rural county (Okeechobee). The Northeast Region contains two rural counties (Baker and Putnam) as well as two counties that are qualified economically distressed rural counties (Flagler and Nassau)(FDEO 2019c). In 2017, the top five fastest-growing counties were Osceola and Orange counties (21.0% and 12.6%, respectively) in the East Central Region; St. Johns and Flagler (19.2% and 9.7%, respectively) in the Northeast Region; and Miami-Dade (8.3%) in the South Region (USCB 2017a, USCB 2017d).

Figure 17-25 shows population counts in census block groups within the counties located in the Study Area. Figure 17-26 illustrates geographic high-density concentration in major urban areas that correspond to MSA, defined as a region containing at least one urban area with a population of 50,000 (*Federal Register* 2010). The MSAs present in the Study Area are (Data.gov 2017):

- Deltona-Daytona Beach-Ormond Beach, FL
- Jacksonville, FL
- Miami-Fort Lauderdale-West Palm Beach, FL
- Orlando-Kissimmee-Sanford, FL
- Palm Bay-Melbourne-Titusville, FL
- Port St. Lucie, FL
- Sebastian-Vero Beach, FL

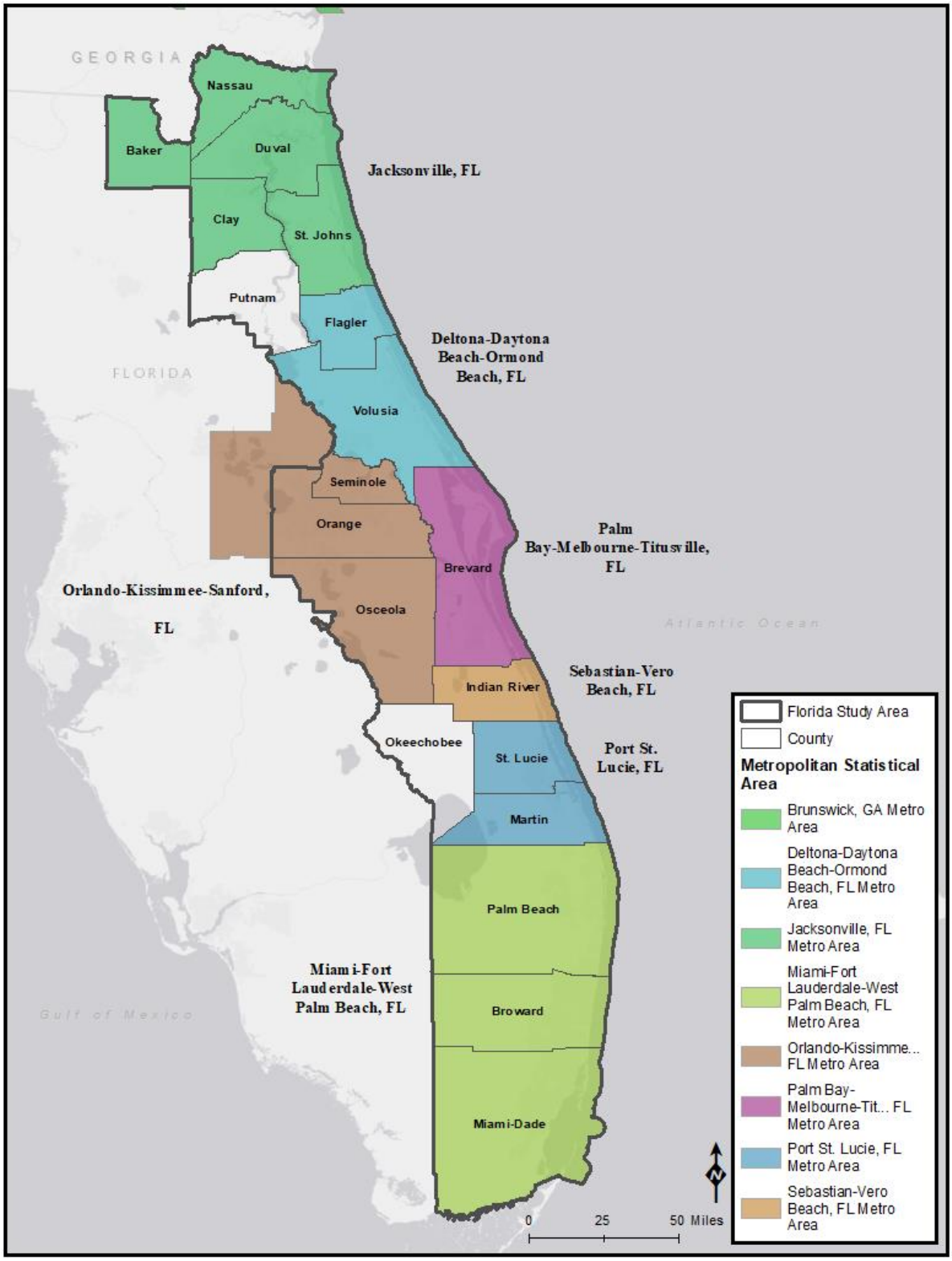
These MSAs contain cities with large centers of population and economic activity such as Jacksonville, Miami, Orlando, Port St. Lucie, Fort Lauderdale, and Hialeah (World Population Review 2019).

More people live near the Nation's coasts than inland counties of the U.S. According to the NOAA, Coastal Watershed Counties were home to 52% of the Nation's population in 2010, but account for less than 20% of the Nation's land mass (excluding Alaska) (NOAA 2013). This population trend is also reflected in Florida. All counties included in the Study Area are defined as Coastal Watershed Counties by NOAA (NOAA 2017a). As shown in Table 17-10, the Study Area is 16,526 square miles, representing 30.8% of the State's total land area of 53,624 square miles. Therefore, more than half (56.4%) of Florida's population resided in 30.8% of its land located in coastal counties in 2017 (USCB 2017d, USCB 2017c). Therefore, the higher population in a smaller land area results in a higher population density in these coastal areas.



Source: USCB 2017r

Figure 17-25. Population in Florida Study Area Counties by Census Block Group



Source: USCB 2017c

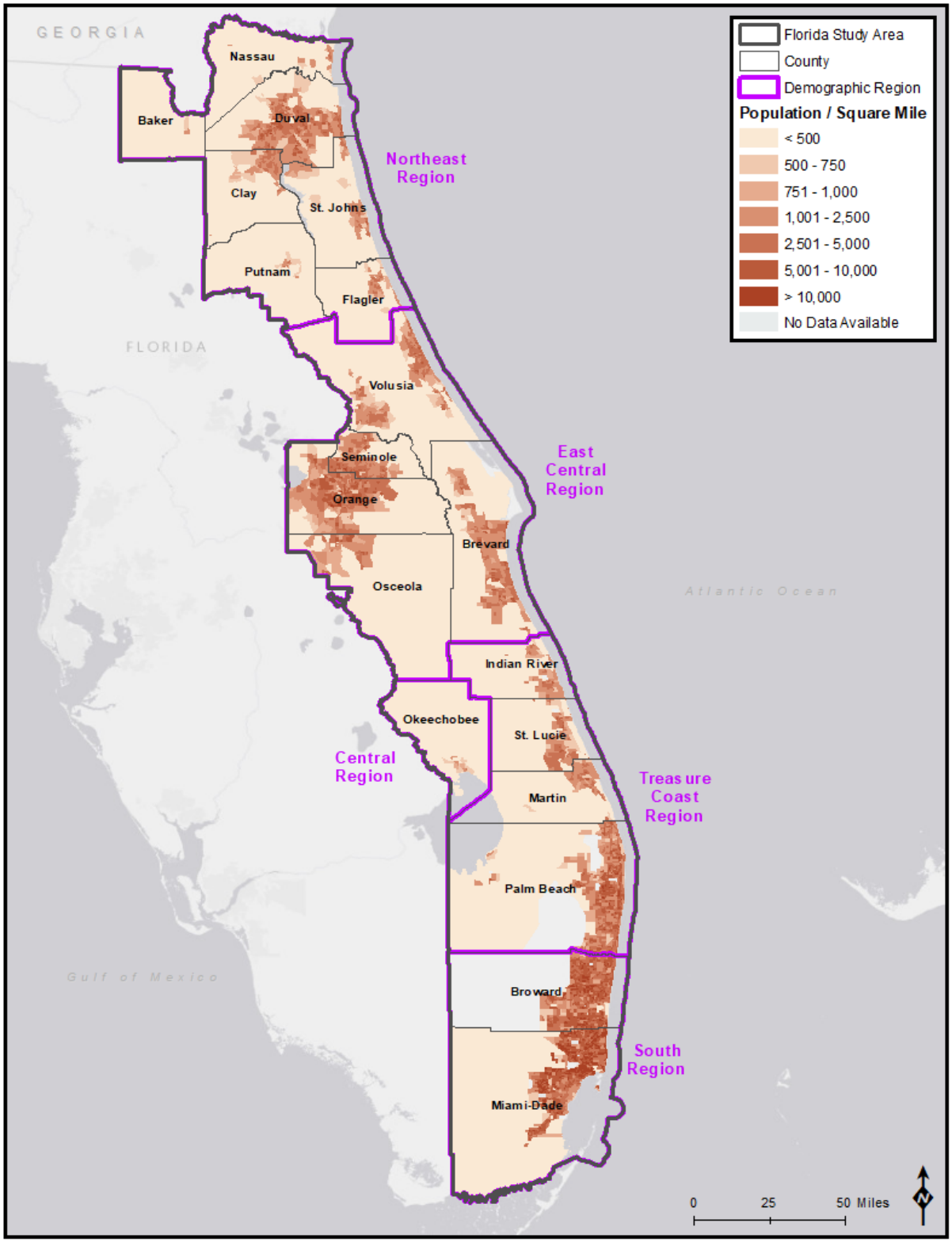
Figure 17-26. Metropolitan Statistical Areas Located within the Florida Study Area

Table 17-10. 2017 and 2040 Population Density in the in the Florida Study Area

Region	Geographic Unit	Total Population (2017)	Population Projection (2040)	Land Area (square miles)	2017 Population Density (people per square mile of land area)	2040 Population Density (people per square mile of land area)
Central	Okeechobee	40,228	44,155	768.9	52.3	57.4
	Total Central Region	***40,228***	***44,155***	***768.9***	***52.3***	***57.4***
East Central	Brevard	568,183	698,681	1,015.2	559.7	688.2
	Orange	1,290,216	1,891,845	902.5	1,429.5	2,096.1
	Osceola	325,168	590,986	1,327.7	244.9	445.1
	Seminole	449,260	573,666	309.4	1,452.0	1,854.1
	Volusia	518,660	629,946	1,101.2	471.0	572.0
	Total East Central	***3,151,487***	***4,385,124***	***4,656.1***	***676.9***	***941.8***
Northeast	Baker	27,537	32,178	585.2	47.1	55.0
	Clay	203,291	281,715	604.8	336.1	465.8
	Duval	912,043	1,177,578	762.9	1,195.4	1,543.5
	Flagler	105,015	151,613	485.1	216.5	312.5
	Nassau	78,435	113,930	648.7	120.9	175.6
	Putnam	72,435	73,545	727.9	99.5	101.0
	St. Johns	226,578	384,648	600.7	377.2	640.3
	Total Northeast	***1,625,334***	***2,215,207***	***4,415.4***	***368.1***	***501.7***
South	Broward	1,890,416	2,238,307	1,203.1	1,571.3	1,860.4
	Miami-Dade	2,702,602	3,427,202	1,898.8	1,423.4	1,805.0
	Total South	***4,593,018***	***5,665,509***	***3,101.9***	***1,480.7***	***1,826.5***
Treasure Coast	Indian River	147,981	194,699	502.8	294.3	387.2
	Martin	155,719	185,807	543.8	286.4	341.7
	Palm Beach	1,426,772	1,763,237	1,965.6	725.9	897.0
	St. Lucie	298,763	395,143	571.7	522.6	691.2
	Total Treasure Coast	***2,029,235***	***2,538,886***	***3,583.9***	***566.2***	***708.4***
	Study Area Total	**11,439,302**	**14,848,881**	**16,526.0**	**692.2**	**898.5**
	Florida	**20,278,447**	**26,373,603**	**53,624.8**	**378.2**	**491.8**
	United States	**321,004,407**	**373,528,000**	**3,531,905.4**	**90.9**	**105.8**

Sources: USCB 2017d, USCB 2017c, USCB 2018b, BEBR 2018

According to NOAA, approximately 319 persons per square mile lived in coastal counties (except Alaska), compared to the national population density of roughly 105 persons per square mile (NOAA 2013). This density pattern is evident in the Study Area, as illustrated by Figure 17-27 which shows population per square mile in the Study Area. Population densities in the Study Area range from 47.1 in Baker County (in the less populous Northeast Region) to 1,571.3 in Broward County (located in the populous South Region) (USCB 2017b, USCB 2017c).



Source: USCB 2017r

Figure 17-27. Population Density in Florida Study Area by Census Block Group

17.4.1.2 Population Projections

As estimated by the University of Florida's Bureau of Economic and Business Research, Florida's population is projected to grow 30.1% by 2040. Population in the Study Area is projected to follow a similar pattern to that of the State, growing 29.8% (3.4 million residents) by 2040. The Nation's population is projected to grow 16.4% (373.5 million), less than the State and the Study Area. Table 17-9 provides details of the projected population for the U.S., the State, and the counties in the Study Area from 2017 to 2040, delineated by region. Figure 17-28 shows the overall projected percent change in population in each county during the same period. Strongest growth is projected in Osceola and St. Johns County; relatively weaker growth is projected in the inland counties of Okeechobee and Putnam (USCB 2017d, USCB 2018b, BEBR 2018).

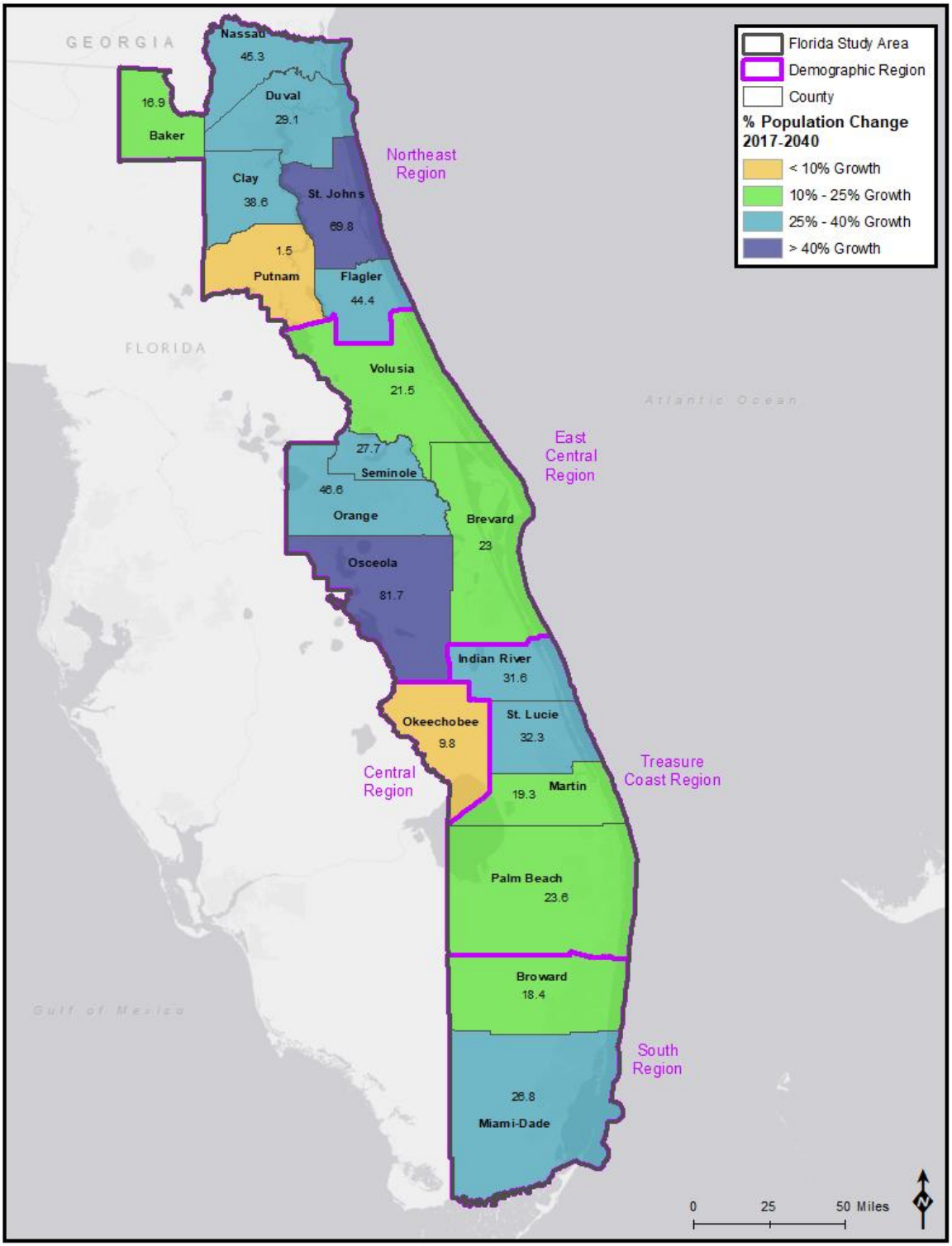
As shown in Table 17-9, projections indicate that 56.3% (14.8 million people) of the State's population will reside in the Study Area by 2040 as compared to 56.4 (11.4 million people) in 2017. Projected growth by study region is Central (9.8%), East Central (39.1%), Northeast (36.3%), South (23.4%) and Treasure Coast (25.1%) (BEBR 2018, USCB 2017c).

Florida's high-population counties are expected to continue their fast-paced growth. As shown in Table 17-9, rapid growth is projected in several counties in the East Central and Northeast Regions. The counties are Osceola and Orange (81.7% and 46.6%, respectively) in the East Central Region; St. Johns and Nassau (69.8% and 45.3%, respectively) in the Northeast Region. Lower population growth is projected in the rural counties of Putnam (1.5%) and Okeechobee (9.8%) (USCB 2017d, BEBR 2018).

Population densities in national coastal areas, already substantially more crowded than the U.S. as a whole, are projected to continue to increase in the future. As shown in Table 17-10, this trend is evident in the Florida Study Area, as population density is projected to increase from 692 persons per square mile in 2017 to 898 persons per square mile in 2040. This situation presents coastal managers with the challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards (BEBR 2018, USCB 2017d).

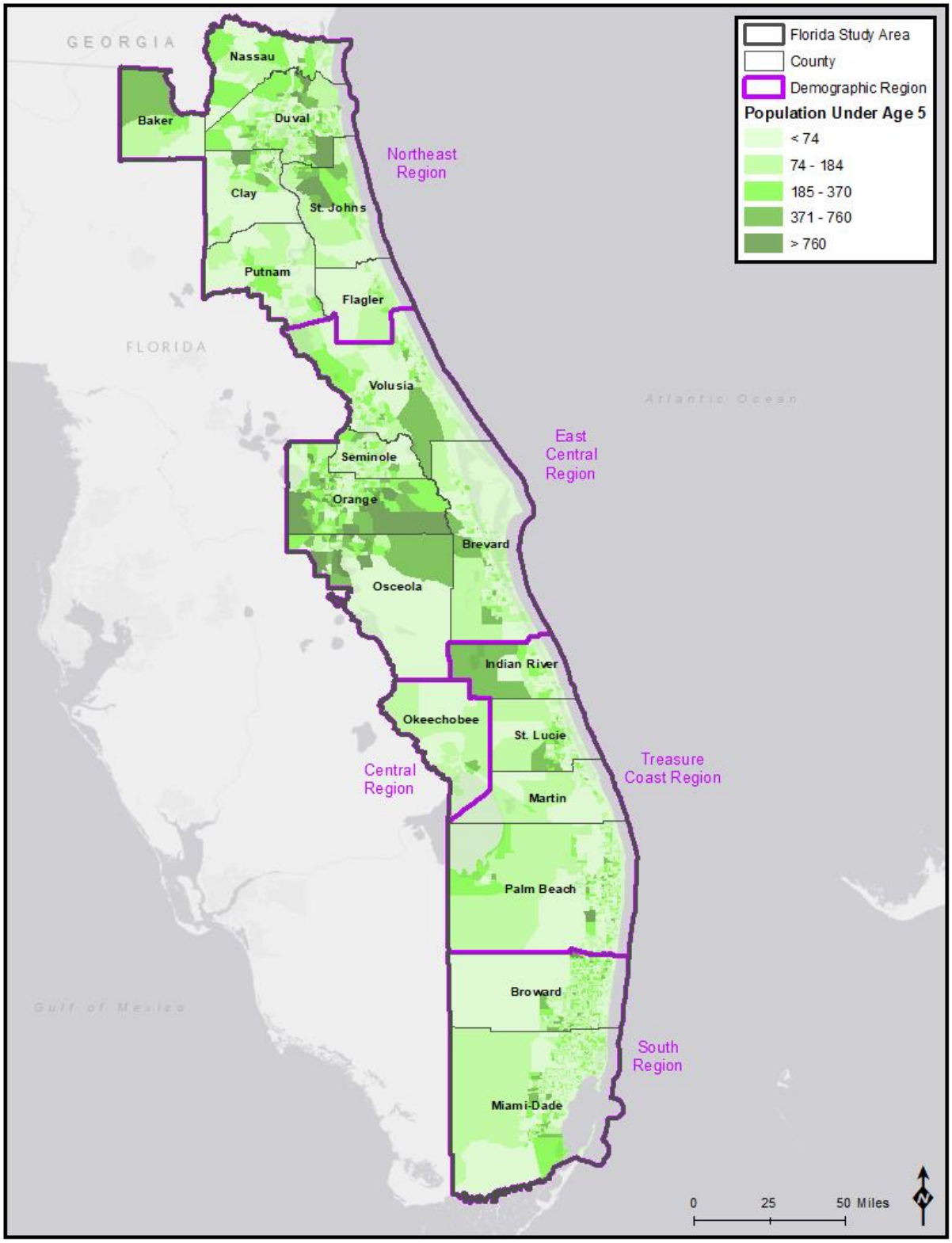
17.4.2 Demographics

As indicated in Chapter 1.6.2, recent population data released by the Census Bureau indicated that U.S. population growth hit an 80 year low in 2018, possibly ushering in an "era of population stagnation" according to the Brookings Institute. Nationwide trends described in Chapter 1.6.2 impact Florida and the Study Area. Evaluating the Study Area's age composition provides insight into the presence of vulnerable populations in the Study Area, such as people "Under Age 5" (young children) and "Over Age 65" (elderly), who may have fewer resources or may be particularly sensitive or susceptible to changing economic conditions. A projected shift in age components in these categories may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. Figure 17-29 and Figure 17-30 show the 2017 estimated population of young children and the elderly, respectively. Figure 17-31 and Figure 17-32 show the projected change in these groups by 2040. Table 17-11 shows age distribution by region for these groups for the 2017 estimated population and 2040 projected population in the U.S., Florida and the Study Area (USCB 2017a, USCB 2017b, USCB 2018b, BEBR 2018).



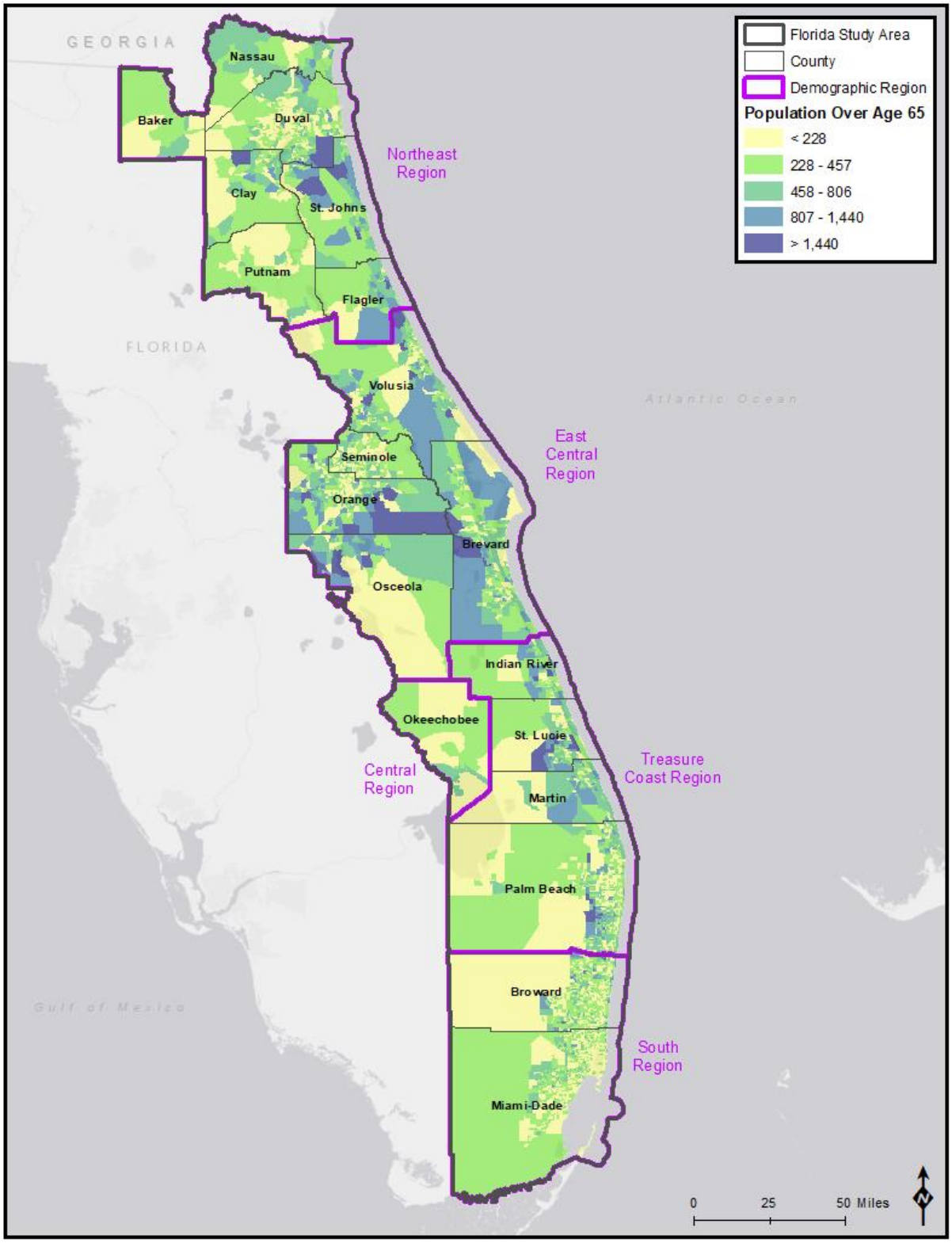
Source: BEBR 2018

Figure 17-28. Overall Projected Population Change from 2017-2040 in the Florida Study Area by County



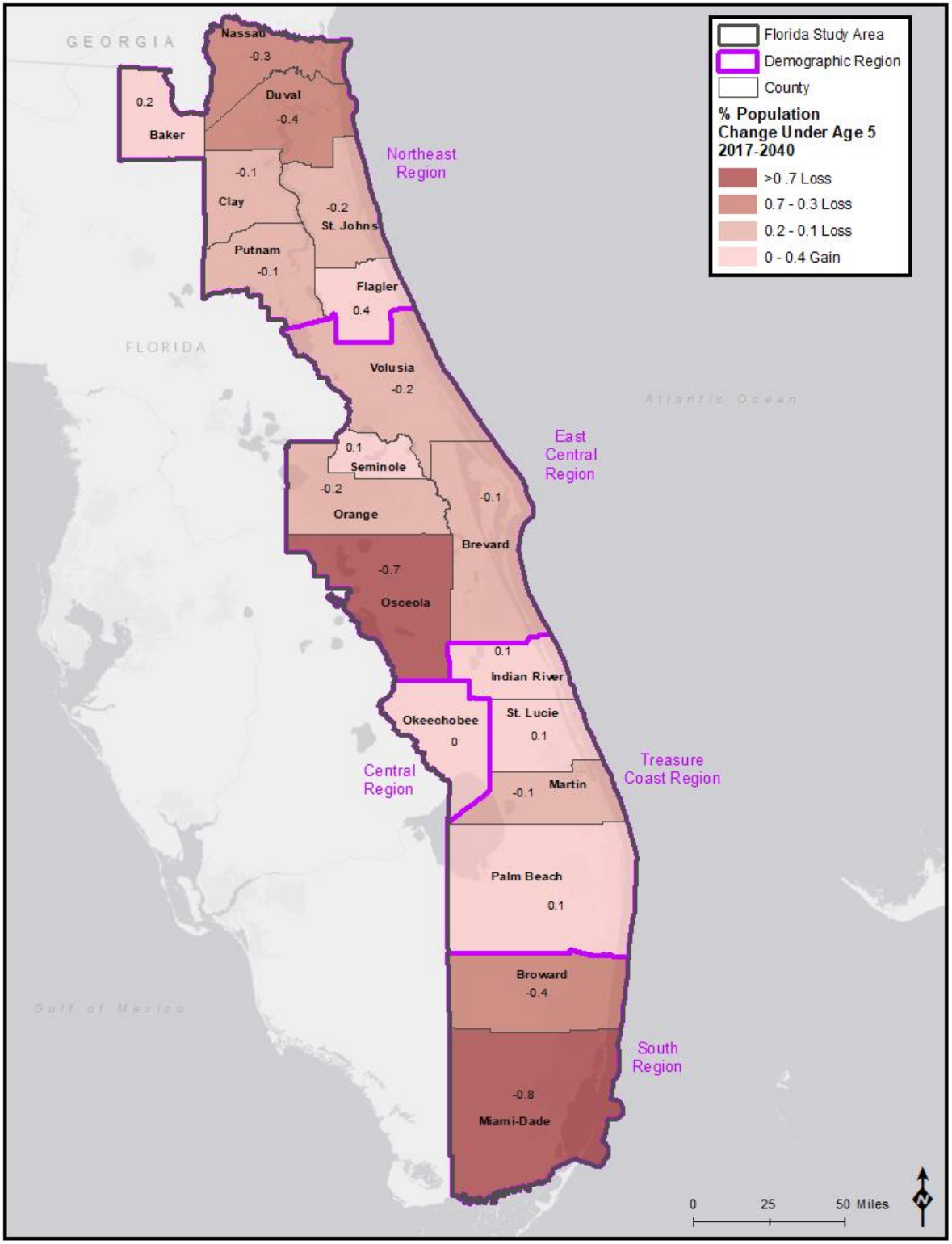
Source: USCB 2017r

Figure 17-29. Population Under Age 5 in the Florida Study Area by Census Block Group



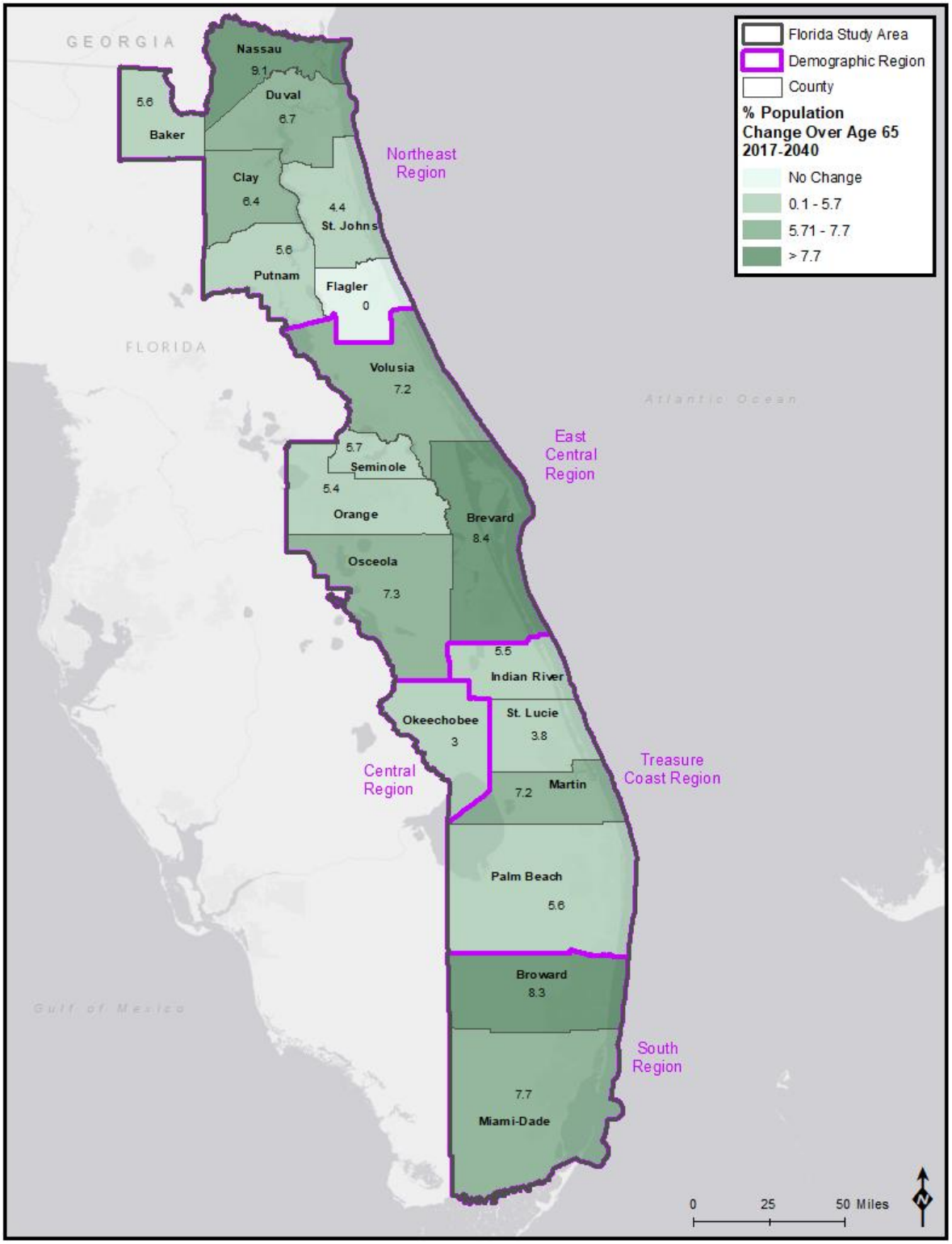
Source: USCB 2017r

Figure 17-30. Population Over Age 65 in the Florida Study Area by Census Block Group



Source: BEBR 2018

Figure 17-31. Projected Change in the Proportion of the Population for Individuals Under Age 5 in the Florida Study Area by 2040



Source: BEBR 2018

Figure 17-32. Projected Change in the Proportion of the Population for Individuals Over Age 65 in the Florida Study Area by 2040

Table 17-11. Population Under Age 5 and Over Age 65 in the Florida Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Populatio n (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
Central	**Okeechobee**	40,228	2,352	5.8	7,752	19.3	44,155	2,593	5.9	9,853	22.3
	Total Central	***40,228***	***2,352***	***5.8***	***7,752***	***19.3***	***44,155***	***2,593***	***5.9***	***9,853***	***22.3***
East Central	**Brevard**	568,183	26,816	4.7	129,240	22.7	698,681	31,982	4.6	217,324	31.1
	Orange	1,290,216	80,510	6.2	143,768	11.1	1,891,845	114,727	6.1	312,418	16.5
	Osceola	325,168	21,034	6.5	40,709	12.5	590,986	34,134	5.8	117,297	19.8
	Seminole	449,260	23,808	5.3	64,875	14.4	573,666	31,043	5.4	115,300	20.1
	Volusia	518,660	24,622	4.7	121,619	23.4	629,946	28,665	4.6	193,054	30.6
	Total East Central	***3,151,487***	***176,790***	***5.6***	***500,211***	***15.9***	***4,385,124***	***240,551***	***5.5***	***955,393***	***21.8***
Northeast	**Baker**	27,537	1,616	5.9	3,749	13.6	32,178	1,940	6.0	6,194	19.2
	Clay	203,291	11,389	5.6	29,377	14.5	281,715	15,436	5.5	58,874	20.9
	Duval	912,043	61,722	6.8	118,638	13.0	1,177,578	74,422	6.3	232,158	19.7
	Flagler	105,015	4,308	4.1	30,184	28.7	151,613	6,859	4.5	43,575	28.7
	Nassau	78,435	4,119	5.3	15,988	20.4	113,930	5,629	4.9	33,603	29.5
	Putnam	72,435	4,134	5.7	15,701	21.7	73,545	4,158	5.7	20,086	27.3
	St. Johns	226,578	11,551	5.1	42,223	18.6	384,648	18,940	4.9	88,751	23.1
	Total Northeast	***1,625,334***	***98,839***	***6.1***	***255,860***	***15.7***	***2,215,207***	***127,384***	***5.8***	***483,241***	***21.8***
South	**Broward**	1,890,416	110,377	5.8	294,961	15.6	2,238,307	122,066	5.5	534,934	23.9
	Miami-Dade	2,702,602	156,200	5.8	414,322	15.3	3,427,202	170,135	5.0	788,700	23.0
	Total South	*4,593,018*	*266,577*	*5.8*	*709,283*	*15.4*	*5,665,509*	*292,201*	*5.2*	*1,323,634*	*23.4*
Treasure Coast	**Indian River**	147,981	6,404	4.3	45,596	30.8	194,699	8,615	4.4	70,783	36.4
	Martin	155,719	6,349	4.1	46,191	29.7	185,807	7,457	4.0	68,587	36.9
	Palm Beach	1,426,772	73,263	5.1	328,507	23.0	1,763,237	91,533	5.2	504,464	28.6
	St. Lucie	298,763	15,741	5.3	68,140	22.8	395,143	21,193	5.4	105,182	26.6
	Total Treasure Coast	***2,029,235***	***101,757***	***5.0***	***488,434***	***24.1***	***2,538,886***	***128,798***	***5.1***	***749,016***	***29.5***

Table 17-11. Population Under Age 5 and Over Age 65 in the Florida Study Area

Region	Geographic Unit	2017 Estimates					Projected 2040				
		Total Population (2017)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)	Total Population (2040)	Under Age 5	Percent Under Age 5 (%)	Over Age 65	Percent Over Age 65 (%)
	Study Area Total	11,439,302	646,315	5.6	1,961,540	17.1	14,848,881	791,527	5.3	3,521,137	23.7
	Florida	20,278,447	1,105,362	5.5	3,926,889	19.4	26,373,603	1,384,736	5.3	6,698,901	25.4
	United States	321,004,407	19,853,515	6.2	47,732,389	14.9	373,528,000	21,106,000	5.7	80,827,000	21.6

Sources: BEBR 2018, USCB 2017b, USCB 2018b

Sensitive populations of people "Under Age 5" (young children) and "Over Age 65" (elderly) were present in the Study Area. According to 2017 estimates, the population of young children represented 6.2% of the U.S. population; 5.5% in Florida, and 5.6% in the Study Area. While the number of young children is projected to rise, the percentage of this group in comparison to the overall population is projected to decline, reflecting an aging of the general population due to a lower natural increase (the excess of births over deaths). Table 17-10 shows the breakdown by demographic region. Projections for the year 2040 indicate this group's decline to 5.7% in the Nation, and to 5.3% in the State and Study Area. The Treasure Coast Region had the smallest percentage (5.0%) of this population in 2017; a slight increase to 5.1% is projected by 2040. For the study area, this is an overall decrease of 0.3% in the proportion of the population under age 5 from 2017-2040 (BEBR 2018, USCB 2017b, USCB 2018b).

According to 2017 estimates shown in Table 17-11, the elderly represented 14.9% of the U.S. population; 19.4% in Florida, and 17.1% in the Study Area. Florida's higher percentage of the elderly indicates its position as a preferred destination for retirees. Table 17-11 shows the breakdown by region. The population of the elderly is projected to rise, fueled by aging baby boomers, and domestic migration. The proportion of elderly in comparison to the overall population is also projected to rise. As mentioned above, the consequence of declining natural increase is the suppression of population growth, resulting in the aging of the general population. By 2040, the population of elderly Americans is projected to increase to 21.6% in the U.S., 25.4% in the State, and 23.7% in the Study Area (BEBR 2018, USCB 2017b, USCB 2018b, BEBR 2017). Within each region of the Study Area, an increase in the elderly population is projected. The Treasure Coast Region had the largest percentage (24.1%) of this population in 2017; a further increase to 29.5% is projected by 2040. For the study area, this is an overall increase of 6.7% in the proportion of the population over age 65 from 2017-2040 (BEBR 2018, USCB 2017b, USCB 2018b).

17.4.3 Housing Utilization and Vacancy Rates

An analysis of housing utilization and vacancy rates help gauge an area's economic climate. Housing and vacancy rates, in addition to details for owner occupied versus rental housing for the Study Area are presented in Table 17-12.

As shown in Table 17-12, in 2017 homeownership in Florida was 64.8%, higher than the Nation (63.8%) and Study Area (62.3%). Renters comprised approximately 35.2% of the State population in 2017. The percentage of households who rented in the Study Area was higher (37.7%) (USCB 2017g, USCB 2017h, USCB 2017j, USCB 2017l, USCB 2017m). The Florida Legislature Office of Economic and Demographic Research (EDR) reported that homeownership in the State has been below its long-run average homeownership rate of 66.3% since 2013. The EDR attributed the decline to home financing conditions that may be challenging for many consumers, shifting preferences among millennials (individuals born between 1981 and 1996), and rising home price pressures (EDR 2019b, Dimock 2019).

Table 17-12. Housing Utilization and Vacancy Rates in the Florida Study Area

Region	Geographic Unit	Total Housing Units (2017)	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Central	Okeechobee	18,598	13,333	5,265	28.3	9,630	72.2	3,703	27.8	$89,900	$726
	Total Central	***18,598***	***13,333***	***5,265***	***28.3***	***9,630***	***72.2***	***3,703***	***27.8***	***NA***	***NA***
East Central	Brevard	274,602	227,223	47,379	17.3	163,565	72.0	63,658	28.0	$162,400	$971
	Orange	517,631	451,960	65,671	12.7	246,375	54.5	205,585	45.5	$192,400	$1,109
	Osceola	139,796	96,250	43,546	31.1	58,140	60.4	38,110	39.6	$164,500	$1,129
	Seminole	186,869	161,371	25,498	13.6	106,116	65.8	55,255	34.2	$201,900	$1,143
	Volusia	258,019	209,885	48,134	18.7	145,699	69.4	64,186	30.6	$149,900	$972
	Total East Central	***1,376,917***	***1,146,689***	***230,228***	***16.7***	***719,895***	***62.8***	***426,794***	***37.2***	***NA***	***NA***
Northeast	Baker	9,838	8,299	1,539	15.6	6,439	77.6	1,860	22.4	$121,100	$755
	Clay	78,815	71,939	6,876	8.7	53,528	74.4	18,411	25.6	$165,300	$1,088
	Duval	399,736	347,783	51,953	13.0	200,667	57.7	147,116	42.3	$156,200	$991
	Flagler	50,279	39,433	10,846	21.6	30,369	77.0	9,064	23.0	$188,400	$1,118
	Nassau	37,177	30,454	6,723	18.1	23,688	77.8	6,766	22.2	$203,500	$1,084
	Putnam	37,251	27,951	9,300	25.0	20,321	72.7	7,630	27.3	$82,800	$679
	St. Johns	100,322	83,744	16,578	16.5	64,505	77.0	19,239	23.0	$274,600	$1,207
	Total Northeast	***713,418***	***609,603***	***103,815***	***14.6***	***399,517***	***65.5***	***210,086***	***34.5***	***NA***	***NA***
South	Broward	818,382	675,828	142,554	17.4	420,780	62.3	255,048	37.7	$223,400	$1,271
	Miami-Dade	1,008,908	858,289	150,619	14.9	448,011	52.2	410,278	47.8	$242,800	$1,195
	Total South	***1,827,290***	***1,534,117***	***293,173***	***16.0***	***868,791***	***56.6***	***665,326***	***43.4***	***NA***	***NA***

Table 17-12. Housing Utilization and Vacancy Rates in the Florida Study Area

Region	Geographic Unit	Total Housing Units (2017)	Occupied Housing Units	Vacant Housing Units	Percent Vacancy (%)	Owner-Occupied Housing Units	Percent Owner-Occupied Housing Units (%)	Renter-Occupied Housing Units	Percent Renter-Occupied Housing Units (%)	Median Home Value	Median Gross Rent
Treasure Coast	**Indian River**	78,469	57,911	20,558	26.2	43,914	75.8	13,997	24.2	$172,600	$928
	Martin	79,523	63,497	16,026	20.2	48,642	76.6	14,855	23.4	$233,000	$1,043
	Palm Beach	678,673	543,591	135,082	19.9	372,677	68.6	170,914	31.4	$242,500	$1,264
	St. Lucie	138,923	110,043	28,880	20.8	79,480	72.2	30,563	27.8	$150,700	$1,088
	Total Treasure Coast	***975,588***	***775,042***	***200,546***	***20.6***	***544,713***	***70.3***	***230,329***	***29.7***	***NA***	***NA***
	Study Area Total	**4,911,811**	**4,078,784**	**833,027**	**17.0**	**2,542,546**	**62.3**	**1,536,238**	**37.7**	**$179,889.5**	**$1,040.1**
	Florida	**9,259,684**	**7,510,882**	**1,748,802**	**18.9**	**4,868,827**	**64.8**	**2,642,055**	**35.2**	**$178,700**	**$1,077**
	United States	**135,393,564**	**118,825,921**	**16,567,643**	**12.2**	**75,833,135**	**63.8**	**42,992,786**	**36.2**	**$193,500**	**$982**

Sources: USCB 2017g, USCB 2017j, USCB 2017l, USCB 2017m

A 2018 Forbes article on the best cities to own rental property in Florida cites favorable statewide conditions for homebuyers, such as fairly low housing prices, low property taxes, and no State income tax. In spite of these factors, many prospective homeowners are opting to rent instead of buy. As a result, rental rates are skyrocketing in many urban areas (Forbes 2018a). Certain demographic groups – such as young adults, minorities, and the lesser educated – have historically been more likely to rent than others, and rental rates have increased among these groups over the past decade. However, rental rates have also increased among some groups that have traditionally been less likely to rent, including whites and middle-aged adults. The movement toward renting has also occurred across all levels of educational attainment. When asked about the specific reasons why they rent, a majority of renters, especially minorities, cited financial reasons. The typical amount of financial assets owned has decreased over the past decade for younger and lower- and middle-income prospective buyers. Homeownership remains out of reach for many due to stringent lending standards, lack of financial assets for down payment, and price appreciation which increases both the mortgage payment and required down payment. Declines in homeownership have been particularly steep among young, black and lower-income households (Pew Research 2016, Pew Research 2017).

As shown in Table 17-12, home vacancy rates in Florida (18.9%) are significantly higher than the Nation's vacancy rates (12.2%) (USCB 2017g, USCB 2017m). According to a study by Lending Tree that ranked vacancy rates of U.S. cities, four Florida cities made the Top 10 list for high vacancies. Three of the four cities (Miami, Orlando and Jacksonville) are in the Study Area, with vacancy rates ranging from 13.4% to 17%. The reason for the high vacancy rates as cited by the study was Florida's status as a preferred destination for homeowners to buy secondary residences. Properties remaining unused for most of the year are counted as vacant by the Census Bureau. These homes may be used seasonally by snowbirds or winter residents whose primary home is another State or country or rented out on a short-term basis via online platforms such as Airbnb and VRBO (previously known as Vacation Rentals by Owner) (Daily Mail 2019). A favorable regulatory environment toward short term rentals was cited by a recent investment article (Forbes 2018a).

Short term rental businesses are growing in Florida. According to an Airbnb press release, Florida Airbnb hosts earned a combined $450 million in supplemental income while welcoming approximately 2.7 million guests to the State in 2017. The 2.7 million guests to Florida represent 75% year-over-year growth. Table 17-13 shows the number of guests that stayed in Airbnbs in several counties located within the Study Area in 2017. Miami Dade County had the highest number of guest arrivals (667,200), followed by Osceola (358,400) and Broward (239,600) (Florida Trend 2017).

Table 17-13. Airbnb Guest Arrivals and Host Income in Select Counties in the Florida Study Area

Geographic Unit	Total 2017 Guest Arrivals	Total 2017 Host Income
Duval	42,600	$6.1 million
Brevard	45,500	$6.5 million
Volusia	51,100	$7.5 million
St. Johns	64,800	$8.8 million
Palm Beach	72,500	$17.1 million
Orange	229,500	$25 million
Broward	239,600	$45.7 million
Osceola	358,400	$39.6 million
Miami-Dade	667,200	$134.6 million

Source: Florida Trend 2017

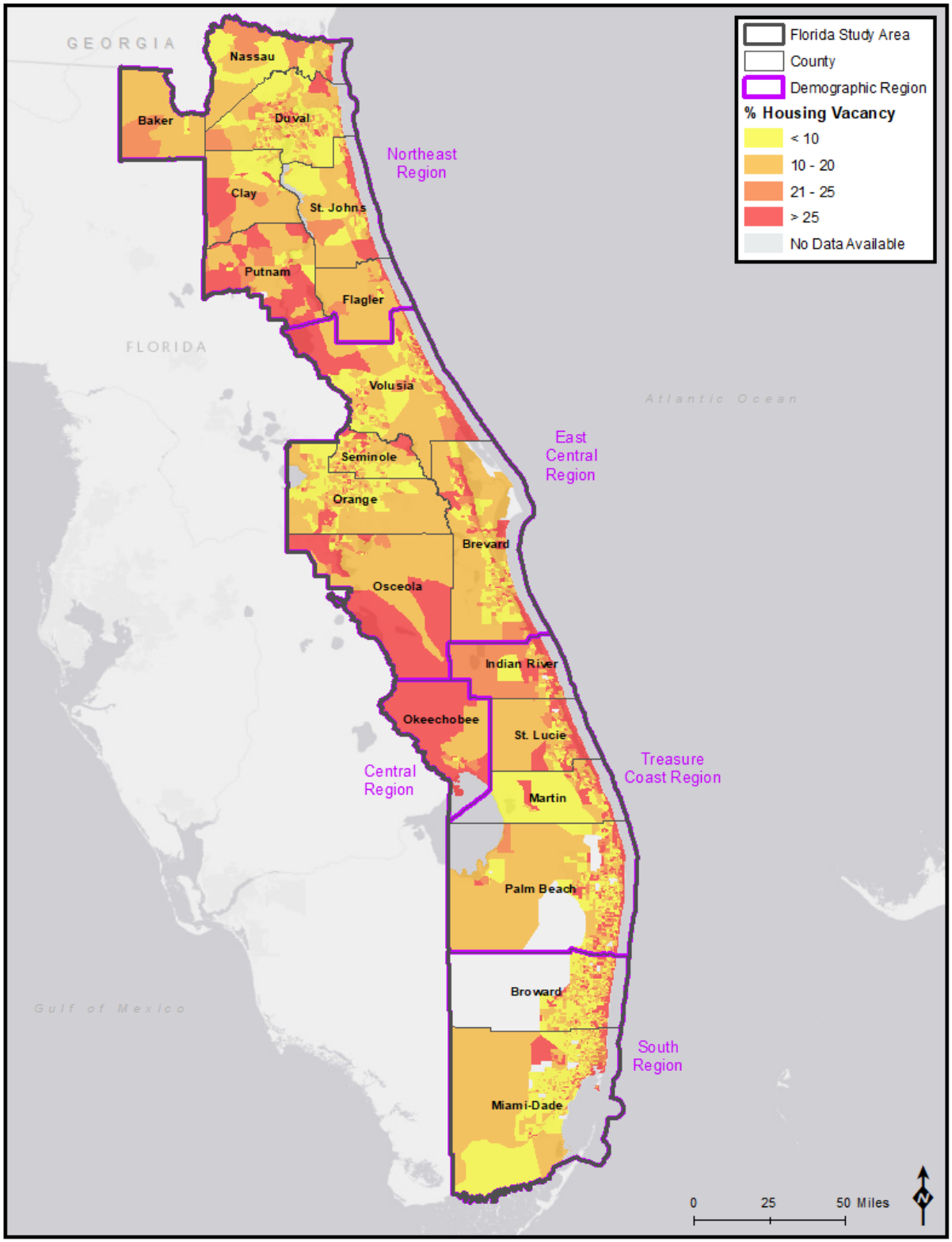
Figure 17-33 shows vacancy rates in the Study Area by census block group. The figure illustrates high vacancy rates along the entire coast, mostly likely caused by properties defined as vacant by the Census Bureau that are vacation homes and/or investment properties used as short-term rentals. The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019). Foreign investors are attracted to Florida's relatively cheaper real estate prices, and lenient tax laws. In 2018, purchases of townhomes, condos and single family homes by foreign investors totaled 22.9 billion, representing 13% of the State's residential market, greater than the Nation (5%) (NAR 2018).

The U.S. continues to face an affordable housing crisis. Nearly two-thirds of renters nationwide say they can't afford to buy a home. Saving for a down payment is becoming more difficult due to the rising home prices and wage growth stagnation. The National Low Income Housing Coalition estimates that there is a shortage of 7 million homes affordable and available to extremely low-income households, defined as household incomes at or below the poverty guideline or 30% of their area median income. Nationwide, only 37 affordable and available rental homes exist for every 100 extremely low-income renter households. Extremely low-income renters face a shortage in every State and major metropolitan area (National Low Income Housing Coalition 2018).

Housing affordability for low- and moderate-income workers is a problem in Florida, particularly in South Florida and Orlando. According to the Florida Policy Institute, 36% of Florida households are paying more than 30% of their incomes for housing, including mortgage or rent, utilities, taxes, insurance and neighborhood or condo association fees. Nearly 20% of Floridians are spending more than half of their incomes on housing. Florida's population growth has increased demand for housing of all types. Demand for housing from new residents has resulted in increased home prices and rental rates. Figure 17-34 and Figure 17-35 shows median home value and median gross rent in the Study Area, making it more difficult for low wage workers to find affordable housing (Martinez 2018). Chapter 1.6.3 discusses additional home value trends across the overall Project Area, including Florida.

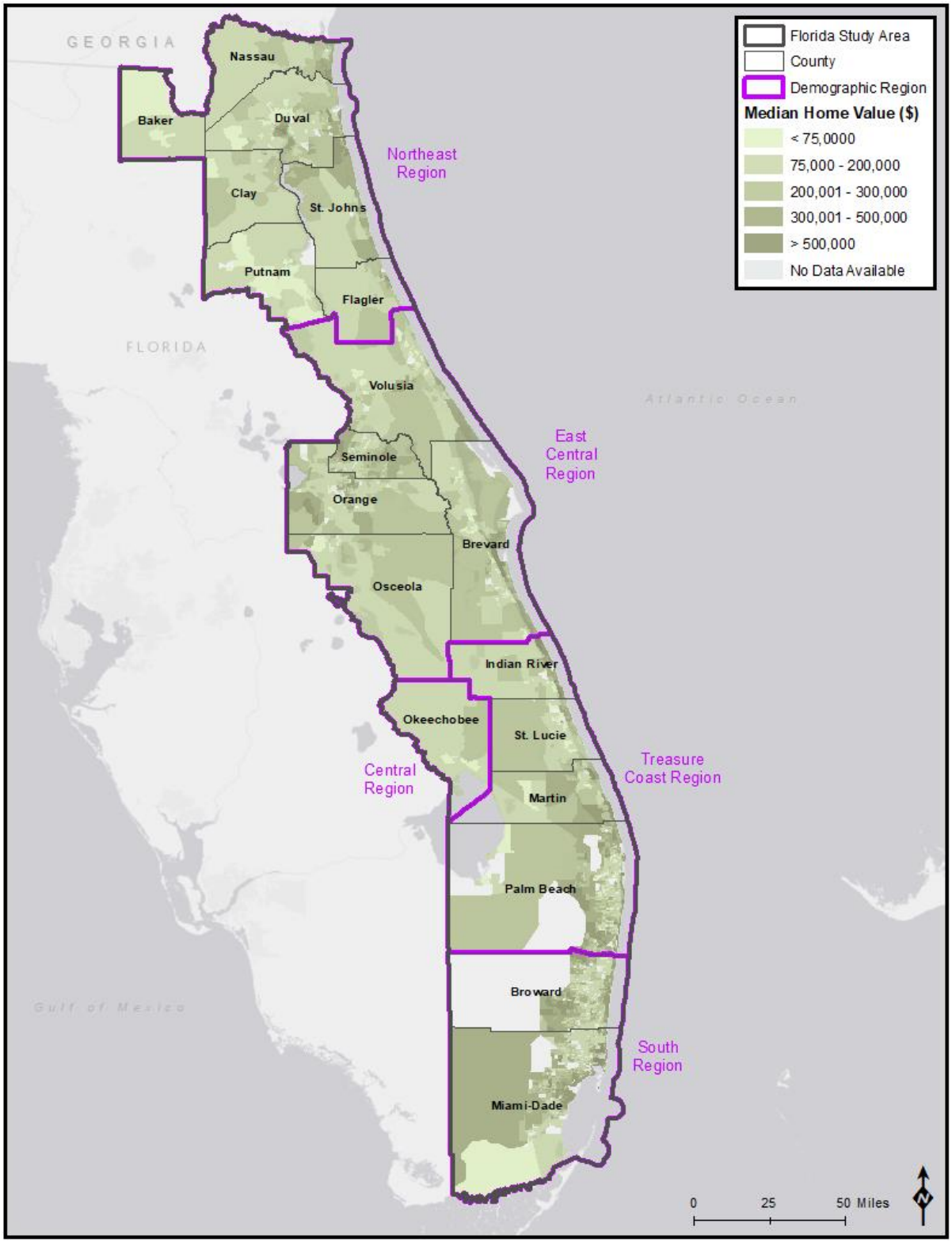
According to a 2019 Rental Market Study of the nearly 2.8 million renter households in Florida, 28.6% (795,605 households) are low-income cost burdened households, paying more than 40% of income for gross rent (rent and utilities). Low-income is defined as Household income at 60% of area median income or less. Of the 1.6 million renter households in the Study Area, 29.7% (487,997 households) are low-income and cost burdened, representing 61.3% of all vulnerable households in the State. The majority of vulnerable households is in the South Region (215,663) comprising 44.2% of the Study Area. The East Central Region has 135,601 (27.8%); Treasure Coast has 76,149 (15.6%); the Northeast Region has 59,649 (12.2%); and the rural Central Region has 937 (0.2%) (Shimberg Center for Housing Studies 2019).

The county with the largest number of vulnerable households is Miami-Dade. A new report found that South Florida's housing affordability crisis is among the worst in the Nation. Six in 10 employed adults in South Florida are spending more than 30% of their income on rent, the highest of any metro area in the country. Researcher Richard Florida, who co-authored "Miami's Housing Affordability Crisis" for the Miami Urban Future Initiative, also found that housing affordability is worse for minority populations. The report shows that black families in South Florida have less money left over after paying for housing costs than anywhere else (WLRN Miami 2019).



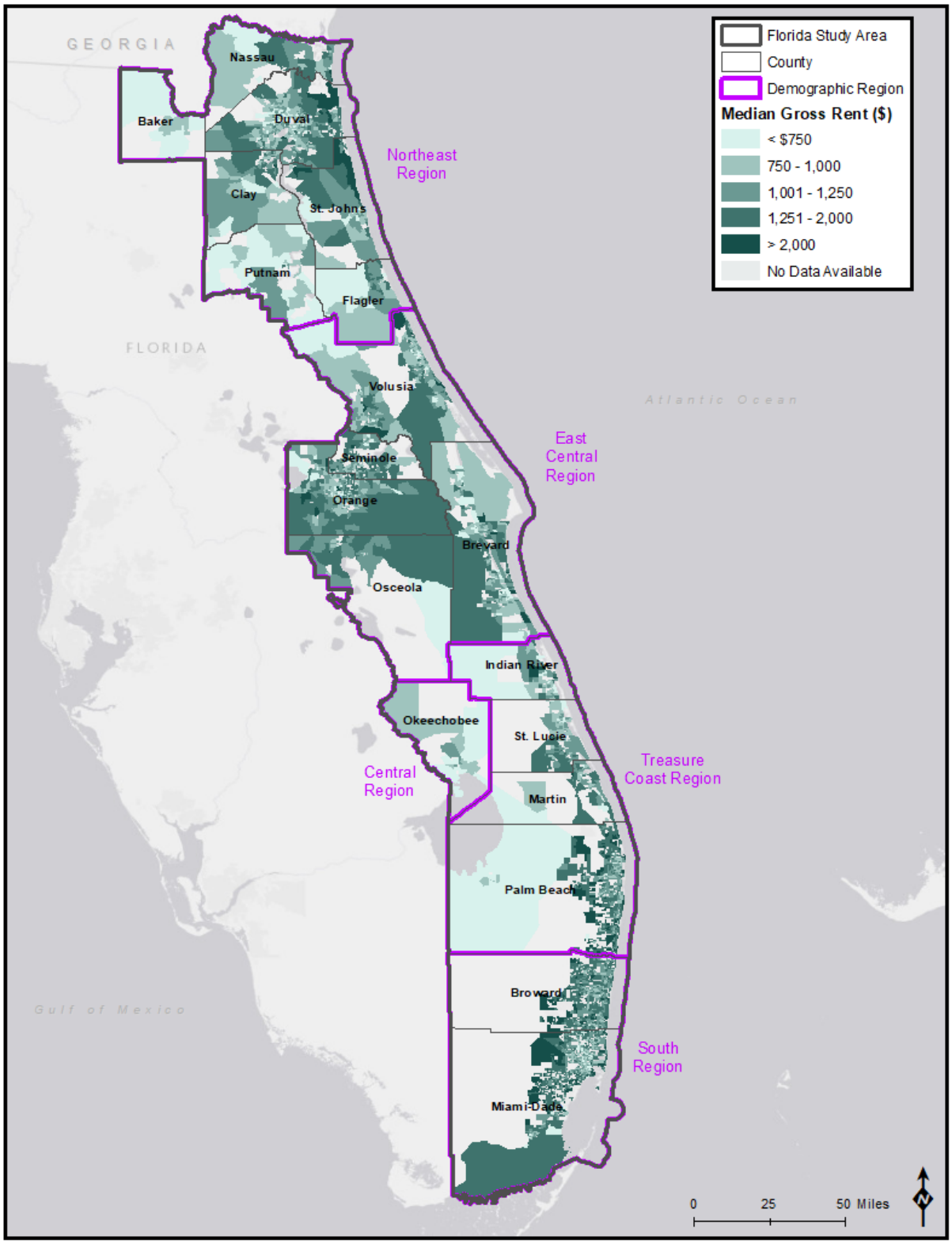
Source: USCB 2017r

Figure 17-33. Housing Vacancy Rates in the Florida Study Area by Census Block Group



Source: USCB 2017r

Figure 17-34. Median Home Value in the Florida Study Area by Census Block Group



Source: USCB 2017r

Figure 17-35. Median Gross Rent in the Florida Study Area by Census Block Group

According to prominent urbanist Richard Florida, Miami has (WLRN Miami 2019):

> "incredible wealth, packed along the coastlines, in parts of downtown -- like Miami's downtown -- and in and around knowledge institutions [and] universities all throughout the region. Then we just have people who are working in low-wage service jobs not making enough to make ends meet. And that's the problem for affordability. Even though our housing prices, on balance, are lower than the superstar cities like New York and L.A. or San Francisco, our median incomes are also way lower. So then we get a real big crisis of affordability. So that's what's terrifying -- that because our incomes are low and because people don't have the money for a down payment, they have to go in the rental market. And then our rental market is such that people are paying extraordinarily high prices relative to income. And I think that's the nature of our housing, that's the real issue in our housing affordability problem."

The City of Miami is preparing an Affordable Housing Master Plan to lay out a 10-year timeline for addressing Miami's housing crisis (Rodriguez 2019). Figure 17-35 illustrates median gross rent, indicating the lack of affordable rental housing at a cost of less than $1,000 in the Study Area.

The 2019 Rental Market Study includes housing needs for vulnerable populations of commercial fishing workers, farmworkers and homeless. The housing needs of these subpopulations are summarized below:

It was estimated that 1,093 units of affordable rental housing were needed for commercial fishing workers statewide. County-level estimates are not available. However, as discussed in the Employment section (Chapter 17.4.4), the Study Area accounts for 52.5% of Florida maritime jobs. Therefore, it is reasonable to assume that approximately half of the commercial fishing households in need of affordable housing originate from the Study Area (Shimberg Center for Housing Studies 2019).

Three regions in the Study Area were cited as having more than 2,000 homeless individuals: Miami-Dade, Orange-Osceola-Seminole, and Broward. The Orange-Osceola-Seminole Region had the highest count of homeless families (8,137). The next highest family counts range from 2,100 to 3,615 in regions including Miami-Dade, Clay-Duval-Nassau, and Broward (Shimberg Center for Housing Studies 2019).

Florida's agricultural workforce (farmworkers) is heavily concentrated in two areas. The major fruit and vegetable growing region is located in central and southwestern counties outside of the Study Area. A great portion of the sugar cane and nursery operations are concentrated within the Florida Study Area. Florida had approximately 113,354 farmworkers in 2017, estimated to form 100,810 households. Farmworkers include migrant workers who relocate during the course of a growing season, and seasonal workers who remain in the same housing but travel to different employers over a wide geographical area (HUD 2019a). Approximately 32,783 (32.5%) of farmworker households are located within the Study Area, particularly in Palm Beach (10,317 households) and Miami-Dade (9,741 households) Counties (Shimberg Center for Housing Studies 2019).

Mounting threats from climate change and sea level rise may compound the housing affordability crisis over time. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on the region's remaining housing stock. As less-advantaged neighborhoods are damaged by flooding, they may undergo climate gentrification, being redeveloped for more affluent and advantaged groups.

17.4.4 Employment

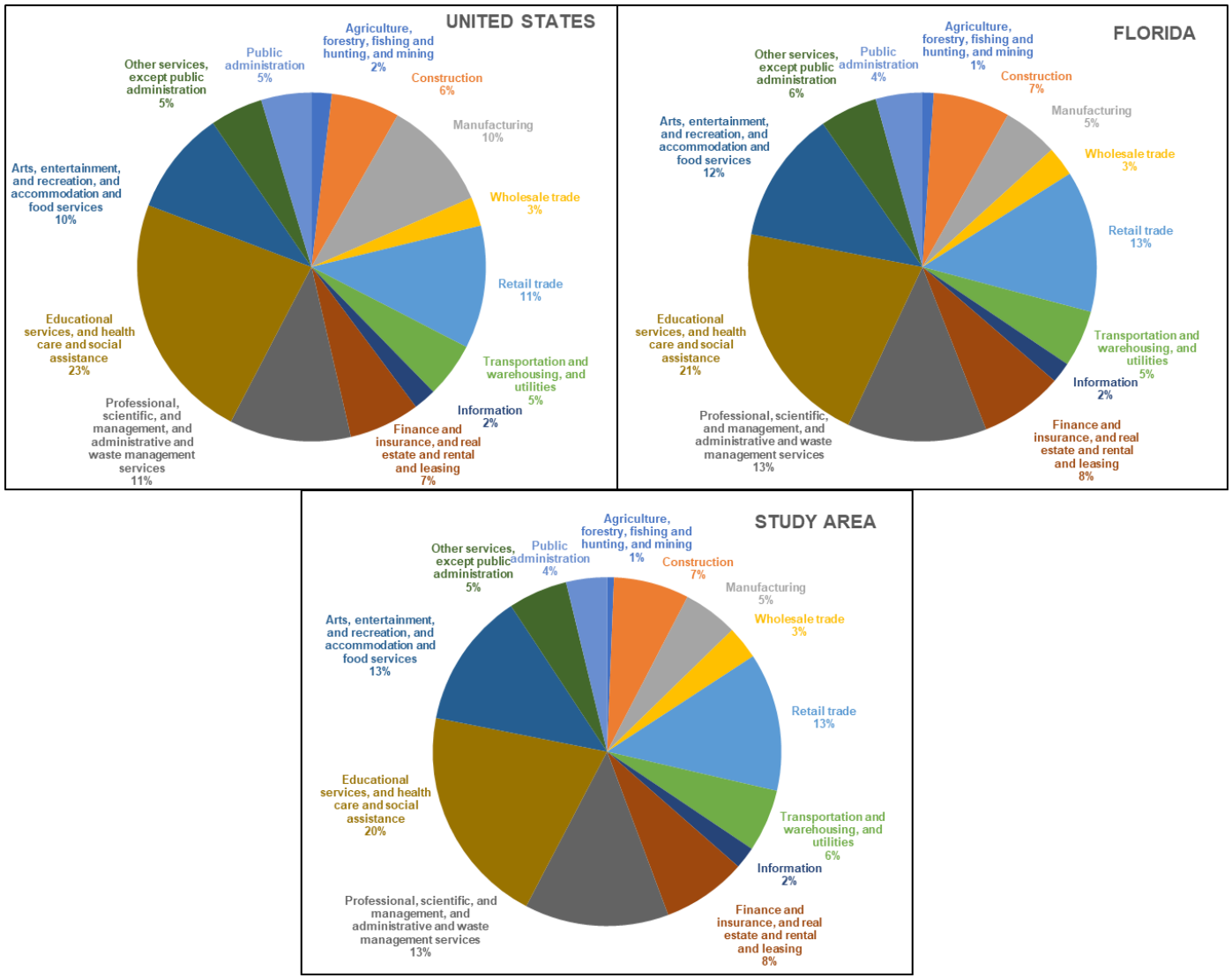
17.4.4.1 Types of Employment

Few States can match the scale and scope of Florida's industry assets. The State's competitive costs, large talent pool, comprehensive infrastructure, global connectivity, and huge market have supported the growth of a robust economy (EFI 2019c). Table 17-14 and Figure 17-36 show the number of jobs in each major industry sector for the U.S., the State and the Study Area.

Table 17-14. Census Bureau Labor and Industry Statistics for the U.S., Florida, and the Florida Study Area (number of jobs)

Industry	United States	Percent (%)	Florida	Percent (%)	Study Area	Percent (%)
TOTAL	**150,599,165**		**9,018,570**		**5,311,865**	
Agriculture, forestry, fishing and hunting, and mining	2,817,922	1.9	94,064	1.0	33,822	0.6
Construction	9,564,541	6.4	641,435	7.1	371,371	7.0
Manufacturing	15,477,389	10.3	461,205	5.1	270,602	5.1
Wholesale trade	4,042,867	2.7	247,827	2.7	162,973	3.1
Retail trade	17,167,000	11.4	1,184,364	13.1	680,960	12.8
Transportation and warehousing, and utilities	7,681,579	5.1	473,171	5.2	307,985	5.8
Information	3,173,300	2.1	173,733	1.9	108,003	2.0
Finance and insurance, and real estate and rental and leasing	9,908,320	6.6	697,248	7.7	416,791	7.8
Professional, scientific, and management, and administrative and waste management services	17,001,157	11.3	1,166,602	12.9	711,397	13.4
Educational services, and health care and social assistance	34,781,348	23.1	1,896,691	21.0	1,084,231	20.4
Arts, entertainment, and recreation, and accommodation and food services	14,586,646	9.7	1,110,967	12.3	670,575	12.6
Other services, except public administration	7,371,226	4.9	480,743	5.3	291,862	5.5
Public administration	7,025,870	4.7	390,520	4.3	201,293	3.8

Source: USCB 2017p



Source: USCB 2017p

Figure 17-36. Number of Jobs by Industry Sector for the U.S., Florida, and the Florida Study Area

USCB data indicate the dominant industry sector in the Study Area are: educational services, and health care and social assistance (20.4%), professional, scientific, and management, and administrative and waste management (13.4%), retail trade (12.8%), and arts, entertainment, and recreation, and accommodation and food services (12.6%). Generally, the dominant employment categories in the Study Area are similar to those of the State. Both State and Study Area have significantly less manufacturing (5.1%) than the Nation (10.3%) (USCB 2017p).

The Florida Economic Development Council lists the top five Florida industries as 1) Aerospace and Aviation, 2) Life Sciences, 3) Manufacturing, 4) Security, and 5) Information Technology (Walker 2015). Businesses in these job sectors are most heavily concentrated in major urban centers. In addition, aerospace and aviation industries are found along the "Space Coast," a moniker given to the area of Brevard County containing the Kennedy Space Center and Cape Canaveral Air Force Station, and extend towards the Orlando area in Orange County (EFI 2019b). Although not commonly included as industry, agriculture and tourism are the first and second largest industries in Florida, respectively, according to land use research conducted at the University of Florida (Volk et al. 2017).

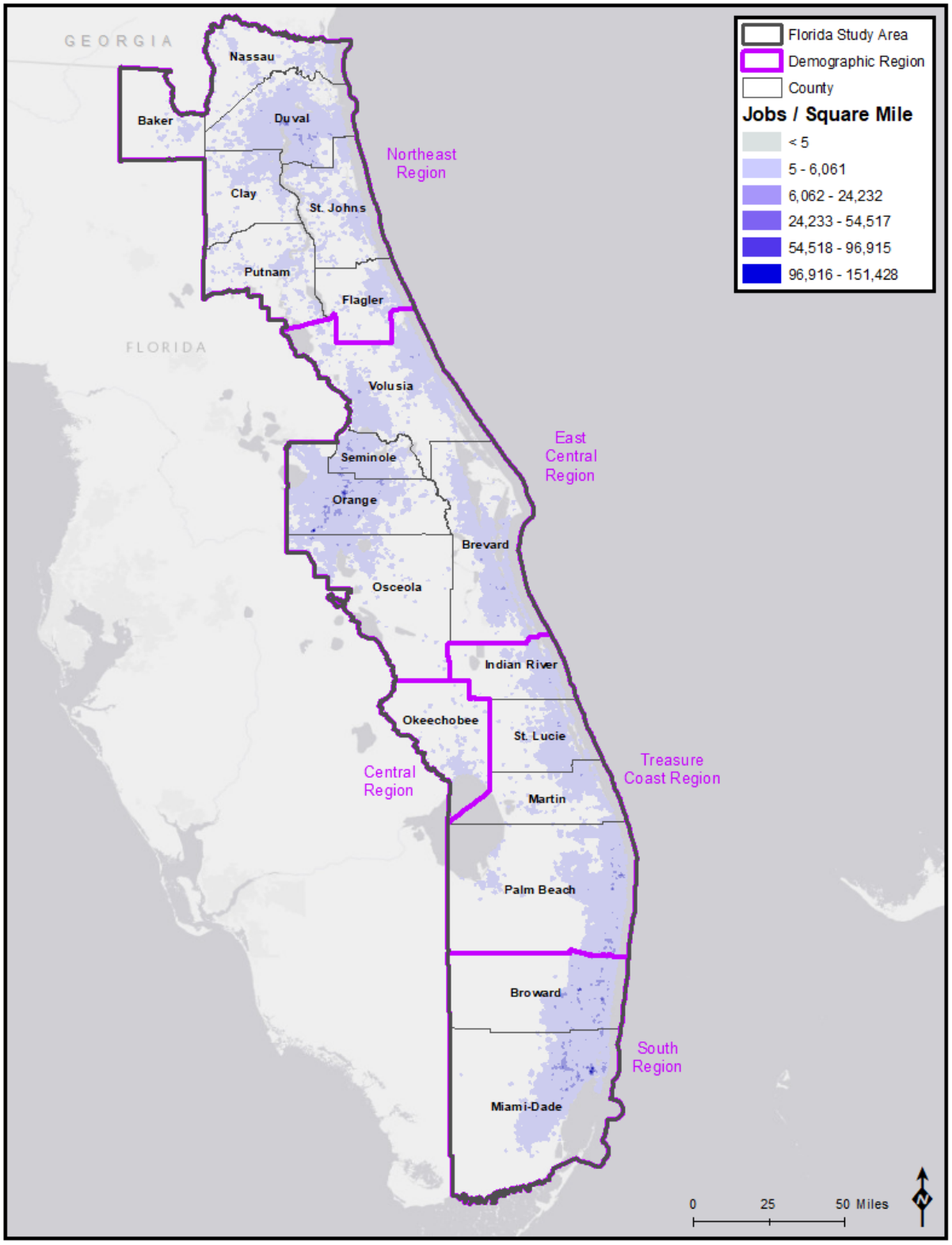
Florida's 2018 Annual Gross Domestic Product was 1.0 trillion, which represented 5.4% of the Nation's gross domestic product (BEA 2019).

In 2017, Florida had a total employment of 9.0 million jobs, representing 5.9% of the total jobs in the U.S. The Study Area had 5.0 million jobs, more than half (58.9%) of the total jobs in the State (USCB 2017a, USCB 2017i).

Population growth is Florida's primary engine of economic growth, fueling both employment and income growth (EDR 2019a). As discussed in Chapter 17.4.1, the Study Area has high population density which increases the demand for all goods, services, and workers. Density attracts more businesses and firms that offer greater variety and competition for goods and services (EDR 2019a).

Figure 17-37 shows jobs per square mile in the Study Area and illustrates that there are more jobs in counties with high density populations such as Jacksonville, Miami, Orlando, Port St. Lucie, Fort Lauderdale, and Hialeah. Job creation is typically higher in urban areas, largely because of population density, the inherent markets they engender, and a larger and more diverse workforce. In addition, urban areas with large populations become more attractive to people and firms by creating economies of scale (EDR 2019a).

The South (38.8%) and East Central (30.5%) regions of the Study Area had the majority of jobs in the Study Area in 2917, totaling 69.3% (USCB 2017i). The remaining 30.7% of jobs was distributed between the Northeast, Treasure Coast and Central regions (USCB 2017i). Job distribution is sparse in rural areas (Putnam, Baker and Okeechobee Counties), and qualified economically distressed rural counties (Flagler and Nassau) counties (FDEO 2019c). Rural areas tend to have fewer locally available options and less economic development (FDEO 2019c).



Source: USCB 2017r

Figure 17-37. Jobs Per Square Mile in the Florida Study Area by Census Block Group

17.4.4.1.1 Florida's Ocean Economy

Overall, Florida's ocean economy ranked second in employment in the U.S. in 2016 among the 30 States included in the U.S. Ocean and Great Lakes economy (NOAA 2016c). As shown in Table 17-15, Florida's ocean economy accounted for 517,855 maritime jobs in 2016, accounting for 6.1% of Florida's employment (NOAA 2016b). Florida was the largest employer in the Nation's marine construction (heavy construction activities associated with dredging navigation channels, beach re-nourishment and dock building) sector (NOAA 2019i). Within the State, 82.6% of maritime jobs were in the tourism and recreation sector. The sector includes eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums (NOAA 2019k).

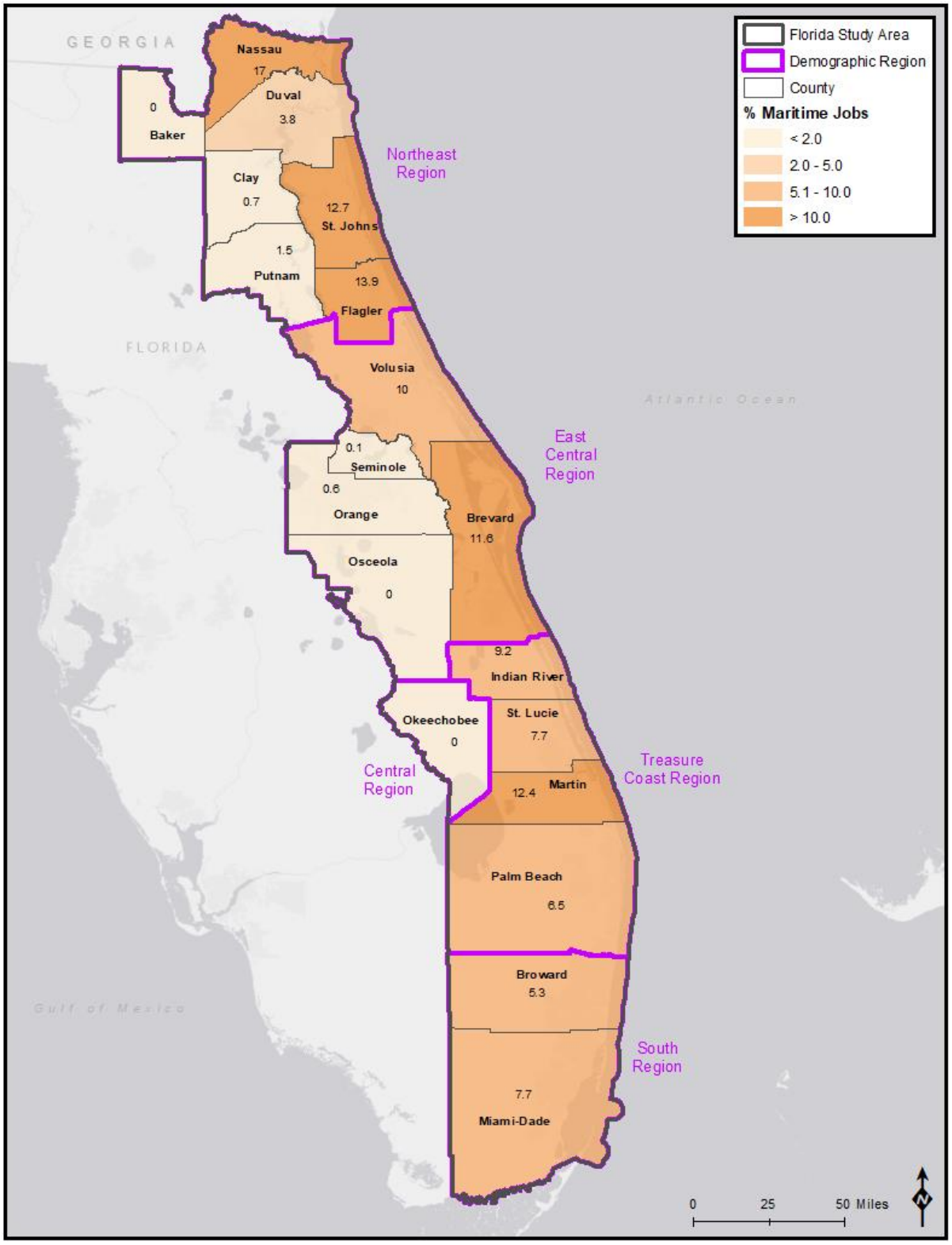
The Study Area had 272,315 maritime jobs in 2016, representing 52.6% of total maritime jobs in the State. Miami-Dade County had the greatest number of maritime jobs (86,965), representing 31.9% of maritime jobs in the Study Area. Counties with more than 10,000 maritime jobs were Volusia (17,009), Duval (20,103), Brevard (23,447), Palm Beach 39,433, and Broward (43,614). The Tourism and Recreation sector was the dominant sector in each county, followed by marine construction. At a regional level, Florida's southernmost regions - Treasure Coast and South - had the majority of maritime jobs, at 58,145 and 130,579, respectively. Figure 17-38 shows the proportion of maritime jobs to county jobs in the Study Area. The highest proportions were in Nassau (17.0%) and Flagler (13.9%) Counties, indicative of less economic diversity in economically distressed rural areas (NOAA 2016c).

17.4.4.2 Income

As indicated in Chapter 1.6.4.2, median household income indicates the relative wealth of a geographic area; the higher the median household income, the wealthier the area. Median household income tends to more accurately reflect the typical household of a geographic area than per capita income, which measures the average income earned per person. Per capita income is useful in comparing the wealth of populations, but can be distorted by households with incomes that are drastically high or low compared to the majority (Harness 2019). As shown in Table 17-15, Florida lags behind the U.S. in both median household income and per capita income. According to the U.S. Census Bureau, the U.S. had a median income of $57,652, and a per capita income of $31,177 in 2017. During the same period, Florida had a median income of $50,883 (11.7% lower than the Nation's median income), and a per capita income of $28,774 (7.7% lower than the Nation's per capita income). Median income in the Study Area is slightly higher at $52,615 but per capita income is slightly lower at $28,316 (USCB 2017k, USCB 2017n).

Florida's average annual wage has typically been below the national average, according to the Florida Legislature EDR. Much of the job growth in Florida has come in economic sectors with a large proportion of low wage workers, such as the accommodation and food services employment sector. The sector is large, but has the lowest average annual wage, and had, until recently, been growing faster than overall employment in the State. This industry sector is closely related to the health of Florida's tourism industry that had a record 128.5 million visitors in FY 2018-19, an increase of 5.8% over FY 2017-18 (EDR 2019a). As mentioned in Chapter 17.4.4.1, 82.6% of the State's maritime jobs were in the low-paying tourism and recreation sector (NOAA 2019k).

According to the 2019 State of Working Florida, the labor market has strengthened while economic activity has flourished since 2009. However, many Floridians have been left out of the last decade's growth. Less educated workers have been deprived of the wage gains and employment opportunities of their more highly educated counterparts. Similar disparities exist between workers in Leisure and Hospitality and workers in other industries. Furthermore, the increasing concentration of economic activity in high paying jobs in Florida's larger metro areas means that less populated areas throughout the State are getting left behind (Florida International University 2019).



Source: NOAA 2017b

Figure 17-38. Maritime Jobs in Florida Study Area by County

The 2018 State of Working Florida report stated that as Florida's economy has become a knowledge-driven economy with an increasingly more diverse workforce, the economic gains have not been spread evenly. A tight labor market and increases in productivity have only led to modest wage gains while historically marginalized groups, like black/African Americans, continue to face disproportionately lower labor market outcomes (Florida International University 2018).

Figure 17-39 portrays high median household and Figure 17-40 shows per capita income near the high-paying jobs in Florida's metropolitan areas and nearby suburbs and lower paying jobs in rural areas (USCB 2017k, USCB 2017n).

17.4.4.3 Unemployment

Figure 17-41 shows the 2017 unemployment rates in the counties of the Study Area by census block group. Unemployment rates ranged from 5.3% in St. Johns County to 10.3% in Putnam County, both located in the Northeast Region. The average unemployment rate in the Study Area was 7.3%, similar to the State (7.2%) and higher than the Nation (6.6%). Table 17-15 presents unemployment rates for each county in the Study Area grouped by demographic region (USCB 2017h, USCB 2017p).

The East Central Region had the lowest average unemployment rate (6.9%), with the highest rate occurring in Brevard County (7.6%). The Northeast Region had an average unemployment rate of 7%. The South Region had an average of 7.5%. The Treasure Coast Region had an average of 7.4% (USCB 2017h, USCB 2017p).

17.4.4.4 Educational Attainment

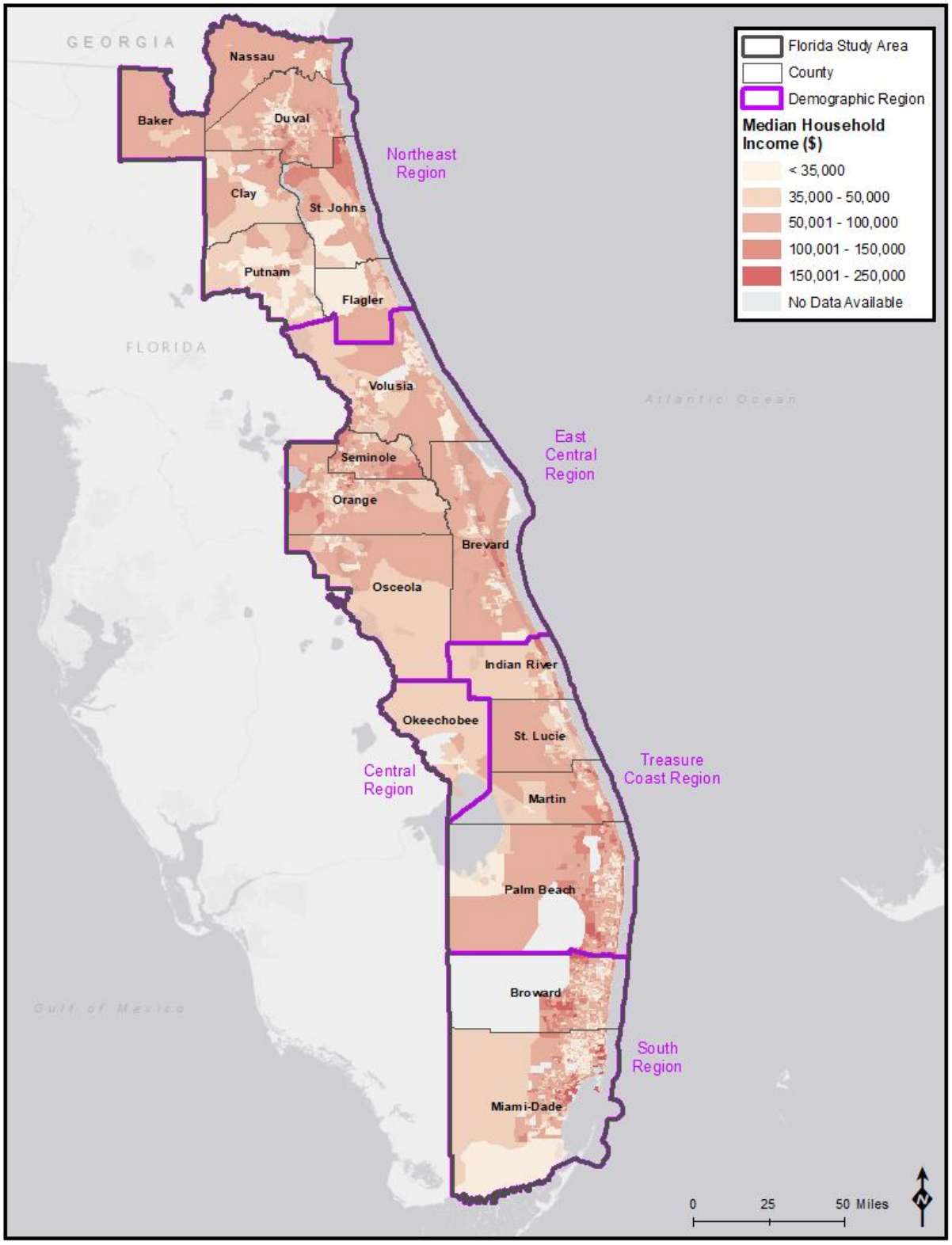
As indicated in Chapter 1.6.4.4, educational attainment refers to the highest level of education that an individual has completed. Higher attainment levels positively impact the individual, the local community, the region and the State, offering increased job opportunities, higher earnings, decreased likelihood of unemployment over a lifetime, and enhanced skills.

Table 17-16 shows the number and percentage of the working-age population classified into seven groups of educational attainment which are: less than 9th grade, 9th to 12th grade without diploma, high school diploma, some college no degree, associate's degree, bachelor's degree, and graduate degree in the counties comprising the Study Area, the State and the Nation (USCB 2017t).

Figure 17-42 shows the percentage of the working-age population who earned only a high school diploma and the percentage who earned a college or advanced degree (associates, bachelor's, and/or graduate degree) in the Nation, the State and the counties comprising the Study Area.

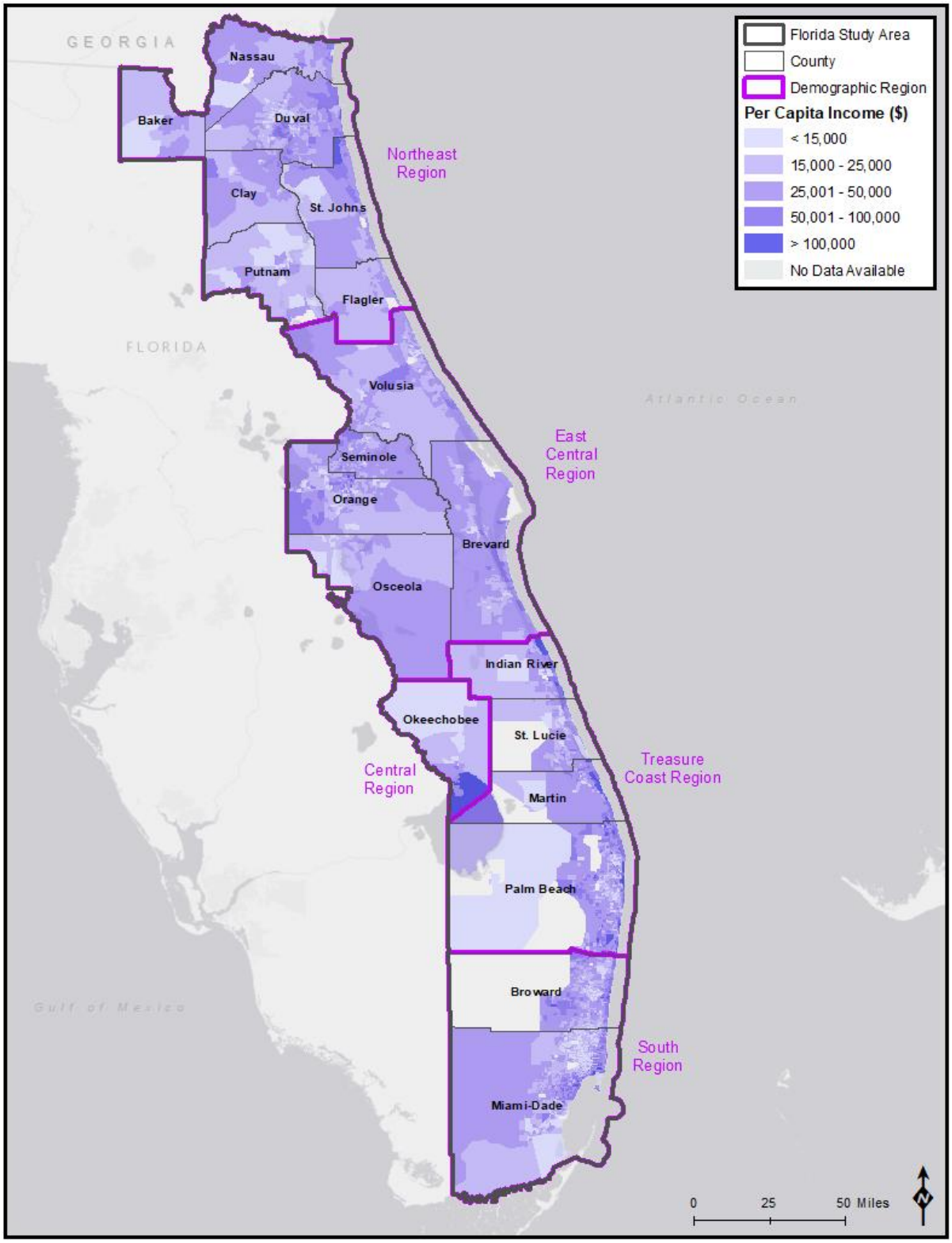
- In the U.S., 27.7% of the working-age population earned only a high school diploma; 36.9% earned a college or advanced degree.
- In Florida, 29.1% of the working-age population earned only a high school diploma; 36.5% earned a college or advanced degree.
- In the Study Area, 27.9% of the working-age population earned only a high school diploma; 36.3% earned a college or advanced degree (USCB 2017q).

Figure 17-43 shows educational attainment by the percentage of the working-age population classified into the seven groups of educational attainment of the Study Area (USCB 2017q).



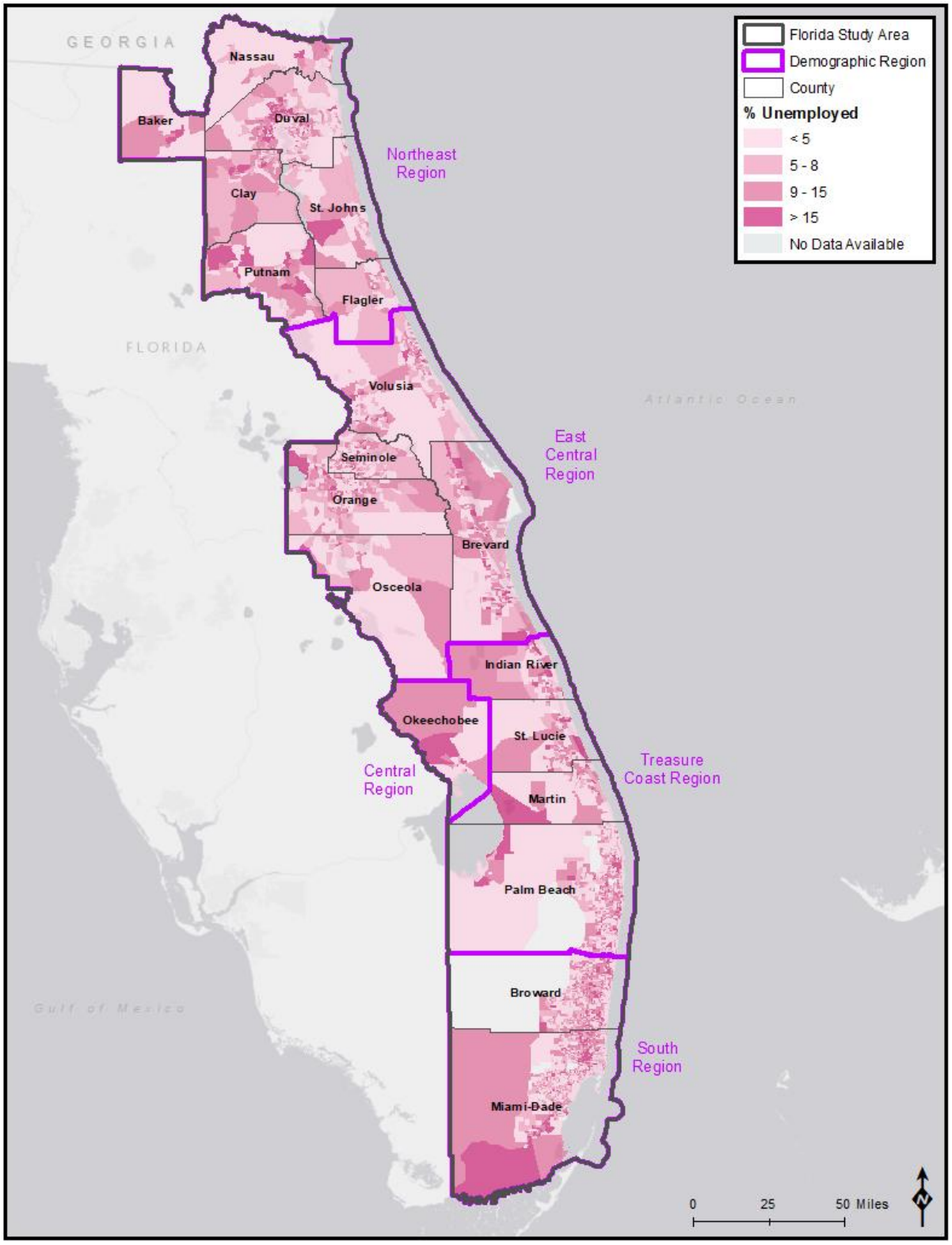
Source: USCB 2017r

Figure 17-39. Median Household Income in the Florida Study Area by Census Block Group



Source: USCB 2017r

Figure 17-40. Per Capita Income in the Florida Study Area by Census Block Group



Source: USCB 2017r

Figure 17-41. Unemployment Rates in the Florida Study Area by Census Block Group

Table 17-15. Employment Data in the Florida Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (civilian and armed forces) (2017)[1]	Civilian Labor Force[1]	Employed (civilian labor force)[1]	Unemployed (civilian labor force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (of total jobs) (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Central	Okeechobee	15,491	15,481	14,085	1,396	9.0	12,062	0	0.0	$39,059	$18,611
	Total Central Region	***15,491***	***15,481***	***14,085***	***1,396***	***9.0***	***12,062***	***0***	***0.0***	***NA***	***NA***
East Central	Brevard	260,165	258,958	239,195	19,763	7.6	202,858	23,447	11.6	$51,536	$29,405
	Orange	689,861	689,398	642,687	46,711	6.8	869,537	5,445	0.6	$51,586	$27,394
	Osceola	156,767	156,687	146,390	10,297	6.6	93,750	0	0.0	$47,343	$20,165
	Seminole	237,354	236,685	220,949	15,736	6.6	201,098	292	0.1	$60,739	$31,363
	Volusia	227,448	227,258	212,016	15,242	6.7	170,417	17,009	10.0	$43,838	$25,871
	Total East Central Region	***1,571,595***	***1,568,986***	***1,461,237***	***107,749***	***6.9***	***1,537,660***	***46,193***	***3.0***	***NA***	***NA***
Northeast	Baker	11,242	11,222	10,567	655	5.8	6,945	0	0.0	$59,506	$22,440
	Clay	101,718	99,806	91,705	8,101	8.1	55,277	397	0.7	$61,971	$28,599
	Duval	476,910	465,327	430,830	34,497	7.4	535,400	20,103	3.8	$51,296	$28,593
	Flagler	42,023	41,997	39,278	2,719	6.5	23,922	3,320	13.9	$51,049	$25,741
	Nassau	37,273	36,875	34,780	2,095	5.7	22,615	3,840	17.0	$64,294	$33,337
	Putnam	27,942	27,917	25,030	2,887	10.3	16,546	242	1.5	$33,619	$18,950
	St. Johns	109,219	108,570	102,778	5,792	5.3	74,688	9,496	12.7	$73,640	$39,563
	Total Northeast Region	***806,327***	***791,714***	***734,968***	***56,746***	***7.2***	***735,393***	***37,398***	***5.1***	***NA***	***NA***
South	Broward	1,008,709	1,007,621	930,561	77,060	7.6	825,870	43,614	5.3	$54,895	$30,109
	Miami-Dade	1,374,955	1,373,703	1,272,735	100,968	7.4	1,129,642	86,965	7.7	$46,338	$25,481
	Total South Region	***2,383,664***	***2,381,324***	***2,203,296***	***178,028***	***7.5***	***1,955,512***	***130,579***	***6.7***	***NA***	***NA***

Table 17-15. Employment Data in the Florida Study Area (from the Longitudinal Employer-Household Dynamics dataset)

Region	Geographic Unit	Total Labor Force (civilian and armed forces) (2017)[1]	Civilian Labor Force[1]	Employed (civilian labor force)[1]	Unemployed (civilian labor force)[1]	Percent Unemployed (%)[1]	Total Jobs[2]	Maritime Jobs[3]	Percent Maritime Jobs (of total jobs) (%)[3]	Median Household Income (2017)[4]	Per Capita Income (2017)[5]
Treasure Coast	Indian River	61,092	61,000	56,016	4,984	8.2	50,082	4,618	9.2	$49,009	$33,122
	Martin	69,454	69,141	64,614	4,527	6.5	66,717	8,305	12.4	$55,588	$38,021
	Palm Beach	708,303	707,928	655,496	52,432	7.4	604,570	39,433	6.5	$57,256	$36,303
	St. Lucie	132,185	132,139	122,153	9,986	7.6	74,917	5,789	7.7	$47,132	$24,940
	Total Treasure Coast Region	***971,034***	***970,208***	***898,279***	***71,929***	***7.4***	***796,286***	***58,145***	***7.3***	***NA***	***NA***
	Study Area Total	**5,748,111**	**5,727,713**	**5,311,865**	**415,848**	**7.3**	**5,036,913**	**272,315**	**5.4**	**$52,615**	**$28,316**
	Florida	**9,772,762**	**9,717,687**	**9,018,570**	**699,117**	**7.2**	**8,452,404**	**517,855**	**6.1**	**$50,883**	**$28,774**
	United States	**162,184,325**	**161,159,470**	**150,599,165**	**10,560,305**	**6.6**	**140,240,825**	**3,389,551**	**2.4**	**$57,652**	**$31,177**

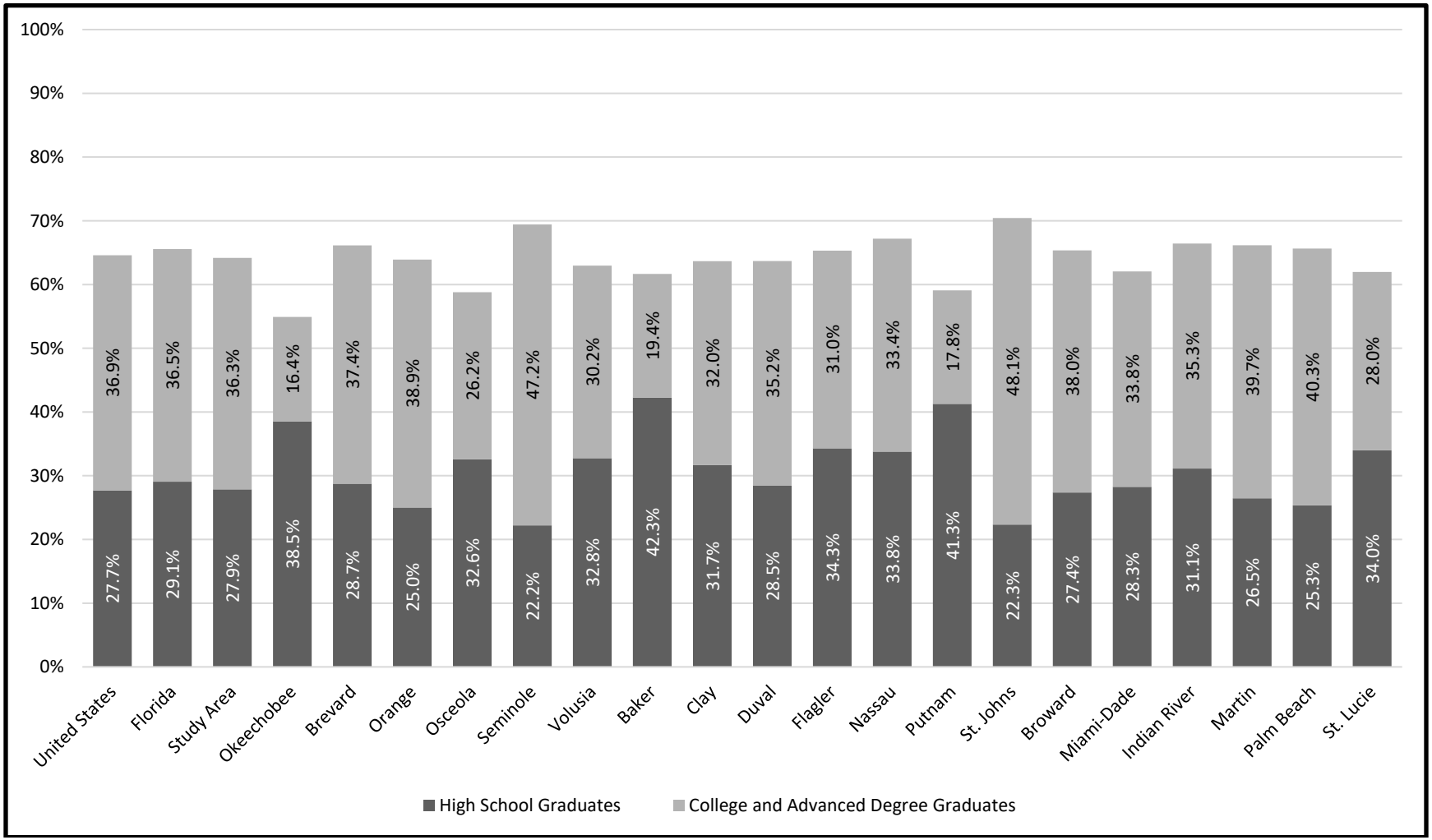
Sources: 1 - USCB 2017h; 2 - USCB 2017i; 3 - NOAA 2016b; 4 - USCB 2017k; 5 - USCB 2017n
Note: Job data are based on the geographic location of the employer. Labor force data are based on the residential location of workers. As a result, labor force and job data numbers do not match as workers may live in one county or State yet be employed in another county or State.

Table 17-16. Educational Attainment in the Florida Study Area

Geographic Unit	Less Than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate (includes equivalent)	Some College, No Degree	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree	Total	Less than 9th Grade (%)	9th to 12th Grade, No Diploma (%)	High School Graduate (includes equivalent) (%)	Some College, No Degree (%)	Associate's Degree (%)	Bachelor's Degree (%)	Graduate or Professional Degree (%)
Baker	850	2,415	8,796	4,723	1,482	1,842	706	**20,814**	4.1	11.6	42.3	22.7	7.1	8.8	3.4
Brevard	10,254	31,003	132,862	115,174	50,238	76,962	45,707	**462,200**	2.2	6.7	28.7	24.9	10.9	16.7	9.9
Broward	66,008	111,639	405,996	335,615	131,796	281,531	151,191	**1,483,776**	4.4	7.5	27.4	22.6	8.9	19.0	10.2
Clay	3,552	11,326	48,845	41,123	15,463	23,914	10,024	**154,247**	2.3	7.3	31.7	26.7	10.0	15.5	6.5
Duval	19,108	61,306	200,640	175,217	62,502	128,588	57,048	**704,409**	2.7	8.7	28.5	24.9	8.9	18.3	8.1
Flagler	2,012	5,459	29,612	22,495	7,785	12,083	6,860	**86,306**	2.3	6.3	34.3	26.1	9.0	14.0	7.9
Indian River	5,054	10,032	38,137	26,065	11,094	20,051	12,067	**122,500**	4.1	8.2	31.1	21.3	9.1	16.4	9.9
Martin	4,815	8,822	34,284	30,234	11,993	24,821	14,595	**129,564**	3.7	6.8	26.5	23.3	9.3	19.2	11.3
Miami-Dade	194,934	202,859	607,481	417,238	174,965	360,632	191,194	**2,149,303**	9.1	9.4	28.3	19.4	8.1	16.8	8.9
Nassau	1,818	3,922	21,118	14,791	5,059	10,267	5,528	**62,503**	2.9	6.3	33.8	23.7	8.1	16.4	8.8
Okeechobee	3,276	5,042	12,079	5,823	1,935	2,339	862	**31,356**	10.4	16.1	38.5	18.6	6.2	7.5	2.7
Orange	40,508	77,110	249,759	242,772	93,352	202,462	92,344	**998,307**	4.1	7.7	25.0	24.3	9.4	20.3	9.3
Osceola	11,540	22,886	79,431	65,937	21,845	29,945	12,176	**243,760**	4.7	9.4	32.6	27.0	9.0	12.3	5.0
Palm Beach	61,296	81,304	291,023	252,616	91,004	236,573	134,837	**1,148,653**	5.3	7.1	25.3	22.0	7.9	20.6	11.7
Putnam	3,594	8,005	23,402	11,616	3,546	4,175	2,358	**56,696**	6.3	14.1	41.3	20.5	6.3	7.4	4.2
Seminole	6,392	16,664	78,409	84,948	45,158	83,288	38,030	**352,889**	1.8	4.7	22.2	24.1	12.8	23.6	10.8
St. Johns	2,594	8,641	39,464	41,076	14,664	45,174	25,069	**176,682**	1.5	4.9	22.3	23.2	8.3	25.6	14.2
St. Lucie	12,204	22,004	80,610	56,033	22,977	28,854	14,535	**237,217**	5.1	9.3	34.0	23.6	9.7	12.2	6.1
Volusia	10,903	35,285	139,354	111,180	39,026	59,722	29,918	**425,388**	2.6	8.3	32.8	26.1	9.2	14.0	7.0
Study Area Total	**460,712**	**725,724**	**2,521,302**	**2,054,676**	**805,884**	**1,633,223**	**845,049**	**9,046,570**	**5.1**	**8.0**	**27.9**	**22.7**	**8.9**	**18.1**	**9.3**
Florida	**710,891**	**1,303,864**	**4,877,816**	**3,766,164**	**1,507,434**	**3,002,459**	**1,614,992**	**16,783,620**	**4.2**	**7.8**	**29.1**	**22.4**	**9.0**	**17.9**	**9.6**
United States	**11,267,058**	**19,234,290**	**69,803,749**	**58,865,296**	**18,760,759**	**46,958,456**	**27,180,887**	**252,070,495**	**4.5**	**7.6**	**27.7**	**23.4**	**7.4**	**18.6**	**10.8**

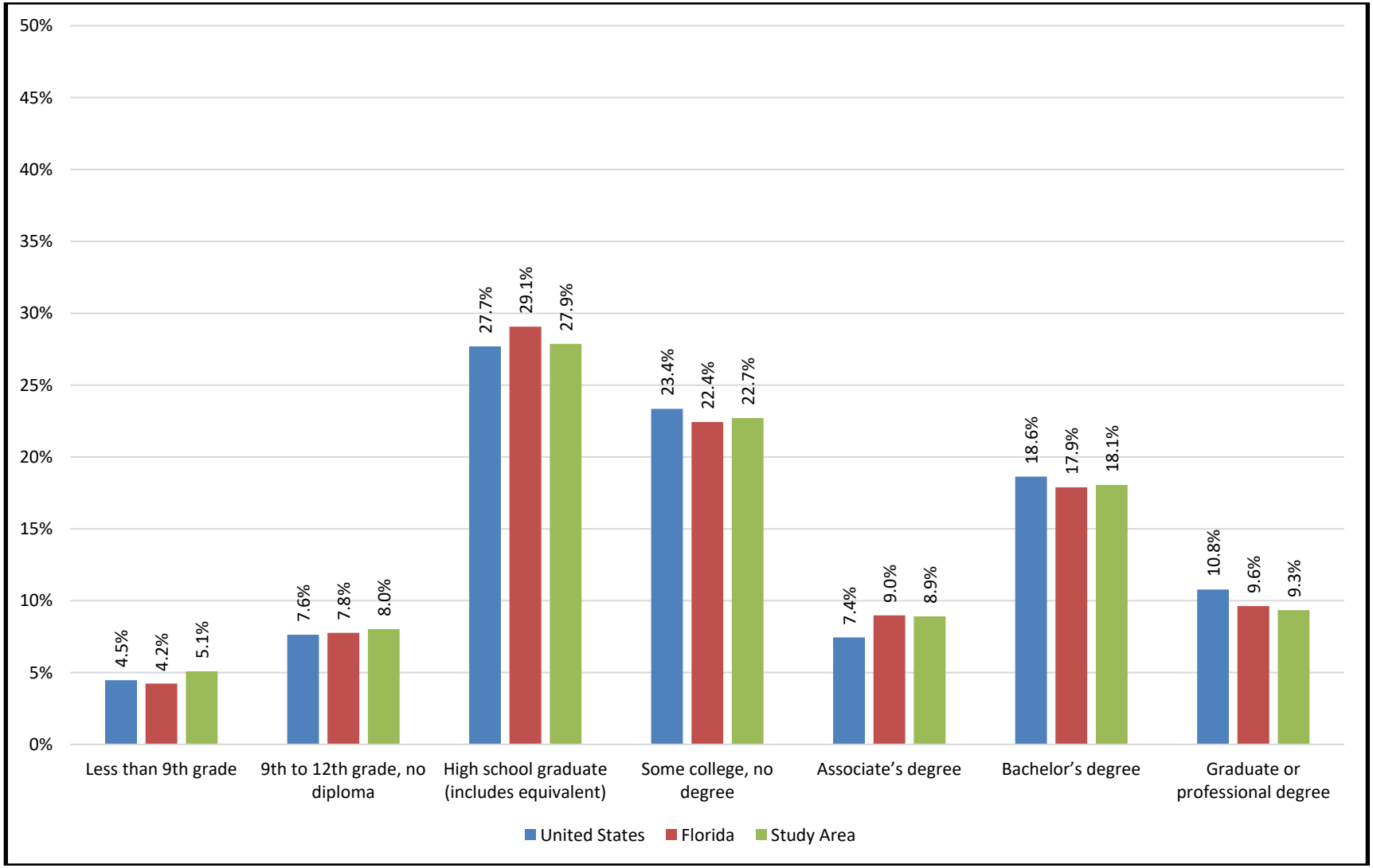
Source: USCB 2017q

Note: The USCB reports educational attainment by age group by level of education. The levels of education differ by age group and also between county-level summarization and State-level summarization methods. Therefore, the county statistics are not one-to-one with the State statistics and do not match up exactly.



Source: USCB 2017q

Figure 17-42. High School, College, and Advanced Degree Graduate Rates in the Florida Study Area



Source: USCB 2017q

Figure 17-43. Educational Attainment in the Florida Study Area

Evaluating the educational attainment of residents in the local vicinity in conjunction with information regarding the distribution of industry sector jobs, average income, and unemployment data will help provide an understanding of the experience, expected salary, availability of the workforce, and skill levels of the workforce during future OCS-related project analysis. This will help evaluators gain a better understanding of the level of workforce support that may be available in the vicinity versus how much support may need to come from outside the project area. Further evaluation of these workforce related topics should be conducted once information is known about the types and skill levels needed to support specific projects.

17.4.5 Vulnerable Populations

Identifying vulnerable populations and evaluating their distinct needs as compared to the general population is an integral part of planning associated with OCS-related development. Chapter 1.6.5 provides a definition of what it means to be "vulnerable," and/or a description of attributes of a "vulnerable population" is necessary.
Vulnerable populations included in this analysis are

- Environmental justice communities of concern, specifically minority and low-income populations based on guidance from the CEQ and Federal interagency working groups on environmental justice.
- Socially vulnerable populations based on the CDC's SoVI in the general population as applied to the Study Area.
- Resource-dependent populations (as defined in Chapter 1.6.5.3) including fishing communities, subsistence populations, and religious populations in the Study Area. These populations/communities may depend more heavily on natural resources than other populations in the region.
- American Indian tribes within the Study Area.
- Limited-English speaking populations based on USCB data.

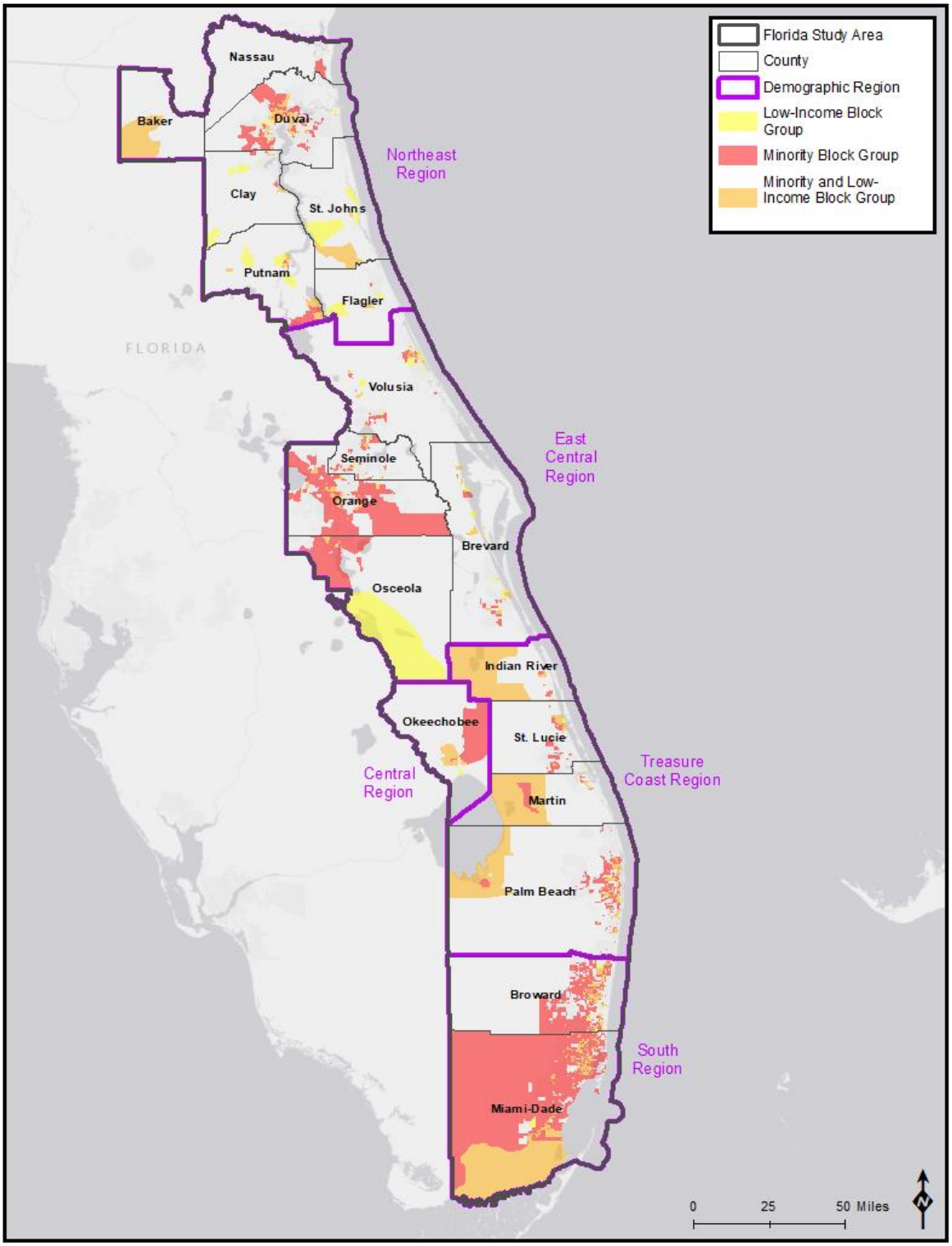
17.4.5.1 Environmental Justice Communities of Concern

Chapter 1.6.5.1 describes EO 12898 under which Federal agencies are directed to identify, and as appropriate address any disproportionately high and adverse human health or environmental effects on minority and/or low-income populations as a result of Federal actions (programs, policies, or activities).

Figure 17-44 shows the location of census block groups within the Study Area that contain minority and low-income populations.

17.4.5.1.1 Minority Populations

The Study Area contains minority populations subject to consideration as potential environmental justice communities of concern. Table 17-17 presents population and environmental justice-related characteristics for the Study Area regarding minority populations. Of the 11,439,302 people living in the Study Area, approximately 6,322,962 (55.3%) are minority. This is significantly higher than the State (45.1%) and the Nation (38.5%). Hispanic or Latino is the largest minority group at 27.5% followed by Black or African American at 18.1%. Therefore, the Study Area contains sensitive populations subject to environmental justice consideration. Of the 5,875 census block groups in the Study Area, approximately 51.0% (2,996 census block groups) are considered minority populations (USCB 2017f).



Source: USCB 2017r

Figure 17-44. Minority and Low-Income Population in the Florida Study Area by Census Block Group

Table 17-17. Low-Income and Minority Populations in the Florida Study Area

Region	Geographic Unit	Total Population (2017)	White, Non-Hispanic Population	Minority Population	Percent Minority Population (%)	Total Number of Census Block Groups	Number of Low-Income Census Block Groups	Percent of Low-Income Census Block Groups (%)	Number of Minority Census Block Groups	Percent of Minority Census Block Groups (%)	Population for Whom Poverty Status is Determined	Population with Incomes Less than 150% of Poverty Level	Percent Population with Incomes Less than 150% of the Poverty Level (%)
Central	Okeechobee	40,228	25,751	14,477	36.0	28	7	25.0	8	28.6	37,043	13,866	37.4
	Total Central Region	**40,228**	**25,751**	**14,477**	**36.0**	**28**	**7**	**25.0**	**8**	**28.6**	**37,043**	**13,866**	**37.4**
East Central	Brevard	568,183	427,709	140,474	24.7	317	41	12.9	36	11.4	561,621	126,759	22.6
	Orange	1,290,216	536,856	753,360	58.4	375	51	13.6	192	51.2	1,256,604	350,748	27.9
	Osceola	325,168	111,112	214,056	65.8	76	8	10.5	45	59.2	322,729	103,034	31.9
	Seminole	449,260	279,744	169,516	37.7	235	23	9.8	63	26.8	445,388	88,207	19.8
	Volusia	518,660	378,165	140,495	27.1	288	40	13.9	47	16.3	508,631	139,696	27.5
	Total East Central Region	**3,151,487**	**1,733,586**	**1,417,901**	**45.0**	**1,291**	**163**	**12.6**	**383**	**29.7**	**3,094,973**	**808,444**	**26.1**
Northeast	Baker	27,537	22,554	4,983	18.1	12	1	8.3	1	8.3	24,923	6,076	24.4
	Clay	203,291	150,764	52,527	25.8	81	10	12.3	8	9.9	201,472	38,813	19.3
	Duval	912,043	493,308	418,735	45.9	489	99	20.2	206	42.1	891,138	227,865	25.6
	Flagler	105,015	78,486	26,529	25.3	51	3	5.9	2	3.9	103,921	25,361	24.4
	Nassau	78,435	68,631	9,804	12.5	39	2	5.1	2	5.1	77,659	14,334	18.5
	Putnam	72,435	51,959	20,476	28.3	61	15	24.6	12	19.7	70,789	28,685	40.5
	St. Johns	226,578	189,412	37,166	16.4	81	10	12.3	3	3.7	223,855	33,505	15.0
	Total Northeast Region	**1,625,334**	**1,055,114**	**570,220**	**35.1**	**814**	**140**	**17.2**	**234**	**28.7**	**1,593,757**	**374,639**	**23.5**
South	Broward	1,890,416	721,241	1,169,175	61.8	939	133	14.2	575	61.2	1,874,096	454,512	24.3
	Miami-Dade	2,702,602	371,233	2,331,369	86.3	1,593	287	18.0	1,438	90.3	2,661,803	847,456	31.8
	Total South Region	**4,593,018**	**1,092,474**	**3,500,544**	**76.2**	**2,532**	**420**	**16.6**	**2,013**	**79.5**	**4,535,899**	**1,301,968**	**28.7**
Treasure Coast	Indian River	147,981	112,347	35,634	24.1	92	10	10.9	10	10.9	146,550	35,943	24.5
	Martin	155,719	123,000	32,719	21.0	93	13	14.0	16	17.2	152,752	30,224	19.8
	Palm Beach	1,426,772	799,018	627,754	44.0	885	120	13.6	280	31.6	1,407,692	321,581	22.8
	St. Lucie	298,763	175,050	123,713	41.4	140	26	18.6	52	37.1	295,954	81,475	27.5
	Total Treasure Coast Region	**2,029,235**	**1,209,415**	**819,820**	**40.0**	**1,210**	**169**	**14.0**	**358**	**29.6**	**2,002,948**	**469,223**	**23.4**
	Study Area Total	**11,439,302**	**5,116,340**	**6,322,962**	**55.3**	**5,875**	**899**	**15.3**	**2,996**	**51.0**	**11,264,620**	**2,968,140**	**26.3**
	Florida	**20,278,447**	**11,124,951**	**9,153,496**	**45.1**						**19,858,469**	**5,162,521**	**26.0**
	United States	**321,004,407**	**197,277,789**	**123,726,618**	**38.5**						**313,048,563**	**74,202,606**	**23.7**

Percent	0-24	25-49	50-74	75-100

Sources: USCB 2017a, USCB 2017f, USCB 2017o

Many counties contain census block groups with high percentages of minority populations. The counties are Miami-Dade (86.3%), Osceola (65.8%), Broward (61.8%), Orange (58.4%) and Duval (45.9%). The South (76.2%) and East Central (45.0%) Regions have the highest concentration percentages of minority populations (USCB 2017f).

17.4.5.1.2 Low-Income Populations

The Study Area contains low-income populations subject to consideration as potential environmental justice communities of concern. Table 17-17 presents population and environmental justice -related characteristics for the Study Area regarding low-income populations. Of the population of 11,264,620 people for whom poverty status is determined living in the Study Area, approximately 2,968,140 (26.3%) individuals have incomes less than 150% of the poverty level. This is equivalent to the State (23.7%) and the Nation (26.0%). The Study Area contains sensitive populations subject to environmental justice consideration. Of the 5,875 census block groups in the Study Area, approximately 15.3% (899 census block groups) are considered low-income populations (USCB 2017o).

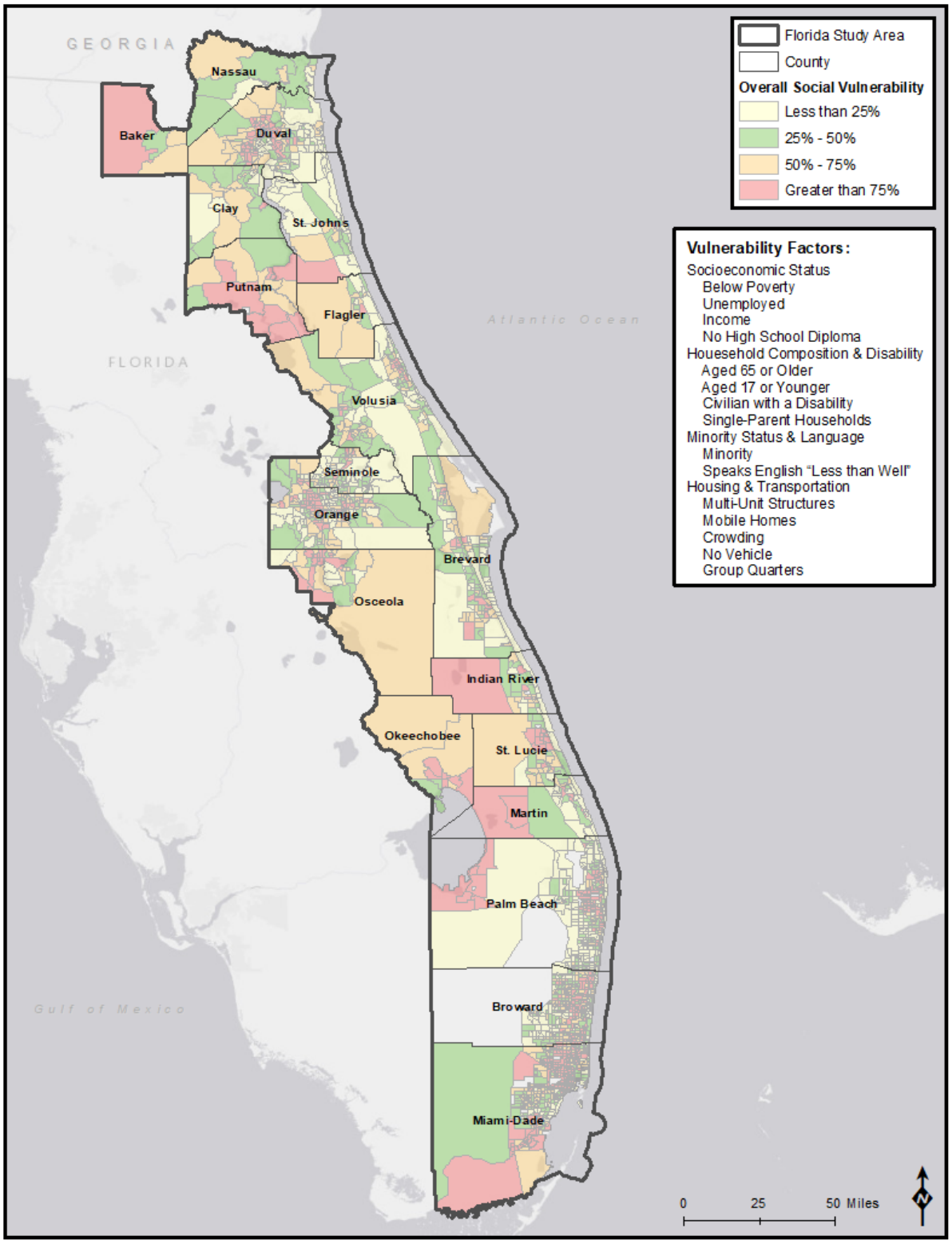
Many counties contain census block groups with high percentages of low-income populations. The counties are Okeechobee (25.0%), Putnam (24.6%), Duval (20.2%), St. Lucie (18.6%) and Miami-Dade (18.0%). The counties are located in the Central (25.0%), Northeast (17.2%) and South (16.6%) Regions (USCB 2017o).

17.4.5.2 Socially Vulnerable Populations

As described in more detail in Chapter 1.6.5.2, the term “vulnerable population” is subject to myriad interpretations. As used in this report, the term “socially vulnerable population” includes factors that identify potential environmental justice communities of concern; yet reaches beyond those definitions to include additional demographic attributes and socioeconomic factors. Demographic characteristics include sex, age, English language proficiency, household type, population density, race and ethnicity. Socioeconomic characteristics include education level, employment status, household income and poverty status. This description does not preclude the application of other factors that may be encountered when evaluating the potential for socially vulnerable populations, such as cultural, historical and behavioral attributes.

Various organizations have developed tools useful for identifying vulnerable populations using a mix of demographic and socioeconomic factors. Use of these tools results in comparative metrics helpful in identifying vulnerable populations in the Study Area. In this report we utilize two different tools developed by the CDC and NOAA to assess vulnerability. The CDC SoVI is used in this chapter to identify vulnerable populations in general (CDC 2016). NOAA’s SVI is comprised of three indices, one of which (social vulnerability index) has some areas of overlap with the CDC SoVI (NOAA Fisheries 2019f). The CDC SVI is used as social vulnerability indicators relevant to fishing dependent communities along the Nation’s coasts and discussed in detail in Fishing Communities (Chapter 17.4.5.3.1).

The output of the CDC SoVI results in a ranking of a community’s overall social vulnerability, as illustrated by census tract in Figure 17-45 for the Study Area. The following sections explore several of the vulnerability factors that factor into the CDC SoVI ranking and present more detailed analysis discussing this figure. Most counties have some populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coast of the Study Area, especially in the Treasure Coast and South Regions. Several large contiguous area of census tracts with high overall social vulnerability are in Miami-Dade, Palm Beach, Martin, Indian River, St. Lucie, Putnam, St. Johns, and Baker Counties (CDC 2016).



Source: CDC 2016

Figure 17-45. Overall Social Vulnerability Using the CDC Social Vulnerability Index in the Florida Study Area by Census Tract

To provide context for social vulnerability of coastal communities, which contain potential environmental justice communities of concern (as defined by the presence of minority and low-income populations), Figure 17-46 combines the CDC SoVI index as shown in Figure 17-45 with minority and low-income populations (as shown in Figure 17-44). Although minority and low-income populations are two separate factors considered in the CDC vulnerability analysis, it is useful to compare the results from

these two datasets to see the direct correlation; areas with a defined higher vulnerability ranking are also areas where minority and low-income population groups are more prevalent.

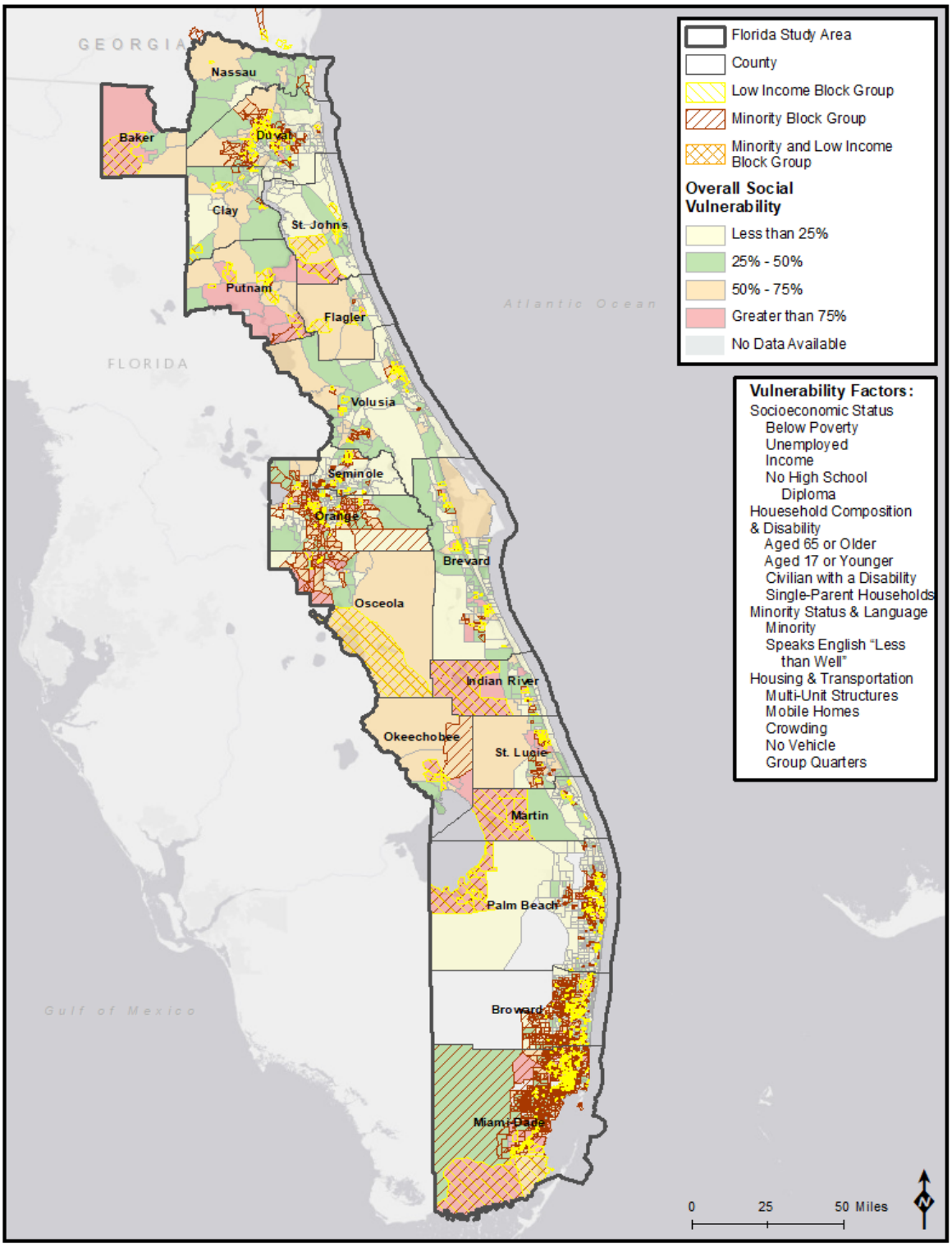
Figure 17-47 shows the output of the CDC SoVI combined with projected sea level rise data from NOAA to reveal the association between vulnerable populations living near the coast and coastal hazards in the Study Area. Figure 17-47 shows that many vulnerable communities along the coast are at risk for impacts associated with sea level rise. Not shown but also applicable (as discussed in Chapter 17.2.2.2) are risks associated with storm surge, and nuisance tidal flooding. Communities subject to sea level rise (i.e., those located along the coastline) would also therefore be subject to storm-surge and nuisance flooding. Additionally, those communities experiencing sea level rise will, over time, experience greater and greater impacts from storm surge and nuisance flooding as a result of the pressures on and changes in the environment associated with sea level rise.

As discussed in Chapter 17.4.5, evaluating the resiliency of socially vulnerable populations to potential emergencies and disasters is part of planning for OCS-related development. These vulnerable populations have a variety of socioeconomic challenges and many live in locations that are physically vulnerable (such as along the coasts) and will continue to experience effects associated with sea level rise. Therefore, it is important that OCS-related projects consider the location of socially vulnerable populations when evaluating potential future project placement.

The output of CDC SoVI indicates that most counties in the Study Area have populations deemed vulnerable to varying degrees. Concentrations of populations with high overall social vulnerability exist along the coasts of the Study Area (CDC 2016).

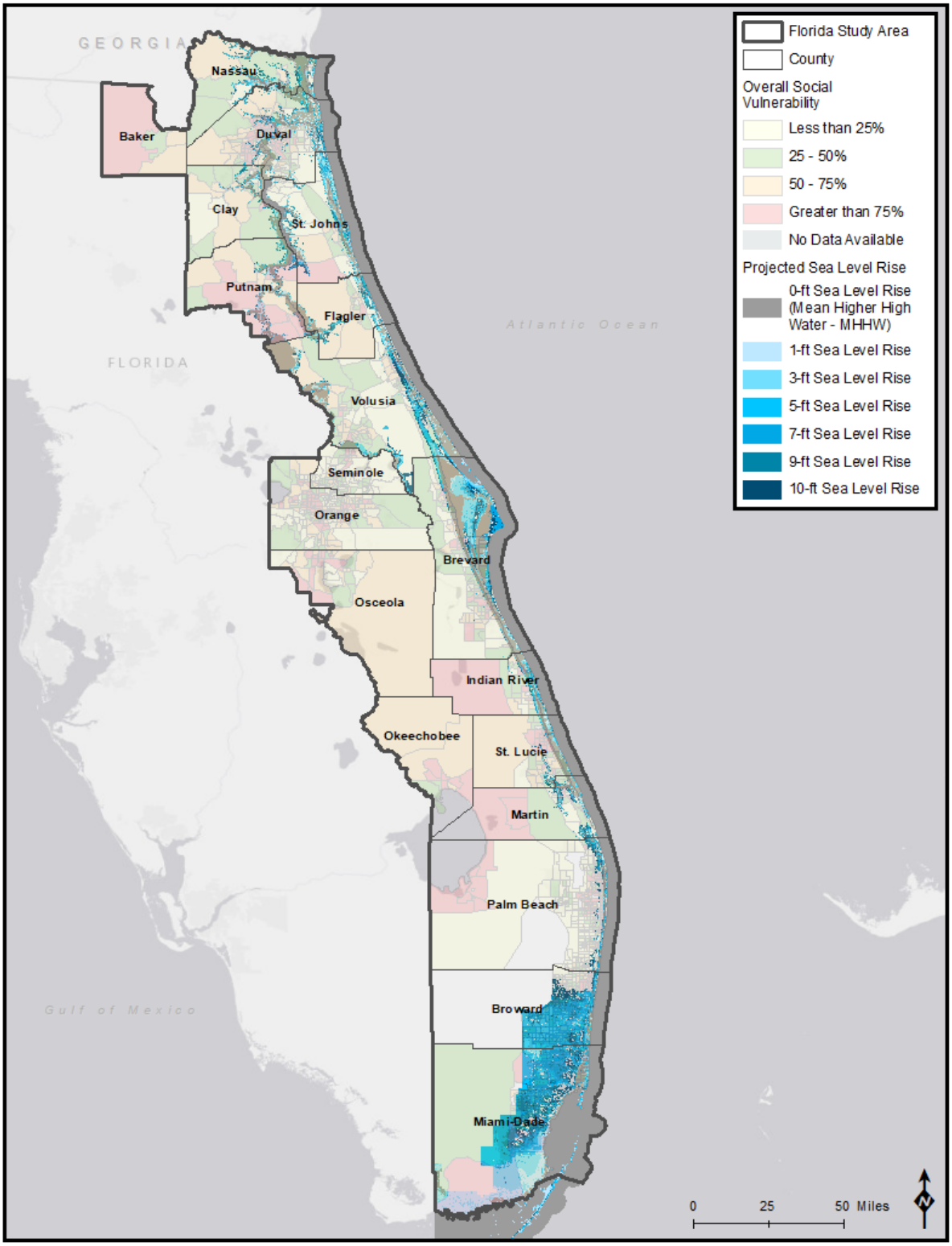
17.4.5.3 Resource-Dependent Populations

Resource-dependent populations are defined for the purposes of this study as those populations which have a heavier dependence on resources “from the land” rather than from commercial sources commonly utilized by a majority of the population in most urban, suburban, and rural communities. These resource-dependent populations have a heavier reliance on fishing, subsistence, and self-sufficiency than the average community. For the Study Area, the resource-dependent populations include fishing communities, subsistence populations, and religious populations.



Sources: CDC 2016, USCB 2017r

Figure 17-46. Overall Social Vulnerability Using the CDC Social Vulnerability Index by Census Tract and Location of Minority and Low-Income Populations by Census Block Group in the Florida Study Area



Sources: CDC 2016, NOAA 2018a

Figure 17-47. Overall Social Vulnerability Using the CDC Social Vulnerability Index and NOAA Sea Level Rise in the Florida Study Area by Census Tract

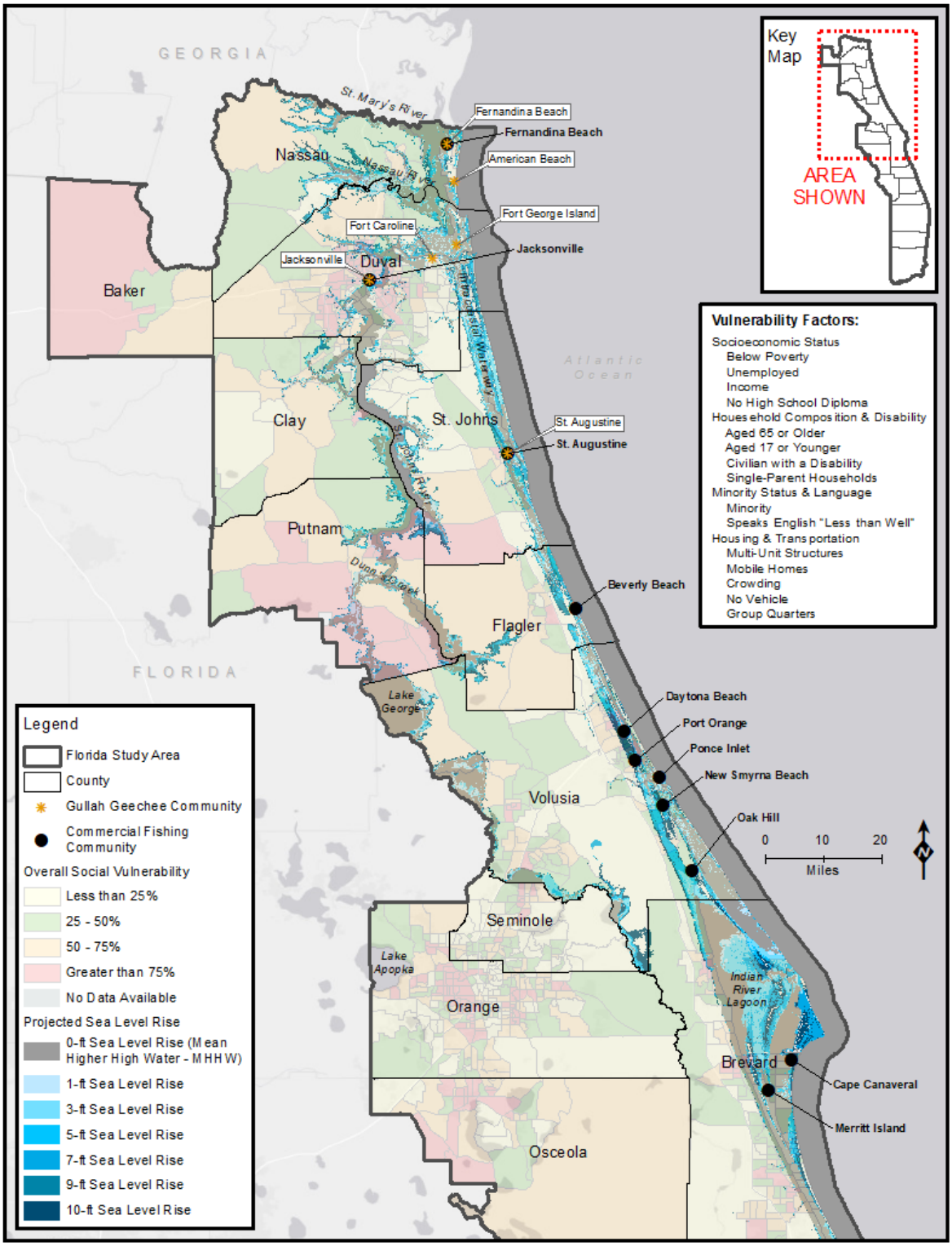
17.4.5.3.1 Fishing Communities

Fishing communities in the Study Area are illustrated in Figure 17-48 and Figure 17-49. The fishing communities located in the Study Area are (NOAA Fisheries 2019i):

- Beverly Beach, Flagler County
- Cape Canaveral, Brevard County
- Fernandina Beach, Nassau County
- Fort Pierce, St. Lucie County
- Homestead, Miami Dade County
- Jupiter, Martin County
- Merritt Island, Brevard County
- New Smyrna Beach, Volusia County
- Palm Beach Shores, Palm Beach County
- Ponce Inlet, Volusia County
- Port Salerno, Martin County
- Sebastian, Indian River County
- Stuart, Martin County
- West Palm Beach, Palm Beach County
- Boynton Beach, Palm Beach County
- Daytona Beach, Volusia County
- Fort Lauderdale, Broward County
- Hialeah, Miami Dade County
- Jacksonville, Duval County
- Jupiter Island, Martin County
- Miami, Miami-Dade County
- Oak Hill, Volusia County
- Pompano Beach, Broward County
- Port Orange, Volusia County
- Port St. Lucie, St. Lucie County
- St. Augustine, St. Johns County
- Vero Beach, Indian River County

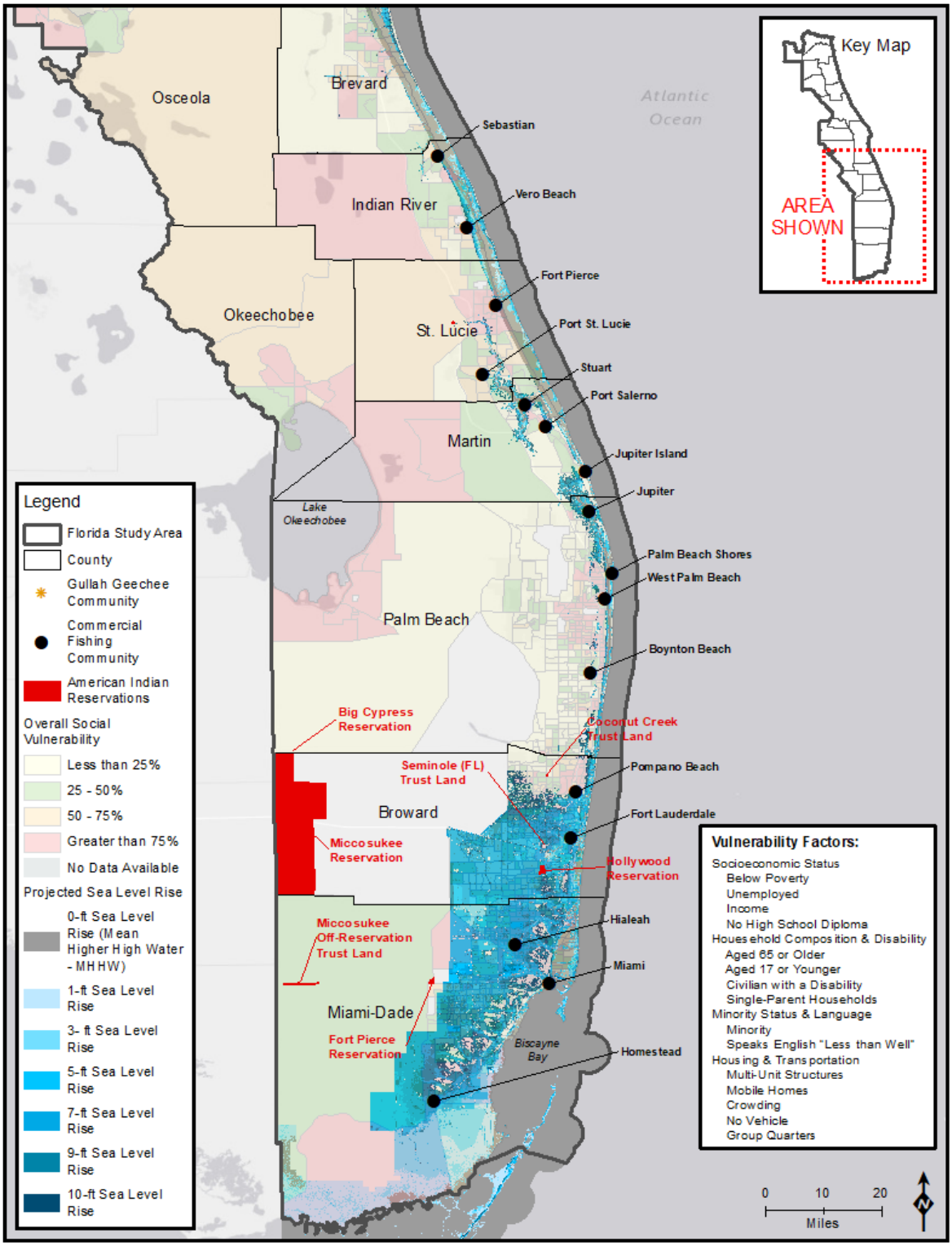
Although not included in the NOAA research, the northeast region of the Study Area is home to the Gullah/Geechee Nation, a subsistence fishing community dependent on ocean resources, living in the sea islands and vicinity of the Gullah Geechee Cultural Heritage Corridor as described in Chapter 17.4.5.3.2 (GGCHCC 2012). The primary difference between the fishing communities described by NOAA and Gullah Geechee subsistence communities is that traditional fishing villages are primarily dependent on boat fishing while Gullah Geechee are dependent on direct access to the marsh and tidal waterways (Vargas 2019).

As can be seen in Figure 17-48 and Figure 17-49, all 27 of these fishing communities are located within areas vulnerable to sea level rise, and therefore also vulnerable to associated storm surge impacts. As discussed in Chapter 17.4.5, defining vulnerable populations for the purpose of creating an environmental report is part of planning for OCS-related development. Therefore, it is recommended that OCS-related projects consider the location of fishing communities early in the site selection process. In response to EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level, NOAA Fisheries initiated a national effort to create and maintain a series of regional fishing community profiles of communities that are engaged in or dependent on fishing for various management actions. These profiles portray past and current engagement in fisheries and also contain basic information on the social and economic characteristics of these communities. When available, in-depth document profiles of fishing communities serve as baseline information for the assessment of social, economic and community impacts. The profiles can be used for many purposes, including the preparation of Environmental Impact Statements required under NEPA. Fishing Community Profiles are available by region and may be accessed through the NOAA Fisheries website (NOAA Fisheries 2019d).



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 17-48. Potential Vulnerable Communities in the Northern Florida Study Area by Census Tract



Sources: NOAA 2018a, NOAA Fisheries 2019k

Figure 17-49. Potential Vulnerable Communities in the Southern Florida Study Area by Census Tract

Chapter 1.6.5.3.1 provides additional resources that can provide in-depth local and regional information about fishing communities within the Study Area. Given the potential vulnerability of fishing communities, a more detailed analysis of the potentially affected communities should be conducted once site-specific information is known about future OCS-related projects. Fishing is a culturally significant activity in the Gullah Geechee community. Therefore, it can be assumed these communities engage in some level of subsistence fishing. This community is discussed in more detail in the following section.

17.4.5.3.2 Subsistence Populations

As indicated in Chapter 1.6.5.3.2, subsistence populations are typically "populations who principally rely on fish and/or wildlife for subsistence" (*Federal Register* 1994). According to the *Council on Environmental Quality's Environmental Justice: Guidance Under the National Environmental Policy Act*, two factors are important when considering whether a group may be considered as a subsistence population. The first factor that must be considered is whether there are differential patterns, that is differences in rates and/or patterns of subsistence consumption by minority populations, low-income populations, and Indian tribes as compared to rates and patterns of consumption by the general population (CEQ 1997). The second factor is subsistence consumption, which is defined as dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet (CEQ 1997). Federal statistical agencies do not specifically track individuals or population groups who subsist on fish or wildlife. In fact, subsistence populations can be difficult to identify because they may live and hunt or fish outside of larger population centers and interact infrequently with government agencies or other organizations.

Little is known about subsistence-oriented fishing in the Study Area. NOAA has done the most relevant research to date by identifying and tracking the fishing communities on the Nation's coasts in general, and in the Study Area (Figure 17-48 and Figure 17-49). These fishing communities have already been identified as potentially vulnerable communities based on the NOAA vulnerability index and the potential risk associated with climate change, sea level change and other factors. Compounding their vulnerability factors, fishing communities may also include high percentages of households that are limited-English speakers. Finally, these communities may also be considered as subsistence if a substantial portion of the food they consume comes from fishing.

Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.

The Gullah/Geechee Heritage Corridor is home to Gullah Geechee people, who are descendants of enslaved Central and West Africans who worked the plantations of the Southeastern United States. Following the abolition of slavery and the American Civil War, the descendants of the Gullah Geechee settled in remote areas throughout the southern United States including many of the barrier islands stretching from North Carolina to Northeast Florida. Cultural and communal ties still remain in these areas today (Jaxson 2018). An estimated 200,000 people of Gullah and Geechee heritage live along the southeast coast according to an environmental impact statement published in 2005 (Otterbourg 2014). Because of the geographic isolation, segregation, and oppression that has continued to the present times, the Gullah and Geechee share similar linguistic, artistic, and societal traits that represent the many ways these peoples maintained their homeland roots while simultaneously assimilating aspects of other cultures they encountered during and after enslavement (NPS 2017).

Also because of the geographic isolation of these communities on islands with no connected infrastructure, subsistence lifestyles were necessary and still persist in the culture. From the 1600s to present-day, Gullah/Geechee depend heavily on resources from both land and the waterways. They have historically harvested from the Intracoastal Waterway in the manner that their indigenous American and

African ancestors did (Gonsalves et al. 2015). Because the income and livelihood many Gullah Geechee residents are still heavily dependent on land and water resources (i.e., grasses for the sweetgrass baskets, food from hunting and fishing), the importance of healthy and functioning ecosystems is critical to maintaining the quality and way of life of Gullah Geechee people (GGCHCC 2012).

The Gullah Geechee Cultural Heritage Corridor, which extends from Wilmington, North Carolina in the north to Jacksonville, Florida, in the south (NPS 2017). The Gullah/Geechee Cultural Heritage Corridor, shown in Figure 17-49, was created to achieve several objectives. The Corridor was created to endorse the important contributions of Gullah Geechee to American culture and history. Additionally, the Corridor assists local governments and entities in and preserving Gullah Geechee folklore, arts, crafts, and music. The Corridor also assists in identifying and preserving sites, historical data, artifacts, and objects associated with Gullah Geechee culture for the benefit and education of the public (GGCHCC 2012).

The Study Area includes part of the Cultural Heritage Corridor totaling 1,135,945 acres in parts of Nassau and Duval Counties and all of St. Johns County (Regulations.gov 2015). The Gullah Geechee community of Cosmo, Florida in Duval County was formed following the Civil War when families of former slaves established a community subsiding on hunting, farming, mullet fishing, crabbing, shrimping, and harvesting oysters at Mill Cove. Cosmo remained in isolation until a bridge was constructed in the 1950s. Further development, including dredging of Mill Cove's marine line, displacement, and suburban gentrification led to Cosmo's decline. The community is now known as Fort Caroline but still contains remnants of Cosmo including the Palm Springs Cemetery, the Alexander Memorial United Methodist Church, and a few houses scattered in heavily wooded areas tucked between modern subdivisions (Jaxson 2018). Similar communities within the Corridor and Study Area include American Beach (Nassau County), Fernandina Beach (Nassau County), Fort George Island (Duval County), Jacksonville (Duval County), and St. Augustine (St. Johns County) (Hiller 2019, NPS 2005).

The fisheries that support the Gullah/Geechee people face a multitude of threats largely derived from activities such as urban, industrial, and agricultural development within coastal watersheds, overfishing, conflict with state agencies for harvesting in their historically traditional manner, competition with commercial fisheries, climate change, sea level rise, ocean acidification, hurricanes, and environmental pollutants (GGCHCC 2012, Gonsalves et al. 2015). The largest threat to Gullah Geechee communities is coastal development adjacent to subsistence waterways, which simultaneously have led to steadily increasing property values and taxes and physically cut off these communities from the marsh and water that is their livelihood (NPS 2005, Vargas 2019). These threats have caused declines in blue crabs, oysters, shrimp, catfish, mullet, spot, croakers, etc., which are staples of the Gullah/Geechee fishing industry and diet (Gonsalves et al. 2015).

17.4.5.3.3 Religious Populations

A subset of subsistence populations can include religious subpopulations such as Amish and Mennonites. A general introduction to Amish and Mennonite culture is included in Chapter 1.6.5.3.3. The only known community of Amish and Mennonites in Florida is Pinecraft, located near Sarasota outside of the Study Area (Visit Sarasota 2019).

17.4.5.4 Tribes

The Study Area has seven Federally-recognized tribes, one of which is not State-recognized (HUD 2019b). Table 17-18 lists the Federally- and State-recognized tribes in Florida. Federally recognized tribal lands are shown in Figure 17-49. These tribes could constitute socially vulnerable populations under the CDC definition because they constitute a minority population and could experience other vulnerability characteristics.

Table 17-18. Federally and State-Recognized Tribes with Historical Ties to Florida

Tribe	Federal and/or State Recognition	Historical Ties to the Study Area	Geographic Units(s)
Resident Tribes within the Study Area			
Miccosukee Tribe of Indians (of Florida)	Federal and State	Yes	Tribal members live in reservations in the Study Area (Broward and Miami-Dade County)
Seminole Tribe of Florida	Federal and State	Yes	Tribal members live in reservations in the Study Area, primarily in Broward County and St. Lucie County.
Federally and State-Recognized Tribes Outside the Study Area			
Alabama-Coushatta Tribe of Texas	Federal	No	Tribal members reside outside of Florida, primarily in Texas but have historical ties to the State.
Choctaw Nation of Oklahoma	Federal	No	Tribal members reside outside of Florida, primarily in Oklahoma, but have historical ties to the State.
Coushatta Tribe of Louisiana	Federal	Yes	Tribal members reside outside of Florida, primarily in Louisiana, but have historical ties to the Study Area (Baker, Brevard, Clay, Duval, Flagler, Nassau, Orange, Putnam, Seminole, St. Johns, and Volusia Counties).
Mississippi Band of Choctaw Indians	Federal and State	No	Tribal members reside outside of Florida, primarily in Mississippi, but have historical ties to the State.
Muscogee (Creek) Nation	Federal and State	Yes	Tribal members reside outside of Florida, primarily in Oklahoma, but have historical ties to the Study Area (Baker, Brevard, Broward, Clay, Duval, Flagler, Indian River, Martin, Nassau, Orange, Osceola, Palm Beach, Putnam, Seminole, St. Lucie, and Volusia Counties).
Poarch Band of Creek Indians	Federal and State	No	Tribal members are descendants of Muscogee Creek Indians and primarily reside outside of Florida in Alabama; they have historical ties to western Florida.
Seminole Nation of Oklahoma	Federal and State	Yes	Tribal members reside outside the Study Area in Oklahoma but have historical tie to the same lands in the Study Area as the Seminole Tribe of Florida.

Sources: FDOT 2019b, HUD 2019b, Miccosukee Tribe 2018, FGDL 2017

Historically, tribes from Florida spanned the entire region known today as the Southeastern United States. These southeastern tribes included Choctaws, Chickasaw, Seminole, Cherokees, Miccosukee, Muscogee, Caluse, and others. During European expansion, the Miccosukee and Seminole Tribe took refuge in the Everglades during the Seminole Wars of the 1800s. Those that avoided removal to Indian Territory eventually became the Seminole Tribe of Florida, formed the Miccosukee Tribe, or remained independent. Seminole Indians removed from Florida became the Seminole Nation.

The Miccosukee Tribe of Indians of Florida (Miccosukee) and the Seminole Tribe of Florida (Seminole Tribe) currently reside and have tribal lands in Florida (FDOT 2019b). The Miccosukee have multiple reservations: Alligator Alley Reservation (81,876 acres) and South Florida Water Management District Water Conservation Area 3A South (233,669 acres) in Broward County, and Krone Alley Reservation (249 acres), Miccosukee Indian Property (906 acres), and Tamiani Trail Reservation (843 acres) in Miami-Dade County. They became federally recognized in 1962 and today there are over 600 tribe members (Miccosukee Tribe 2018).Within the Study Area, the Miccosukee have a total of 317,542 acres in Broward and Miami-Dade Counties (FGDL 2017). The Seminole Tribe of Florida has almost

3,000 members that primarily live on tribal lands in Broward County: Big Cypress Reservation (28,491 acres), Coconut Creek Reservation (51 acres), Hollywood Reservation (507 acres), Seminole Indian Property (2,580 acres), and Seminole Indian Trust Lands (0.259 acres). The Seminole Tribe also has a 73-acre reservation in St. Lucie County (Fort Pierce Reservation). The Seminole Tribe of Florida became federally recognized in 1957 (FGDL 2017).

The Alabama-Coushetta Tribe of Texas, Choctaw Nation of Oklahoma, Mississippi Band of Choctaw, and Poarch Band of Creek Indians have historical ties to the State of Florida, but they do not have historical lands in the Study Area (FDOT 2019b, Miccosukee Tribe 2018, Muscogee (Creek) Nation 2019, Poarch Creek Indians 2019, Seminole Tribe 2019, SPTHB 2017). The Coushatta Tribe of Louisiana, Muscogee Creek Nation (Muscogee), and Seminole Nation of Oklahoma (Seminole Nation), do not currently live in the State, but they have historical ties to the Study Area. (FDOT 2019b). The Sovereign Nation of the Coushatta Tribe of Louisiana (Coushatta) is a federally recognized American Indian tribe with approximately 865 members who live primarily in Louisiana (Coushatta Tribe of Louisiana 2019). Figure 17-49 shows the locations of tribal lands of the Miccosukee Tribe of Indians and Seminole Tribe of Indians in Florida.

These tribes constitute minority populations as classified under EO 12898 and could also constitute socially vulnerable populations under the CDC definition if other vulnerability factors are also present in the community.

The potential impact to tribes and tribal lands should be considered in conjunction with any proposed future project. Section 106 of the NHPA requires tribal consultation throughout all steps of the process when a Federal agency undertaking may affect historic properties that are either located on tribal lands or when an American Indian tribe attaches a religious or cultural significance to the historic property, regardless of the property's location. Under such conditions, the Federal agency must notify the respective federally recognized tribal groups, giving them the opportunity to consult (NPS 2012). State or non-recognized tribal groups may participate in the Section 106 process as members of the public.

Additionally, in accordance with EO 13175, the U.S. Department of the Interior has established a joint Federal-tribal team to define the Department-wide policy for Tribal consultation. The goals of this policy are to

- honor the government-to-government relationship;
- involve the appropriate level of decision maker in a consultation process;
- promote innovations in communication by including a Department-wide tribal governance officer;
- detail early tribal involvement in the design of a process implicating tribal interests; and
- capture a wide range of policy and decision making processes under the consultation umbrella (DOI 2020a).

17.4.5.5 English Language Ability

Populations that speak a primary language other than English are present within the Study Area. Not all people who speak another language have difficulty in English, but those who have difficulty, and particularly those in limited-English households where everyone has difficulty, have the potential to be socially vulnerable (USCB 2015).

Table 17-19 provides an analysis people who speak a language other than English at home in counties within the Study Area. As compared to the U.S. (21.3%), Florida has a high percentage of non-English speakers at home (28.7%). The Study Area has an even higher percentage (37.9%). The South region has the highest percentage (59.9%) of non-English speaker at home within the region. Spanish is the language

spoken by the majority (3,098,315 people or 28.7%) of the Study Area population. Indo European languages were spoken by 6.7% of the Study Area population (USCB 2017e).

Figure 17-50 illustrates the percent of people who speak a language other than English at home in the Study Area. Counties with the highest percentages of these populations were Miami-Dade, Broward, Palm Beach, Indian River, Osceola, Orange and Seminole counties. Hispanic populations in Osceola and Orange counties were bolstered by the in-migration of Puerto Ricans and US Virgin Islanders as a result of the 2017 hurricane season, according to Census Bureau estimates (EDR 2019a). As seen in Figure 17-48 and Figure 17-49, large portions of Broward and Miami-Dade counties are ranked as over 75% vulnerable and impacted by rising sea levels.

There are many recreational and commercial fishermen who supplement their families' food supply through their fishing activities who are also limited-English speakers. Households with people who speak English less than well or reside in limited-English households may face language barriers. Language barriers can affect these limited-English speaking fishermen in a variety of ways. Fishing regulations and fish consumption advisories containing recommendations about species to avoid due to elevated levels of contaminants in species can be complex messages to communicate to limited-English speaking populations (USEPA 2014b). These types of documents are rarely translated from English into other languages. As a result, species of fish containing elevated levels of contaminants may be eaten by these households. Language barriers may be complicated by lack of computers and/or internet access in the household. Lack of strong English language skills could affect participants' ability to engage effectively in the fisheries management process or to find suitable replacement work in case of job disruption.

Information about location of limited-English speaking populations is essential to the OCS-related planning process, particularly in consideration of general communications with communities, individuals, and the public and for emergency planning.

17.4.6 Summary – Demographics and Socioeconomics

Projections indicate the population within the Study Area will continue to increase through at least 2040. Overall population trends currently and predictions for the future in the Study Area indicate an aging population, increasing population density especially in coastal hazard areas, and rising housing costs. Current population growth rates of the Study Area are twice than that of the Nation. Reflecting nationwide trends, Florida's population is aging, a trend which is exacerbated by domestic in-migration from other States in the Northeast, as Florida is a popular location for retirees. The aging population may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

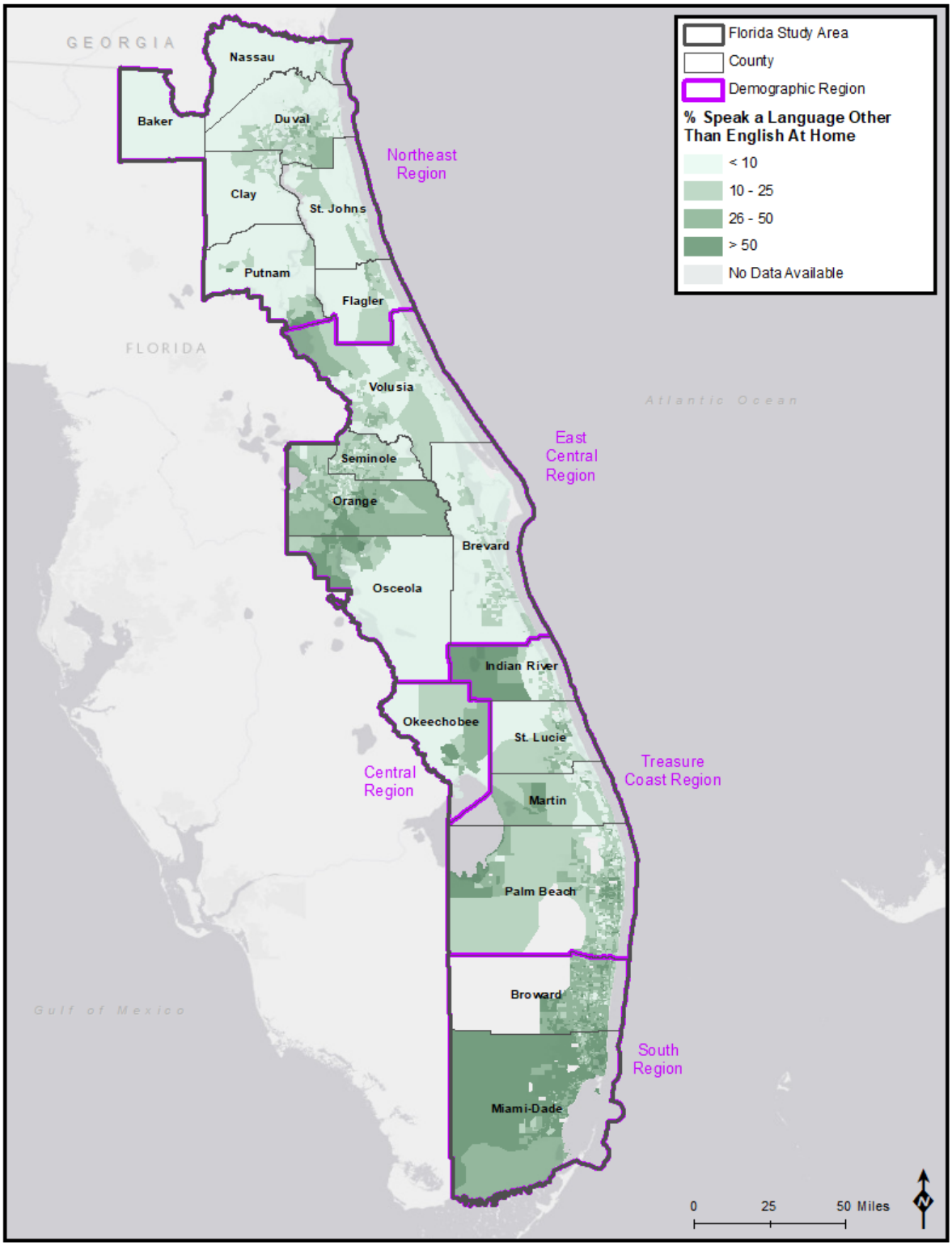
Table 17-19. People who Speak a Language Other than English at Home in the Florida Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5 (2017)	Total Population Who Speak a Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Central	Okeechobee	37,876	8,889	23.5	8,203	370	211	105
	Total Central Region	***37,876***	***8,889***	***23.5***	***8,203***	***370***	***211***	***105***
East Central	Brevard	541,367	56,038	10.4	32,991	13,383	6,817	2,847
	Orange	1,209,706	427,445	35.3	298,211	80,628	36,874	11,732
	Osceola	304,134	150,749	49.6	131,377	12,030	4,038	3,304
	Seminole	425,452	89,732	21.1	60,976	16,029	9,751	2,976
	Volusia	494,038	65,247	13.2	45,619	11,312	5,825	2,491
	Total East Central Region	***2,974,697***	***789,211***	***26.5***	***569,174***	***133,382***	***63,305***	***23,350***
Northeast	Baker	25,921	947	3.7	402	306	148	91
	Clay	191,902	19,644	10.2	10,812	4,465	3,903	464
	Duval	850,321	117,869	13.9	53,471	28,995	27,894	7,509
	Flagler	100,707	14,494	14.4	6,648	6,107	1,580	159
	Nassau	74,316	3,410	4.6	2,074	963	267	106
	Putnam	68,301	6,326	9.3	5,460	404	308	154
	St. Johns	215,027	17,951	8.3	8,632	5,559	2,683	1,077
	Total Northeast Region	***1,526,495***	***180,641***	***11.8***	***87,499***	***46,799***	***36,783***	***9,560***
South	Broward	1,780,039	712,706	40.0	451,087	205,213	31,960	24,446
	Miami-Dade	2,546,402	1,880,020	73.8	1,664,041	175,903	24,530	15,546
	Total South Region	***4,326,441***	***2,592,726***	***59.9***	***2,115,128***	***381,116***	***56,490***	***39,992***

Table 17-19. People who Speak a Language Other than English at Home in the Florida Study Area by Census Block Group

Region	Geographic Unit	Total Population Over Age 5 (2017)	Total Population Who Speak a Language Other than English at Home	Percent Who Speak a Language Other than English at Home (%)	Speak a Language Other Than English			
					Spanish	Indo European	Asian or Pacific Island	Other
Treasure Coast	Indian River	141,577	19,209	13.6	13,462	4,280	1,122	345
	Martin	149,370	20,551	13.8	15,294	3,564	1,139	554
	Palm Beach	1,353,509	421,584	31.1	248,960	137,128	21,052	14,444
	St. Lucie	283,022	62,442	22.1	40,595	17,583	2,795	1,469
	Total Treasure Coast Region	***1,927,478***	***523,786***	***27.2***	***318,311***	***162,555***	***26,108***	***16,812***
	Study Area Total	**10,792,987**	**4,095,253**	**37.9**	**3,098,315**	**724,222**	**182,897**	**89,819**
	Florida	**19,173,085**	**5,503,431**	**28.7**	**4,078,350**	**990,969**	**306,592**	**127,520**
	United States	**301,150,892**	**64,221,193**	**21.3**	**39,769,281**	**10,907,675**	**10,409,087**	**3,135,150**

Source: USCB 2017e
Indo European languages (not synonymous with “European” languages as it excludes Spanish, English, but includes Hindi, Persian, French and German).
Asian and Pacific languages include Japanese, Korean, Chinese (Mandarin and Cantonese), Vietnamese and Thai. Other languages include native languages of North America, Arabic, Hebrew and Swahili.



Sources: USCB 2017r, USCB 2017e

Figure 17-50. Percent of People Who Speak a Language Other than English at Home in the Florida Study Area by Census Block Group

Population growth is concentrated in coastal areas, exposing increasing numbers of people (as the population grows) and infrastructure (as development continues) to coastal hazards. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on development in general and available housing for residents. Mounting threats from climate change and sea level rise may compound housing affordability crisis over time. As less-advantaged neighborhoods are damaged by flooding, they may undergo climate gentrification, being redeveloped for more affluent and advantaged groups. Eventually, as coastal development pressures increase, growth will shift to inland areas and put pressure on agricultural areas.

Home vacancy rates in Florida are significantly higher than the Nation's vacancy rates (USCB 2017g) because secondary homes, investment properties and residences rented as short-term rentals are counted as vacant by the Census Bureau (Daily Mail 2019). Three cities (Miami, Orlando and Jacksonville) in the Study Area have vacancy rates ranging from 13.4% to 17% (Daily Mail 2019). Additionally, the use of residences being rented out as short-term rentals is on the rise in the Study Area. The presence of short-term rentals has been linked to rising home prices and rental rates as homes are sold to Airbnb "landlords" who own multiple area properties (CityLab 2019).

Housing affordability for low- and moderate-income workers is a problem in Florida, particularly in South Florida and Orlando. In spite of favorable conditions statewide for homebuyers, such as fairly low housing prices, low property taxes, and no State income tax, many prospective homeowners are opting to rent instead of buy.

Housing utilization is an important consideration for potential future projects to determine if a region can support the proposed project workforce. Often during the construction stage, workers need to migrate temporarily into the area, either from nearby locations or from outside of the region. These individuals typically occupy hotels or rental properties. Employees that are part of the operational workforce may either purchase or rent homes. Therefore, understanding the current, and future projected changes in housing utilization and vacancy rates can assist during OCS-related project planning stages.

Income in the Study Area is slightly less than the Nation, and the unemployment rate is higher than the Nation. Within the Study Area, the counties with the lowest and highest unemployment rates were both located within the Northern Region (5.3% in St. Johns County and 10.3% in Putnam County, respectively). Employment tends to be in educational services, and health care and social assistance, retail trade, professional, scientific, and management, and administrative and waste management, and arts, entertainment, and recreation, and accommodation and food services. More jobs are available in high-density concentrations in major urban areas with large and growing cities such as Jacksonville, Miami, Orlando, Port St. Lucie, Fort Lauderdale, and Hialeah. Significantly less jobs are available in the rural counties of Putnam, Okeechobee, Nassau, Flagler, and Baker. The Study Area accounts for 52.6% of total maritime jobs in the State, most of which are located in Miami-Dade.

Overall, the Study Area includes a diverse working-age population in terms of educational attainment. The majority (86.9%) of the population are high school or equivalent graduates and have at least some college. Additionally, 59% of the working-age population has achieved at least one college degree (Associate's, Bachelor's, Graduate or professional). Based on the educational diversity of the workforce, in comparison with the types of employment in the area and the unemployment rates, workers should be available with the background to fulfill many various job roles. Future OCS-related projects in the area would likely need to look more closely at each of these workforce characteristics on a local level when considering site-selection and when project needs are more fully understood.

Any projects subject to NEPA must consider the location of vulnerable populations when evaluating potential future project placement. Vulnerable communities in the Study Area include communities that are dependent on subsistence and commercial fishing, can be more socially vulnerable than other low-

income communities (15.3% of the Study Area), minority populations (51% of the Study Area), and populations with a primary language other than English. Miami-Dade, Palm Beach, Martin, Indian River, St. Johns and Baker Counties contain the highest percentages of low-income and minority populations within the Study Area. Concentrations of populations with high overall social vulnerability exist along the coast of the Study Area, especially in the Treasure Coast and South regions. Several large contiguous areas of census tracts with high overall social vulnerability are in Miami-Dade, Palm Beach, Martin, Indian River, St. Lucie, Putnam, St. Johns, and Baker Counties.

The Study Area has seven Federally-recognized tribes and six State-recognized tribes. According to the Florida Department of Transportation, the Miccosukee and Seminole Tribe currently reside and have tribal lands in the State. The Muscogee, Poarch, Seminole Nation, and the Choctaw do not currently have reservation lands in the State; however, they may have historical ties to the area (FDOT 2019b).

Additional vulnerable populations are subsistence communities, which are hard to study because they are not reflected in most common data sources. Fishing communities may constitute a subsistence population. There are 27 fishing communities located the Study Area. These communities are particularly susceptible to projected sea level rise and storm surge changes. These communities also correlate closely with the CDC vulnerability rankings and minority and low-income populations. Other subsistence communities identified in Florida are the Gullah Geechee. Although Gullah Geechee depend on fishing, they differ from NOAA fishing communities in that they require direct access to marshes and waterways, rather than using boats. The Study Area includes part of the Gullah Geechee Cultural Heritage Corridor, totaling 1,135,945 acres in parts of Nassau and Duval Counties and all of St. Johns County (Regulations.gov 2015). Gullah Geechee communities have been identified in Cosmo (Duval County), American Beach (Nassau County), Fernandina Beach (Nassau County), Fort George Island (Duval County), Jacksonville (Duval County), and St. Augustine (St. Johns County), although there are likely many other Gullah Geechee living elsewhere in these Counties.

Linguistically-challenged populations are present throughout the Study Area. These are considered vulnerable populations due to challenges they may face understanding laws and regulations, emergency procedures and notifications, or during interactions with governments, emergency personnel, or the general public. The Study Area has a high percentage of non-English speakers at home, especially in the South region (59.9%). Spanish is the dominant non-English language followed by Indo European languages. Counties with the highest percentages of these populations were Miami-Dade, Broward, Palm Beach, Indian River, Osceola, Orange and Seminole counties.

17.5 Conclusion

This chapter summarizes the results of the coastal land use and social and economic baseline analysis and presents recommendations related to potential future OCS-related development near the Study Area.

17.5.1 Regional Observations

Florida’s geology is characterized by karst topography which contributes to physical vulnerability for various communities within the Study Area (particularly Volusia, Orange, St. Johns, Flagler, Putnam, Clay, and Seminole Counties). In combination with the additional physical vulnerability from projected sea level rise and storm surge changes, communities within these counties could have enhanced vulnerability to karst issues due to the effects of water on these types of rocks. Some of the communities within these counties are also socially vulnerable, thus increasing the potential for future social and economic impacts as a result of severe weather, rising sea level, and changing climate.

Wetlands, as well as streams, rivers, lakes, and associated floodplains are prevalent throughout the Study Area. Many of these areas are also protected areas because of the unique habitats, characteristics, or contributions of these features to the environment.

Protected areas, cultural resources, and recreational areas abound throughout the Study Area. Much of the Study Area is protected from development. The entire State of Florida is regulated under Florida's CMP. All wetlands and water bodies are protected by the CWA and most within the Study Area have multiple additional protections within the State. As such, any development will undergo additional scrutiny by multiple agencies, especially when any water resources are involved, which is likely to occur given their prevalence. It is unlikely that future OCS-related projects could avoid all impacts to such protected areas, cultural and historic resources, and recreational areas. However, analysis of future projects would need to carefully assess the nature of sites that are potentially impacted and consider whether alternatives sites may have lesser impacts to these areas.

Florida's population is aging, a trend which is exacerbated by domestic in-migration from other States in the Northeast, as Florida is a popular location for retirees. The aging population may indicate future social and economic challenges, such as demand for education, healthcare, housing, recreation, transportation, and many other goods and services. They affect the number and characteristics of persons in the labor force and in public and private retirement systems. They affect the allocation of many types of public funds.

Population growth in the Study Area is concentrated in coastal areas which are the areas with the greatest physical vulnerability to rising sea level and changes in storm surges. Rising sea levels and nuisance flooding may make parts of the region uninhabitable, which will put greater pressure on development in general and available housing for residents. Mounting threats from climate change and sea level rise may compound housing affordability crisis over time. As less-advantaged neighborhoods are damaged by flooding, they may undergo climate gentrification, being redeveloped for more affluent and advantaged groups. Eventually, as coastal development pressures increase, growth will shift to inland areas and put pressure on agricultural areas.

Housing affordability for low- and moderate-income workers is a problem in Florida, particularly in South Florida and Orlando. In spite of favorable conditions statewide for homebuyers, such as fairly low housing prices, low property taxes, and no State income tax, many prospective homeowners are opting to rent instead of buy.

The Gullah/Geechee, a unique subsistence and minority population within the Study Area, lives along the coastline in areas particularly vulnerable to sea level rise and storm surge. This community is both physically and socially vulnerable, has some linguistic differences compared to the rest of the Study Area, and is threatened by existing and future land and water use changes over time.

17.5.2 Additional Considerations

Based on the results of the analysis of coastal land use, and general social and economic information or the Study Area, the following recommendations are presented for consideration in conjunction with proposed future OCS-related projects and associated analyses. These recommendations represent the views of the authors and do not necessarily represent the views of BOEM.

- Any projects requiring groundwater extraction will require early involvement of the public, the local water management district, and FDEP in order to garner support to access Florida's water resources. Alternative water sources to groundwater and methods for minimizing possible impacts from industrial water usage must be considered in project design.
- Sea level rise projections in combination with storm surge projections could influence future land use planning and population distribution. Future projects in the area will need to take into account

both sea level rise and storm surge for site selection planning. Any proposed developments in coastal hazard areas should factor a projected sea level rise of at least twice the global predicted levels during the design process. While NOAA predicts a global mean sea level rise of at least 8 inches by 2100, sea level analysis for south Florida projects a main range of local sea level rise of more than twice that, at least 20-56 inches by 2100.

- Based on an analysis of the general land cover within the Study Area, it seems most likely that Baker, Clay, Flagler, Nassau, Orange, Putnam, St. Lucie, St. Johns, and Volusia Counties would be the most suitable counties to accommodate future industrial projects.
- Future potential projects will need to consider protected areas during their site selection process and consider potential impacts to nearby protected areas for project construction and operations. If any protected areas are proposed for project development, individual preservation and management plans should be consulted for additional guidance.
- Land use plans and zoning ordinances influence what onshore development is possible to support OCS development. Projects will likely need to evaluate existing and future land use plans and zoning ordinances that are unique to respective communities. Based on a cursory view of project planning documents available at their website, issues of concern in central Florida include emergency preparedness, housing, transportation, food production in Orange and Seminole Counites, sea level rise along the Space Coast, and urban landscapes designed to connect communities while avoiding sprawl (ECFRPC 2018). Project developers would benefit from early coordination with economic development organizations and local and State governments during the early planning and site selection process.
- Because the of rapid development in coastal Florida, local land use planning documents should be re-evaluated every five years at minimum.
- Proposed development targeted in Opportunity Zones that is also consistent with land use management and farmland preservation guidelines would likely receive local support.
- Much of the Study Area is protected from development. In addition to municipal land planning documents, additional planning documents may be available for protected areas. Any proposed plans potentially impacting protected areas should take into account individual plans for protected areas where available.
- Future project planning should involve coordination with organizations that support economic development and are designed to help draw businesses to Florida organizations. Projects that are consistent with planned future development and project developers interested in working in partnership with the communities during the planning and siting process to minimize potential impacts will receive more support for a potential project.
- The Study Area has many land constraints on development because of the amount of protected land and increasing population density. Future development projects should be planned in already urbanized areas, which may mean developing contaminated sites. Although contaminated sites will have additional costs upfront from remediation, they could be offset by tax incentives and the overall costs as the pressures of sea level rise and climate change increase in frequency, duration, and impact. Any plans should factor loss of productivity from evacuations or storm damage over the long term. Populations with particular vulnerabilities, such as ethnic, linguistic or cultural minorities, low-income groups and populations with particular vulnerabilities, those who depend on subsistence resources may have distinct cultural or economic relationships with coastal lands that require special attention in environmental impact assessment analyses and environmental justice determinations. These communities could experience the greatest impacts associated with proposed future projects. Future projects should consider the location of vulnerable communities early in the site selection process to satisfy EO 12898 and other mandates requiring agencies to examine the social and economic impacts of policies and regulations at the community level.
- Cultural resource surveys may be required once site-specific information is known.

- Further attempts to identify subsistence populations should be considered once site-specific information is known. Such additional evaluation will likely require outreach to local community leaders, community organizers, and community groups to aid in the identification of these populations.
- All data presented in this analysis is relevant as of 2019. Future project analysis should evaluate the most current data available at the time. The references and data sources provided in this current analysis can provide a starting point for that future analysis.
- The data presented in this analysis is presented at the level of the Study Area. Future project analysis needs to look in greater detail at each of these resource areas once site-specific information is known.

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CHAPTER 18

LIST OF PREPARERS

18 List of Preparers

Name/Education	Project Role	Experience
Project Management Team		
Roberta A. Hurley M.A. Chemistry B.S. Chemistry B.S. Biology	AECOM Project Manager/Quality Assurance Lead	Over 35 years of experience in regulatory and NEPA compliance, including project management and public outreach.
Jill Cahoon M.A. Geography B.S. Geography and GIS	AECOM GIS Team Lead	19 years of experience in GIS data collection, organization and analysis for demographic, land use, and environmental applications.
Carol Butler Freeman, P.G. M.S. Geological Science; M.S. Space Studies; B.S. Geology	AECOM Land Use and Socioeconomic Team Lead	11 years of experience in NEPA compliance and document preparation; 24 years of experience in scientific and technical analysis.
Anneliesa Barta M.B.A. Finance	AECOM Land Use and Socioeconomic Deputy Team Lead	10 years of experience in environmental and sustainability planning, 5 years of experience in NEPA document preparation.
Erika A. Grace M.S. Environmental Toxicology B.S. Biological Sciences	AECOM Project Coordinator	11 years of experience in NEPA coordination and document preparation; 13 years of experience in environmental services and technical evaluations
Amy Kunza Vargas B.S. Botany M.S. Biology	AECOM Project Coordinator	11 years of experience in NEPA document preparation; 13 years of experience in environmental services.
Regina Greer B.S. Computer Science	AECOM Administrative Support	Over 20 years of experience as an Administrative Assistant; over 5 years of experience providing support on NEPA projects.
Contributing Authors		
Zoe Knesl M.S. Marine Ecology B.S. Integrative Biology and Studio Art	Demographics and Socioeconomics	11 years of experience in NEPA compliance and document preparation; 28 years of experience in scientific, laboratory, and technical analysis.
Laura Owens B.S. Physics and Geology	Physical Characteristics	Over 8 years of experience in in NEPA compliance and environmental impact assessment; 15 years of experience in environmental services.

Name/Education	Project Role	Experience
Michael Deacon B.S. Environmental Studies B.S. Environmental Health	Existing and Future Land Use, Zoning, Industry, Industrial Incentives, Protected Areas, Cultural and Historic Resources, Recreation, Transportation, Tribes	Over 20 years of experience in NEPA compliance and document preparation.
Kristen Beckhorn Ph.D. Environmental Toxicology M.S. Environmental Toxicology B.S. Environmental Science, Chemistry	Land Cover, Existing and Future Land Use, Protected Areas, Recreation	9 years of experience in regulatory review, including NEPA review and document preparation.
Nicole Spangler B.S. Chemical Engineering	Zoning, Industry, Industrial Incentives, Transportation	Over 8 years of experience in in NEPA compliance and environmental impact assessment; 15 years of experience in environmental services.
Katherine Winterstein B.S. Anthropology	Cultural and Historic Resources, Tribes	4 years of academic experience in cultural resources; 6 months of experience in NEPA document preparation.
Delia Juliana M.S Environmental Toxicology B.S Animal and Veterinary Sciences	Land Cover, Existing and Future Land Use, Protected Areas, Recreation	4 years of experience in scientific laboratory; 6 months of experience in NEPA document preparation.
Ian Ammons B.S. Biological Sciences	Zoning, Industry, Industrial Incentives, Transportation	1 year of experience in environmental permitting and consulting.
GIS Specialists		
Kathy O'Sullivan, GISP B.A. Education A.S. Drafting and Design	AECOM GIS Specialist	Over 20 years of experience as a GIS Specialist supporting NEPA compliance; an additional 16 years of experience in urban planning technical assistance.
Kathryn G. Clark Certificate in Geospatial Technology B.S. Geology	AECOM GIS Specialist	13 years of experience as an Environmental Professional; 5 years of experience as a GIS Specialist supporting NEPA and environmental impact analyses.
Justin Mandrup-Poulsen M.S. GIS B.S. Geography	AECOM GIS Specialist	4 years of experience in mapping and spatial analysis.

Name/Education	Project Role	Experience
Brian Norris M.S. Geography B.S. Economics	AECOM GIS Specialist	4 years of' experience in GIS and remote-sensing analysis.
Savannah Walters B.A. Geography A.A. General Studies	GIS	1.5 years of professional experience as a GIS Specialist supporting NEPA compliance; an additional 2 years of academic experience in GIS and spatial analysis.
Huilan Luo M.A. Geomatics B.S. Surveying and Mapping Engineering	GIS	14 years of experience in GIS data analysis and application development for FEMA study, flood risk product, water resources, transportation planning, and environmental applications.

APPENDIX A

GEOGRAPHIC INFORMATION SYSTEM (GIS) DATABASE (ELECTRONIC FILES)

A Geographic Information System (GIS) Database (electronic files)

The electronic files can be found online at https://www.boem.gov/environment/environmental-assessment/nepa-activities-gulf-mexico under the Supporting Documents tab.

APPENDIX B

LINKS TO STUDY AREAS COMPREHENSIVE PLANS AND ZONING ORDINANCES/GUIDELINES

B Links to the Study Areas' Comprehensive Plans and Zoning Ordinances/Guidelines

State	County	Comprehensive Plan/Guidelines
Maine	Cumberland	https://www.cumberlandcounty.org/170/Reports-Plans
	Hancock	https://www.maine.gov/dacf/municipalplanning/comp_plans/planning_data.shtml
	Kennebec	https://www.kvcog.org/municipal-services/community-planning
	Knox	http://www.knoxregionalplanning.com/wp-content/uploads/2018/02/2018-Comprehensive-Plan-Update-slg-1.pdf
	Lincoln	https://lcrpc.org/land-use-planning
	Sagadahoc	Not Available
	Waldo	Not Available
	Washington	http://wccog.net/resources.htm
New Hampshire	Strafford	https://www.nhmunicipal.org/town-city-article/planning-new-hampshires-future-state-development-plan-regional-master-plans-local
	Rockingham	https://www.therpc.org/regional-community-planning/regional-master-plan
Massachusetts	Barnstable	https://www.businessbarnstable.com/planning-zoning
	Dukes	Not Available
	Bristol	Not Available
	Essex	https://www.essexma.org/long-term-planning-committee
	Plymouth	https://www.plymouth-ma.gov/planning-board/pages/master-plans
	Suffolk	https://www.boston.gov/departments/mayors-office/imagine-boston-2030
	Middlesex	Not Available
	Norfolk	https://norfolkct.org/planning-and-zoning-commission/
	Nantucket	https://www.nantucket-ma.gov/306/Planning-Economic-Development-Commission

State	County	Comprehensive Plan/Guidelines
Rhode Island	Bristol	http://www.planning.ri.gov/documents/comp/2017/BRI-10YP-16_StateApproved_20170202.pdf
	Kent	Not Available
	Newport	http://www.planning.ri.gov/documents/comp/2017/NewportCompPlan2017.pdf
	Providence	http://www.planning.ri.gov/documents/comp/2015/pvd_10yp_12_final.pdf
	Washington	Not Available
Connecticut	Fairfield	https://www.fairfieldct.org/filestorage/10726/11028/12429/20922/POCD.pdf
	Middlesex	Not Available
	New Haven	https://www.newhavenct.gov/gov/depts/city_plan/plans_n_projects/2015_comprehensive_plan.htm
	New London	http://www.ci.new-london.ct.us/content/7433/7451/default.aspx
New York	Albany	https://www.albanycounty.com/home/showdocument?id=1182
	Columbia	Not Available
	Greene	https://www.greenegovernment.com/departments/planning-and-economic-development/planning
	Rensselaer	https://rensselaerny.gov/application/files/9115/6356/7853/Comprehensive_Plan_2006.pdf
	Dutchess	https://www.dutchessny.gov/Departments/Planning/planning.htm
	Orange	https://www.orangecountygov.com/DocumentCenter/View/11613/Orange-County-Comprehensive-Plan-2018-Update---Core-Document-FINAL-DRAFT-1319
	Putnam	Not Available
	Rockland	http://rocklandgov.com/departments/planning/comprehensive-plan/plan-documents/#:~:text=Rockland%20County%20Comprehensive%20Plan%20(45mb,actions%20by%20towns%20and%20villages.
	Sullivan	Not Available
	Ulster	https://ulstercountyny.gov/planning/land-use
	Westchester	https://planning.westchestergov.com/initiatives/westchester-2025/local-planning-support/comprehensive-planning
	Nassau	https://www.nassaucountyny.gov/2857/Comprehensive-Planning
	Suffolk	https://www.suffolkcountyny.gov/Departments/Economic-Development-and-Planning/Planning-and-Environment/Research-and-Statistics/Publications

State	County	Comprehensive Plan/Guidelines
New York (continued)	Bronx	http://bronxboropres.nyc.gov/planning-development/
	Kings	https://www1.nyc.gov/site/planning/plans/brooklyn.page
	New York	https://www1.nyc.gov/site/planning/plans/city-wide.page
	Queens	https://www1.nyc.gov/site/planning/plans/queens.page
	Richmond	https://www1.nyc.gov/site/planning/plans/staten-island.page
New Jersey	Bergen	Not Available
	Essex	http://ecdpw.org/division_of_planning.php
	Hudson	http://www.hudsoncountynj.org/hudson-county-planning-board/master-plan/
	Middlesex	http://www.middlesexcountynj.gov/Government/Departments/IM/Pages/Planning/Environmental%20Sustainability/Office-of-Planning---Comprehensive-Planning-and-the-Environment---Comprehensive-Plan.aspx
	Monmouth	https://www.visitmonmouth.com/page.aspx?ID=4197
	Ocean	http://www.planning.co.ocean.nj.us/frmSROceanCountyComprehensiveMasterPlan
	Passaic	https://www.passaiccountynj.org/Departments/Planning/pc%20future.pdf
	Somerset	https://www.co.somerset.nj.us/government/public-works/planning/master-plan
	Union	https://ucnj.org/union-county-transportation-master-plan/master-plan/
	Burlington	Not Available
	Camden	https://www.camdencounty.com/service/public-works/planning/master-plan/
	Gloucester	Not Available
	Mercer	http://www.mercercounty.org/departments/planning/plans-and-reports/mercer-county-master-plan
	Atlantic	https://www.atlantic-county.org/documents/planning/Master%20Plan_5-1-18.pdf
	Cape May	https://www.capemaycountynj.gov/449/Comprehensive-Plan
	Cumberland	http://www.co.cumberland.nj.us/planning-future
	Salem	https://www.salemcountynj.gov/departments/planning-board/

State	County	Comprehensive Plan/Guidelines
Pennsylvania	Philadelphia	https://www.phila.gov/programs/the-comprehensive-plan/
	Delaware	https://www.delcopa.gov/planning/delawarecounty2035.html
	Bucks	https://dataportal-bucksgis.opendata.arcgis.com/pages/countywide-plans
Delaware	Kent	https://www.ecode360.com/7601989
		https://www.co.kent.de.us/planning-dept/planning/comprehensive-plan.aspx
	Sussex	https://www.ecode360.com/7601390
		https://sussexcountyde.gov/planning-zoning
		https://sussexcountyde.gov/2018-comp-plan-documents
	New Castle	https://www.nccde.org/229/County-Laws-Code
		https://library.municode.com/de/new_castle_county/codes/code_of_ordinances
		https://www.nccde.org/DocumentCenter/View/30501/NCC-at-2050_FINAL?bidId=
	All Counties	https://stateplanning.delaware.gov/lup/comprehensive-plan.shtml
Maryland	Worcester	http://www.co.worcester.md.us/departments/drp/maps
	Wicomico	http://www.wicomicocounty.org/DocumentCenter/View/5781/2017WicomicoCountyComprehensivePlan_Adopted_03212017?bidId=
	Baltimore City	https://archive.baltimorecity.gov/Default.aspx?TabID=372
	Cecil	https://planning.maryland.gov/Documents/OurWork/compplans/10_CMP_Cecil.pdf
	Baltimore	https://www.baltimorecountymd.gov/Agencies/planning/masterplanning/masterplan2020download.html
	Calvert	https://planning.maryland.gov/Documents/OurWork/compplans/19-cmp-calvert.pdf
	Dorchester	http://www.dorchestercountymd.com/wp-content/uploads/2017/06/Dorchester-County-Comprehensive-Plan-LQ.pdf https://planning.maryland.gov/Documents/OurWork/compplans/09_WRE_Dorchester.pdf https://planning.maryland.gov/Documents/OurWork/compplans/12_MGM_Dorchester.pdf
	Anne Arundel	https://planning.maryland.gov/Documents/OurWork/compplans/09_CMP_AnneArundel.pdf
	Prince George's	http://www.mncppcapps.org/planning/Publications/PDFs/241/Water%20Resources%20Master%20Plan.pdf http://mncppcapps.org/planning/publications/BookDetail.cfm?item_id=279&category_id=1&name=&pricemin=&pricemax=&author=&Pubs_year=all&price=&

State	County	Comprehensive Plan/Guidelines
Maryland (continued)	Howard	https://planning.maryland.gov/Documents/OurWork/compplans/12_CMP_Howard.pdf
	Queen Anne's	https://planning.maryland.gov/Documents/OurWork/compplans/10_CMP_QueenAnnes.pdf
	Talbot	https://planning.maryland.gov/Documents/OurWork/compplans/05_CMP_Talbot.pdf https://planning.maryland.gov/Documents/OurWork/compplans/10_WRE_Talbot.pdf http://www.talbotcountymd.gov/uploads/File/council/Bill%201178%20as%20enacted.PDF
	Somerset	https://planning.maryland.gov/Documents/OurWork/compplans/96_CMP_Somerset.pdf https://planning.maryland.gov/Documents/OurWork/compplans/10_WRE_Somerset.pdf
	Harford	https://planning.maryland.gov/Documents/OurWork/compplans/17-CMP-Harford.pdf
	St. Mary's	https://planning.maryland.gov/Documents/OurWork/compplans/10_CMP_StMarys.pdf
	Kent	https://planning.maryland.gov/Documents/OurWork/compplans/18-CMP-Kent.pdf
	Charles	https://www.charlescountymd.gov/home/showdocument?id=3674
	Caroline	https://planning.maryland.gov/Documents/OurWork/compplans/10_CMP_Caroline.pdf
District of Columbia	District of Columbia Beach (city)	https://www.vbgov.com/government/departments/planning/2016ComprehensivePlan/Pages/Comprehensive%20Plan.aspx
	District of Columbia Beach (city)	https://library.municode.com/va/District of Columbia_beach/codes/code_of_ordinances
Virginia	Accomack	https://www.co.accomack.va.us/departments/planning-and-community-development/land-use-planning
	Alexandria (city)	https://www.alexandriava.gov/projects/future/
	Arlington	https://projects.arlingtonva.us/plans-studies/
	Caroline	https://co.caroline.va.us/267/Comprehensive-Plan
	Charles City	https://www.co.charles-city.va.us/154/Community-Development
	Chesapeake (city)	http://www.cityofchesapeake.net/government/city-departments/departments/Planning-Department/moving-forward-2035.htm
	Chesterfield	https://www.chesterfield.gov/874/Comprehensive-Plan
	Colonial Heights (city)	https://www.colonialheightsva.gov/273/Comprehensive-Plan
	Essex	http://www.essex-virginia.org/Business

State	County	Comprehensive Plan/Guidelines
Virginia (continued)	Fairfax (city)	https://www.fairfaxva.gov/government/community-development-planning/planning
	Fairfax	https://www.fairfaxcounty.gov/topics/land-use-and-planning
	Falls Church (city)	https://www.fallschurchva.gov/866/Planning-Zoning
	Fredericksburg (city)	https://www.fredericksburgva.gov/1367/Planning-Zoning
	Gloucester	https://www.gloucesterva.info/368/Community-Planning-Initiatives-Projects
	Hampton (city)	https://hampton.gov/258/Planning-Zoning-Administration
	Hanover	https://www.hanovercounty.gov/199/Comprehensive-Plan
	Henrico	https://henrico.us/planning/
	Hopewell (city)	https://hopewellva.gov/strategic-plans/
		https://hopewellva.gov/comprehensive-plan-2028/
	Isle of Wight	http://www.co.isle-of-wight.va.us/plan/
	James City	https://www.jamescitycountyva.gov/489/2035-Comprehensive-Plan
	King and Queen	http://www.kingandqueenco.net/html/Govt/bzondocs/Full%20KQ%20Comp%20Plan%202030%20Adopted%2003.11.2019.pdf
	King George	https://www.kinggeorgecountyva.gov/DocumentCenter/View/549/Comprehensive-Plan-2013-PDF?bidId=
	King William	https://kingwilliamcounty.us/departments-and-services/planning-department/comprehensive-plan/
	Lancaster	http://www.lancova.com/page2.asp?pageID=70
	Manassas (city)	https://www.manassascity.org/837/Comprehensive-Plan
	Manassas Park (city)	https://www.cityofmanassaspark.us/city-services/planning-a-zoning/148-related-codes-a-ordinances/178-comprehensive-plan.html
	Mathews	http://www.mathewscountyva.gov/government/planning-zoning-wetlands
	Middlesex	http://www.co.middlesex.va.us/index_CompPlan_Middlesex.html
	New Kent	http://www.co.newkent.state.va.us/index.aspx?NID=211
	Newport News (city)	https://www.nnva.gov/1763/Comprehensive-Plan

State	County	Comprehensive Plan/Guidelines
Virginia (continued)	Norfolk (city)	https://www.norfolk.gov/index.aspx?nid=1376
	Northampton	https://www.co.northampton.va.us/government/departments_elected_offices/planning_permiting_enforcement/planning/comp_plan
	Northumberland	http://www.co.northumberland.va.us/planningcommission.html
	Petersburg (city)	http://www.petersburg-va.org/DocumentCenter/View/1836/Comprehensive-Plan-Working-Master-Copy-CC1?bidId=
	Poquoson (city)	https://www.ci.poquoson.va.us/346/Comprehensive-Plan
	Portsmouth (city)	https://www.portsmouthva.gov/396/Comprehensive-Plan
	Prince George	https://www.princegeorgeva.org/residents/community_development_and_code_compliance/planning_and_zoning/comprehensive_plan.php
	Prince William	http://www.pwcgov.org/government/dept/planning/Pages/default.aspx
	Richmond (city)	http://www.richmondgov.com/PlanningAndDevelopmentReview/PlansAndDocuments.aspx
	Richmond	https://co.richmond.va.us/files/Complete_Comprehensive_Plan.pdf
	Spotsylvania	http://www.spotsylvania.va.us/content/20925/20991/24029/24033/24035/default.aspx
	Stafford	https://staffordcountyva.gov/1712/Comprehensive-Plan-2016---2036
	Suffolk (city)	http://www.suffolkva.us/578/Comprehensive-Planning
	Surry	https://www.surrycountyva.gov/195/Planning-Community-Development
	Virginia Beach (city)	https://www.vbgov.com/government/departments/planning/2016ComprehensivePlan/Pages/Comprehensive%20Plan.aspx
	Westmoreland	https://www.westmoreland-county.org/sites/default/files/sites/default/files/comp_plan_adopted.pdf
	Williamsburg (city)	https://www.williamsburgva.gov/government/transparency-in-city-government/2013-comprehensive-plan
	York	https://www.yorkcounty.gov/194/Comprehensive-Plan
North Carolina	Beaufort	https://www.beaufortcountysc.gov/council/comprehensive-plan/index.html
	Bertie	http://www.co.bertie.nc.us/departments/pi/pi.html
	Brunswick	https://www.brunswickcountync.gov/planning/
	Camden	https://www.camdencountync.gov/departments/planning-zoning

State	County	Comprehensive Plan/Guidelines
North Carolina (continued)	Carteret	https://www.carteretcountync.gov/509/Additional-Maps-Documents
	Chowan	https://www.chowancounty-nc.gov/index.asp?Type=B_BASIC&SEC={2FE34CFD-F43F-4215-8C8B-765C2F4711DB}
	Columbus	http://www2.columbusco.org/Planning/CLUP.pdf
	Craven	https://www.cravencountync.gov/343/Ordinances-Plans
	Currituck	https://co.currituck.nc.us/unified-development-ordinance/
	Dare	https://www.darenc.com/departments/airport/master-plan
	Gates	https://gatescounty.govoffice2.com/index.asp?SEC=C2B8F2A8-C362-433C-A4F1-C4789D41F4C3&Type=B_BASIC
	Hertford	http://www.hertfordcountync.gov/departments/general-administration/planning-and-zoning/
	Hyde	http://www.hydecountync.gov/board_of_commissioners/ordinances_and_resolutions.php
	Jones	https://www.jonescountync.gov/index.asp?SEC=47AF8946-57E6-4E1B-8B82-16E7C2534C84&Type=B_BASIC
	New Hanover	https://planning.nhcgov.com/long-range-planning/comprehensive-plan/
	Onslow	https://www.onslowcountync.gov/1076/Comprehensive-PlanCAMA-Core-Land-Use-Pla
	Pamlico	http://www.pamlicocounty.org/ordinances-and-plans.aspx
	Pasquotank	https://www.pasquotankcountync.org/planning
	Pender	http://www.pendercountync.gov/pcd/planning-zoning/
	Perquimans	https://www.perquimanscountync.gov/planning-and-zoning
	Pitt	https://www.pittcountync.gov/261/2030-Comprehensive-Land-Use-Plan
	Tyrrell	Not Available
	Washington	https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/Publications/index.cfm
South Carolina	Charleston	https://www.charlestoncounty.org/departments/zoning-planning/comp-plan.php
	Colleton	https://www.colletoncounty.org/Data/Sites/1/media/planning_dev/2030-adopted-colleton-county-plan-adopted_010720.pdf
	Horry	https://www.horrycounty.org/Departments/Planning-and-Zoning/IMAGINE2040
	Georgetown	http://www.georgetowncountysc.org/planning/

State	County	Comprehensive Plan/Guidelines
South Carolina (continued)	Dorchester	https://www.dorchestercountysc.gov/government/planning-development/planning-zoning/comprehensive-plan
	Berkeley	https://berkeleycountysc.gov/dept/planning/comprehensive-plan/
	Hampton	http://www.hamptoncountysc.org/DocumentCenter/View/455/Comprehensive-Plan---Aug--2009?bidId=
	Jasper	https://www.jaspercountysc.gov/departments/departments-i-v/planning-building/compprehensive-master-plan
Georgia	Brantley	https://www.dca.ga.gov/node/4212
	Bryan	https://www.bryancountyga.org/government/departments-h-z/planning-zoning/comprehensive-plan
	Richmond Hill (City)	https://www.dca.ga.gov/sites/default/files/revised_richmondhill_compplan_5_21_18.pdf
	Camden	https://issuu.com/camdencountyboc/docs/camden_joint_comp_plan_final_reduce?e=32272897/62777157
	Charlton	https://www.dca.ga.gov/sites/default/files/charlton_co_folkston_ci_homeland_ci_plan_update_2015.pdf
	Chatham	https://www.thempc.org/Comprehensive/Compplan#gsc.tab=0
	Savannah (city)	https://sdra.net/
	Bloomingdale (city)	https://www.dca.ga.gov/node/4197
	Garden City (City)	http://www.gardencity-ga.gov/economic-development/garden-city-comprehensive-plan
	Pooler (city)	https://www.dca.ga.gov/node/2850
	Thunderbolt (city)	https://www.dca.ga.gov/node/3014
	Tybee Island (city)	https://www.cityoftybee.org/345/Master-Plan
	Effingham	https://www.dca.ga.gov/sites/default/files/effinghamco.guytonci.rinconci.springfieldci.community_assessment_plan_2009.pdf
	Rincon (City)	https://www.dca.ga.gov/node/4343
	Springfield (City)	https://library.municode.com/ga/springfield/codes/code_of_ordinances
	Glynn	https://www.glynncounty.org/1895/Comprehensive-Plan-2018
	Brunswick (City)	https://www.dca.ga.gov/node/4220

State	County	Comprehensive Plan/Guidelines
Georgia (continued)	Jekyll Island (City)	https://www.jekyllisland.com/jekyll-island-authority/master-plan/
	Liberty	https://thelcpc.org/comprehensive-planning/
	Long	https://www.dca.ga.gov/node/2627
	McIntosh	https://www.dca.ga.gov/node/2665
	Wayne County	https://www.dca.ga.gov/sites/default/files/wayne_co_jesup_ci_odum_ci_screven_ci_comp_plan_community_assessment_2010.pdf
	Jesup (city)	https://www.dca.ga.gov/node/3164
Florida	Baker	http://www.bakercountyfl.org/docs/comp_plan_2020.pdf
	Broward	https://www.broward.org/Planning/ComprehensivePlanning/Pages/default.aspx
	Volusia	https://www.volusia.org/services/growth-and-resource-management/planning-and-development/long-range-planning/comprehensive-plan.stml
	Miami-Dade	https://www.miamidade.gov/planning/cdmp.asp#:~:text=The%20Comprehensive%20Development%20Master%20Plan,to%20accomplish%20the%20Plan's%20objectives.
	St. Johns	http://www.sjcfl.us/LongRangePlanning/CompPlan.aspx
	Duval	https://www.coj.net/departments/planning-and-development/community-planning-division/land-use-notices/2030-comprehensive-plan-land-use-category-descript
	Martin	https://www.martin.fl.us/government/departments/growth-management-department/comprehensive-planning
	Flagler	http://www.flaglercounty.org/departments/comprehensive_plan.php
	St. Lucie	https://www.stlucieco.gov/departments-services/a-z/planning-and-development-services/planning/comprehensive-planning
	Nassau	https://www.nassaucountyfl.com/769/2030-Comprehensive-Plan
	Brevard	https://www.brevardfl.gov/PlanningDev/PlanningAndZoning/ComprehensivePlanAndStudies
	Indian River	https://www.irccdd.com/Planning_Division/Comp_Plan.htm
	Okeechobee	http://www.co.okeechobee.fl.us/Home/ShowDocument?id=710#:~:text=The%20Okeechobee%20County%20Comprehensive%20Plan%20consists%20of%20two%20separate%20documents,and%20Goals%2C%20Objectives%20and%20Policies.&text=The%20Goals%2C%20Objectives%20and%20Policies,the%20Florida%20Growth%20Management%20Act.
	Seminole	https://www.seminolecountyfl.gov/departments-services/development-services/planning-development/codes-regulations/comprehensive-plan/index.stml
	Putnam	https://main.putnam-fl.com/?s=comprehensive+plan

State	County	Comprehensive Plan/Guidelines
Florida (continued)	Clay	https://www.claycountygov.com/departments/planning/2040-comprehensive-plan
	Osceola	https://www.osceola.org/agencies-departments/community-development/offices/planning-office/comprehensive-plan/
	Palm Beach	https://discover.pbcgov.org/pzb/planning/Pages/Comprehensive-Plan.aspx
	Orange	https://www.orangecountyfl.net/PlanningDevelopment/ComprehensivePlanning.aspx#.XzP_hyhKiUk

The Department of the Interior Mission

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated Island Communities.

The Bureau of Ocean Energy Management Mission

The Bureau of Ocean Energy Management (BOEM) is responsible for managing development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.