OCS Study

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Economic Inventory of Environmental and Social Resources Potentially Impacted by a Catastrophic Discharge Event within OCS Regions

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1. Introduction

In the aftermath of the *Deepwater Horizon* oil spill in April 2010, the Bureau of Ocean Energy Management (BOEM) is considering the potential impacts of low-probability/high-consequence events more explicit in its assessments of future exploration, development, and production activities for oil and gas on the Outer Continental Shelf (OCS). A decision as to whether or not to proceed with proposed lease sales (auctions) indirectly carries with it the risk, however slight, of catastrophic discharge events (CDEs). This paper, which expands upon the *Inventory of Environmental and Social Resource Categories along the U.S. Coast* (June 2012), expands on a November 2011 study entitled *Potential Magnitude of Environmental and Social Costs of a "Catastrophic" Spill Event in the Central Gulf of Mexico (GOM) Program Area* (Appendix B of the 2012 – 2017 Proposed Program decision document) and addresses environmental and social resources and activities that could be affected by a CDE. While it identifies the resources and activities that could be affected by a CDE, it does not do so for activities necessary to obtain other energy substitutes, such as onshore oil and gas.

As described below, a catastrophic event is not expected and would be considered well outside the normal range of probability despite the inherent risks of oil production-related activities. Recently implemented safeguards, including additional subsea blowout preventer (BOP) testing, required second downhole mechanical barriers, well containment systems, and additional regulatory oversight make such an event even less likely. However, a CDE is still possible, although the same initial discharge event could cause very different impact trajectories, depending upon the location of the event and the interaction of a range of physical and human factors. Therefore, it is difficult to predict what the impacts of future events would be other than to say they could be large in terms of human, economic, and environmental impacts. The potential for catastrophe is not solely a function of the quantity of oil released, as the uncontrolled release of X barrels at a particular location at a particular time of year could have more significant economic or environmental effects than a release of $10X$ barrels under different circumstances. Wherever possible, BOEM is interested in understanding the potential costs to society in quantitative or monetary terms, recognizing that the type and scale of actual costs would be highly dependent upon the circumstances of the event and its aftermath, and that the full scope of effects on the wellbeing of communities and the environment is difficult to quantify in monetary terms. Recognizing that the scope of effects on these resources could vary greatly based on the magnitude of the event, describing these resources in their totality provides a holistic look at potentially affected assets.

This document describes resources and activities that could be affected by CDEs. Resources and activities are presented for each planning area and the adjacent coastal areas. The effects of a CDE could extend beyond the analyzed planning area and, in the case of a spill of imported oil due to a tanker accident, the source of the CDE could be outside of the planning area (for example, near a port or even along another coast, given that imports would not have to be shipped to the area where the OCS oil would have been produced). However, the segmentation of areas in this document makes it easier for the reader to distinguish which resources and activities are most important in each planning area and the nearby coastal areas.

A complementary analysis in the second part of *Economic Analysis Methodology for the Five Year OCS Oil and Gas Leasing Program for 2012-2017* (BOEM 2012-022), which presents the

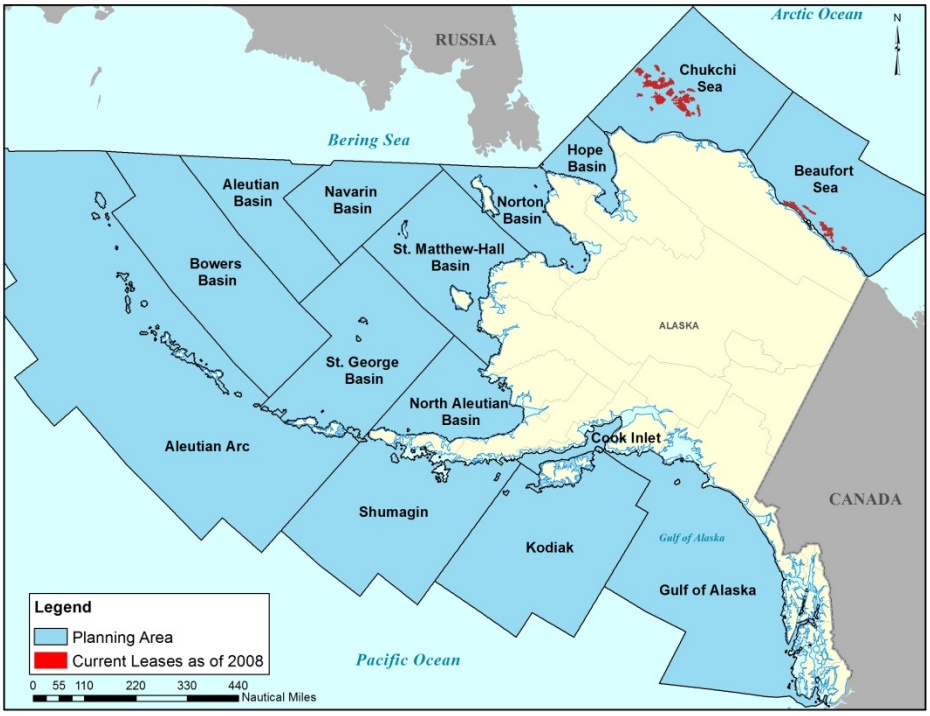
results of an initial attempt to quantify possible costs of hypothetical CDEs, using the very sparse set of available data.

The actual cost of a specific CDE would depend on the extent to which it affects nearby resources and activities. While it is extremely unlikely that even a CDE would destroy all, or even most, of the value of the resources and activities described, the information in this document allows the reader to consider the different kinds of effects that might occur in or near one planning area relative to those that might occur in or near another. Further, any estimation of costs must necessarily be from a national or a regional perspective. From a national perspective, if the total value of recreational visits (whether measured in contributions to local economies or consumer surplus) remained the same but merely shifted from one location to another, there would be no net cost. From a regional perspective, the full cost or benefit would be attributed to each of the affected areas. Likewise, from a national perspective, funds paid for cleanup are costs, because the money otherwise would have been spent elsewhere in the national economy. However, from a regional perspective, some of the financial costs of a CDE may be offset by the inflow of funds for containment and cleanup activities (e.g., funds provided to companies and individuals owning fishing boats) and compensation payments. A thorough estimate of possible costs from a CDE from a regional perspective would include consideration of such factors and include only the plausible costs for each hypothetical CDE scenario. Because the primary purpose of this document is to provide a description of the most important resources and activities that could be affected along various portions of the coast and not to estimate possible costs of a potential CDE, it largely ignores offsetting effects of revenue inflows, possible movement of recreational or commercial activities from one portion of the coast to another, and other such factors that should be considered in a true estimation of potential costs. It instead describes the full inventory of resources and activities, rather than those resources and activities likely to be at risk from specific CDE scenarios, on a planning area basis. For reference, Figures 1-1 and 1-2 show the location of each planning area.

Figure 1-1: Map of Planning Areas in the Atlantic, Gulf of Mexico, and Pacific Outer Continental Shelf Regions

Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

Figure 1-2: Map of Planning Areas in the Alaska OCS Region



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

2. Description of a Catastrophic Discharge Event

A CDE is defined as any high-volume release of oil into the marine environment with long-term effects, regardless of its cause (e.g., a hurricane, human error, terrorism). The analyses performed in development of the 2012 - 2017 Proposed Final Program (PFP) decision document and Environmental Impact Statement (EIS) focus on low-probability, hypothetical CDEs resulting from well blowouts that cannot be contained for months. The National Oil and Hazardous Substances Pollution Contingency Plan further defines such a catastrophic event as a "spill of national significance," or one that, "due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of federal, state, local, and responsible party resources to contain and clean up the discharge" (40 CFR 300, Appendix E).

This assessment of the potential value of resources and activities that could be impacted by a CDE does not mean that a catastrophic event is expected or likely. A CDE is very unlikely in any planning area, especially in light of the greatly improved regulations and industry safeguards that have been implemented since the *Deepwater Horizon* explosion and oil spill. These improvements not only address the factors that contribute to a possible loss of well control, but they improve the likelihood that any such accident would be controlled quickly and the oil contained or removed before it could spread to sensitive resources.

For the purpose of this assessment, two types of CDEs are possible: a catastrophic event from (1) a wellhead blowout, or (2) a tanker spill.

2.1 OCS Catastrophic Event Spills

To consider potential environmental and social costs, BOEM previously developed specifications regarding the magnitude of catastrophic events by program area as part of the Five Year OCS Oil and Gas Leasing Program for 2012 - 2017. CDE size ranges were developed for each program area, taking into account considerations such as water depth, weather conditions (such as ice cover), potential flow rate, and the potential availability of response equipment for drilling relief wells. For 2012 - 2017 Gulf of Mexico (GOM) program areas, CDE volumes range from 900,000 to 7,200,000 barrels (bbl), depending on the depth at which the loss of well control occurs. For the Cook Inlet program area, CDE volume estimates range from 75,000 to 125,000 bbl, depending on the availability of a rig to drill a relief well. For the Chukchi Sea and Beaufort Sea program areas, CDE volume estimates range from 1,400,000 to 2,100,000 bbl and 1,700,000 to 3,900,000 bbl, respectively. For these Arctic CDE estimates, the range in volumes depends on the timing of the CDE relative to the ice-free (open water) season and the availability of a rig to drill a relief well. These estimates assume an unmitigated flow rate until a relief well is drilled and do not account for use of response assets including a capping stack.

2.2 Tanker Spills

The alternative to production from a new Five Year Program (i.e., conducting no lease sales for at least the relevant five-year period), is to increase consumption of substitute energy sources, such as increased imports of foreign oil. Therefore, BOEM is considering the resources and activities that could potentially be impacted by a low-probability/high-consequence tanker spill

from tankers that would be delivering foreign oil to U.S. ports to replace the foregone OCS oil production, as well as from tankers that would be delivering oil produced under the program to U.S. ports.[1] **Table 2-1** provides a general profile of such tankers.

Table 2-1: Profile of Tankers Transporting Imported Oil

Type	Deadweight Tonnage	Cargo Capacity (bbl)	Maximum Wing Tank Capacity (bbl)
Ultra large crude carrier	300,000 – 550,000	1,920,000 – 3,520,000	250,000
Very large crude carrier	200,000 – 320,000	1,280,000 – 2,048,000	137,000
Suezmax	120,000 – 180,000	768,000 – 1,152,000	96,000
Aframax	79,000 – 120,000	506,000 – 768,000	550,000
Small	55,000	352,000	25,000

Design features on double-hulled tankers generally ensure that no more than 50 percent of a tanker's total cargo volume could be lost under any reasonable "worst-case discharge" scenario, so a catastrophic event would involve an ultra large crude carrier (ULCC) tanker of 550,000 deadweight tonnage and a maximum cargo of 3.52 million barrels releasing up to 1.76 million barrels of its cargo. Even this value, which represents the likely worst-case tanker event, is at the low end of the CDE spill size ranges for OCS well blowouts given in the preceding section. The actual impact of the spill would depend on geographic area affected and distance from shore at which the tanker discharge occurs. Consequently, a smaller spill close to shore could impose much higher costs than a larger spill occurring far offshore[2]. For example, ultra-large crude carriers in the GOM offload at the Louisiana Offshore Oil Port (LOOP) or transfer oil to smaller tankers in the offshore lightering zones, so it would be highly unlikely that the spill would occur closer than 50 miles to shore. The largest event in the nearshore GOM would likely be a spill from an Aframax tanker headed towards the Houston Ship Channel after lightering in the Western or Central GOM. The maximum spill volume in that case would most likely be 384,000 barrels.

[1] See explanation of estimated market substitutions for OCS production in Net Social Value section of Part IV.C of the 2012 - 2017 Proposed Final Program decision document.

[2] Proximity to shore accounts for part of the much higher per-barrel cleanup and response costs for the close-to-shore Exxon Valdez (non-OCS) tanker spill relative to per-barrel costs for the *Deepwater Horizon* oil spill.

3. Potential Impacts of a Catastrophic Event on Coastal Areas

In the broadest terms, a CDE in any planning area would have the potential for (1) direct and indirect impacts on physical and biological resources, (2) direct and indirect impacts on regional economic activities, many of which are dependent upon the health and availability of these resources, and (3) direct impacts on the public's use and enjoyment of physical and biological resources. The EIS for the Five Year OCS Oil and Gas Leasing Program for 2012 - 2017[3] provides a broad analysis of these three impact categories in the context of a well blowout and/or CDE. Building on that analysis, this document provides additional monetized estimates of resource categories that might be affected in the unlikely case of a CDE.

As described above, a CDE in this analysis is characterized by the release of a large volume of oil over a long period of time. However, the volume and duration of the release are only two of the factors that will influence the nature and severity of the event's impacts. Other factors that can influence a CDE's impact (or the ability to predict its impact) include, but are not limited to the following:

- For wellhead blowout events:
    - The size and complexity of the geologic reservoir and the pressure under which oil is contained in the reservoir.
    - The relative maturity of the production field since the dynamics of a more mature field are likely to be better understood than those of a field in a newer, "frontier" region.
    - The water depth at which the event occurs.
    - The performance of technology (proper performance versus failure).
    - The human response to the event.
- For both wellhead blowout events and tanker spills:
    - The location of the event relative to the coastline.
    - The response infrastructure and capability at or in operational proximity to the event location.
    - The nature and extent of immediate containment actions at the source and thus the period over which the oil release is uncontrolled.
    - The nature and extent of response actions including booming, skimming, burning, and/or the use of dispersants as oil moves away from the event location.
    - The properties of the oil and the degree to which it evaporates or weathers under local environmental conditions.
    - The influence of prevailing winds or ocean currents on oil in the water.

[3] U.S. Department of the Interior. Bureau of Ocean Energy Management. *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017: Final Programmatic Environmental Impact Statement*. Rept. no. BOEM 2012-030. 2012.

- The tourist/fishing seasons and meteorological conditions in which the event occurs.

This analysis focuses on the resources and activities that might be affected by a CDE rather than on specific scenarios that account for each of these variables and the impacts and costs that might result from each.

Because economic values and regional economic activity measure different factors, they provide complementary, yet different, perspectives on the economic implications of a spill. As noted above, a catastrophic event would have the potential for (1) direct and indirect impacts on physical and biological resources, (2) direct and indirect impacts on regional economic activities, and (3) direct impacts on the public's use of coastal resources. This analysis attempts to develop reasonable estimates of the value of these resources and activities to help frame the discussion of the potential cost of a hypothetical CDE. In applying the estimated value of resources and activities presented in this paper to any estimate of spill costs, the following should be noted.

- The economic cost of a CDE is the value of the resources used or destroyed as a result of the spill. The economic spill cost may differ from the amount of compensation paid by responsible parties to those affected. Compensable damage is dependent upon particular legal statutes in place in the affected countries and may or may not include all aspects of the economic cost of a spill.

- According to standard economic theory, the economic cost of a good, service, or productive resource is determined by what society is willing to sacrifice in order to acquire it. If the good or service is traded in properly functioning competitive markets, its price is representative of its opportunity cost and provides a reasonable and convenient approximation of its value to society. However, many services and amenities provided by the natural environment are not traded in markets and do not have a market price. Where market prices are non-existent it becomes necessary to assess the cost of damages using other, somewhat less direct methods. This analysis considers both the direct, market-based components of the economic cost and the value of damages to natural resources not exchanged in markets.

- When describing the potential impacts associated with a catastrophic event, it is important to distinguish between changes in economic *value* and changes in regional economic *activity*. Value, more specifically net economic value or consumer surplus, is measured by what individuals are *willing to pay* for something above and beyond what they are required to spend. This concept of value is recognized as the appropriate measure to compare the costs and benefits of policy alternatives and measure damages resulting from damage to or degradation of natural resources.[4] Alternatively, economic activity reflects commercial revenues, employment, tax receipts, *et cetera,* and is generally driven by consumer expenditures.

[4] For example, see U.S. Environmental Protection Agency's *Guidelines for Preparing Economic Analyses* (2010) and U.S. Department of the Interior Natural Resource Damage Assessment Regulations (43 CFR Part 11).

3.1 General Potential Effects on Physical and Biological Resources

In all planning areas, each phase of a CDE has the potential to result in adverse impacts on coastal or marine habitats and wildlife, and could result in the following outcomes for each of the stages of a CDE associated with a blowout:

- During the initial event, a blowout could disturb a large amount of sediment if it occurs outside the wellbore, below the seafloor.

- During the offshore spill phase, oil in the pelagic zone or at the surface could result in population-level impacts on offshore biological resources, including federal- and state-listed threatened and endangered species. In addition, natural processes, such as flocculation, and human intervention, such as the use of dispersants, could expose biological organisms to oil. Bottom-disturbing response activities, such as vessel anchoring, could have an adverse impact on benthic communities.

- During the onshore contact period, potential impacts on biological resources would expand to coastal species and degradation of sensitive coastal habitats could occur, even if mitigated by response actions such as the use of booms and skimmers. Any resulting loss of vegetation could lead to erosion and permanent land loss.

- Over the longer term, habitat loss or impairment caused by exposure to oil could result in additional adverse changes in biological populations by disrupting the elements required for successful reproduction. The chronic effects of sub-lethal exposure to oil could result in losses that exceed mortality due to oiling, if these residual effects influence a significant proportion of a population or disproportionately affect an important population segment.

The impact on physical and biological resources resulting from a tanker spill of imported oil would largely be the same as those resulting from a blowout. The exception would be that the potential for acute and chronic effects on biological organisms in the water column, and not on the ocean surface, would be reduced.

Measuring the impact of a CDE in monetary terms in the context of natural resource damage assessment is increasingly dependent on the use of "equivalency analyses" such as habitat equivalency analysis (HEA) or resource equivalency analysis (REA), rather than on efforts to try to estimate social welfare values for natural resources for which there is no "market price," such as through stated preference techniques that estimate consumer surplus through the creation of hypothetical markets.[5] In general, equivalency analyses determine the necessary scale of actions such as habitat restoration that would deliver a quantity of natural resource services equal to the "residual" impact, or the reduction in ecosystem services over time, attributable to the event after taking into account response and cleanup activities. Once these analyses are completed, and one or more restoration actions have been identified and scaled to the loss, the actions'

[5] For a brief explanation of habitat equivalency analysis, and resource equivalency analysis, see *Forecasting Environmental and Social Externalities Associated with OCS Oil and Gas Development: The Revised Offshore Environmental Cost Model (OECM)* (BOEM 2012-025) at www.boem.gov.

implementation costs become the monetary measure of the event's impact. The magnitude of these costs can vary considerably based on their location, scale, and complexity.

The HEA method has been supported by the courts and is listed explicitly as an acceptable method for quantifying ecological service losses in the DOI regulations.[6] When data are available, HEA can be a time- and cost-effective method for service loss quantification. As a result, it is the most widely applied approach to ecosystem service loss quantification in natural resource damage assessments.

3.2 General Potential Effects on Economic Activity

While measures of changes in social welfare or consumer surplus are appropriate in the context of cost-benefit analyses and assessments of natural resource damages, the alternative and more commonly cited method to consider the impact of a CDE is to assess its effect on regional economic activity in terms of jobs, labor income, and value added. In many coastal areas, regional economies tend to be dominated by tourism and recreation, commercial fishing, commercial shipping, and oil and natural gas production. Though not explored here in detail, the economic context in which a CDE occurs could have an effect on the short- or long-term impact on economic activity. For example, during a recession or other period of low economic growth, workers who lose their jobs as a direct or indirect result of a CDE may have difficulty finding new employment, thereby increasing the severity of the economic effect. Conversely, some workers and/or owners in some businesses, such as commercial fishing, are likely to be hired to assist with containment/cleanup efforts or to house cleanup workers. Summary level information on the industries that a CDE would affect most significantly is discussed in the following paragraphs.

Tourism and Recreation: Prior to oil from a CDE reaching shore or migrating some distance away from the source, water-dependent tourism and recreation activities could be affected in the vicinity of the spill. Effects such as reduced participation and thus reduced economic activity also could be observed during the early stages of an event due to perceived or anticipated changes in the availability or quality of ocean and coastal resources. As the event continues over an extended period of time and as oil spreads over a larger area or comes into contact with coastal resources, the impact on industries supported by tourism and recreation would become more widespread, particularly if the event occurred during the vacation season. Employment for spill cleanup operations would provide temporary business for hotels, caterers, and similar businesses, but the income and employment would not always accrue to the same businesses and employees who suffered from the negative effect on normal tourism and recreation activities. The scale of the impact on the tourism and recreation sector could be significant based on the size and importance of this sector to many coastal areas, particularly in the conterminous United States. Additionally, the scope and scale of the impact of a CDE over the longer term would further depend both on the speed and success of cleanup activities and on the time required for

[6] For example, in the case of United States v. Great Lakes Dredge and Dock Company, HEA was used to scale damages associated with lost sea bottom habitat in the Florida Keys National Marine Sanctuary to restoration projects proposed as compensation. The U.S. Court of Appeals for the 11th Circuit, upheld the decision that reliance on HEA for scaling ecological losses to restoration was appropriate in this case (U.S. v. Great Lakes Dredge & Dock Co., 259 F.3d 1300 (11th Cir. 2001)).

the public to regain confidence that tourism- and recreation-related amenities have returned to their pre-event condition.

Commercial Fishing: Similar to recreational fishing, the commercial fishing sector could be disrupted by a CDE in or near planning areas, if state and federal waters were closed to fishing over a period that could extend to several months after the event. The impact of the spill would depend on the season in which it occurred and the location of areas subject to closure, since commercial fisheries have both spatial and temporal characteristics. However, as with other sectors, the potential for impact is large if fishers do not have the ability to move from closed to open areas in an economically rational manner, without experiencing a significant change in net revenues due to greater fuel and other costs associated with harvesting in a less preferred location. Over the longer term, after cleanup and other response actions are complete, this sector also may be susceptible to a slower-than-expected return to baseline market conditions if consumers perceive that there are continuing issues with the quality or safety of seafood products. As outlined in the chapters that follow, the commercial fishing industry generates income and value added measured in billions of dollars on an annual basis. A CDE that caused significant disruption to commercial fishing for part of a year may therefore result in substantial regional economic impacts. However, depending on the species impacted, as well as how much oil was released and other factors such as its rate of degradation and how and where it dispersed, a fishing ban resulting from a CDE may lead to an increase in fish stocks if recovery/reproduction exceeded population prior to the event, partially mitigating adverse impacts for the commercial fishing sector.

Commercial Shipping and Transport: A CDE has the potential to disrupt commercial shipping of domestic and international freight as well as passenger transportation within the marine transportation system. In particular, a significant and persistent oil spill could cause delays in vessel movement, and economic losses, resulting from the need to decontaminate vessels prior to their entry into a port.

Oil and Natural Gas: In the aftermath of a catastrophic blowout event and less likely in the aftermath of a tanker spill, a suspension of at least some offshore oil and natural gas activities would be likely to allow for review and possible additional revision of safety and operating procedures. In addition, the pace at which new exploration activities are permitted might decrease for some period of time. If either outcome applied to a large area or continued for more than a few months, the regional economic effect could be pronounced, as it would have an effect on a wide range of firms that provide materials and services throughout the oil and natural gas value chain. In the extremely unlikely case of more than one such event in the same area, attitude changes could lead to long-term or permanent loss of some economic activities. Employment for spill cleanup operations would provide temporary employment to some workers but not necessarily for those affected by the slower pace of oil and natural gas exploration, development, and production. The potential scale of this impact is indicated by measures of the oil and natural gas sector's size in individual planning areas.

3.3 General Potential Effects on Public Use

Coastal areas offer numerous opportunities for the public to use and enjoy coastal and marine resources.[7] These include beach use, hunting, wildlife viewing, subsistence use, and other recreational activities, particularly in state- and federally-managed parklands, and recreational fishing. A CDE would result in a decrease in the number of trips taken by the public for the purpose of engaging in one or more of these activities, whether due to the imposition of use restrictions, or simply because of the public's perception of the decreased quality and availability of natural amenities in the event's aftermath. If a CDE were to occur during, or just prior to, the peak coastal use season, the number of foregone trips for public use would be particularly high. Additional information on public uses of coastal and marine resources and a discussion of the potential impact of a CDE on these uses is presented below.

Beach Activity: Beach use represents a major component of the public's use of coastal resources. When oil from a CDE reaches the shoreline, the use of oiled coastal beaches would be restricted or prohibited at least until the completion of cleanup activities. Beach use might decline also due to perceptions and concerns about the quality of the beach environment even at locations where the oil did not come in contact with the shore. The magnitude of the impact will be a function of factors such as the length of oiled beach, the season(s) in which prohibitions or restrictions on beach use are in place, the effectiveness of cleanup or other response activities, and public perceptions of the extent to which beaches and shoreline waters have been affected. Changes in recreational use are commonly assessed as a change in social welfare or consumer surplus based on economic studies that estimate the value the public places on an activity such as a trip to the beach.

Park Visitation: Coastal communities in planning areas are also home to state- and federally-owned parks, including state and National Parks, National Seashores, and National Wildlife Refuges (NWR). In addition to visiting beaches in these parks, the public visits these areas for numerous other activities, such as hiking, hunting, and wildlife viewing. As with beach use, a CDE has the potential to cause the closure of one or more of these areas for an extended period of time, resulting in a reduction in the number of trips to these parks, and economic losses determined by the value that members of the public place on a single trip, which may vary within and between planning areas.

Recreational Fishing: Recreational fishing, both from shore and by boat, is a major public use of coastal natural resources that would also be disrupted by a catastrophic spill event. If the event were to occur immediately prior to or during the peak fishing season, the impact, as measured by the number of foregone trips, would be substantial. In economic terms, the impact could be measured as a change in social welfare by valuing each of the foregone trips based on consumer surplus values similar those used for other recreational activities. Alternatively, it may be appropriate to consider the impact in terms of recreational fishing's contribution to the regional economy. If a CDE were to prevent or otherwise limit the scale of recreational fishing

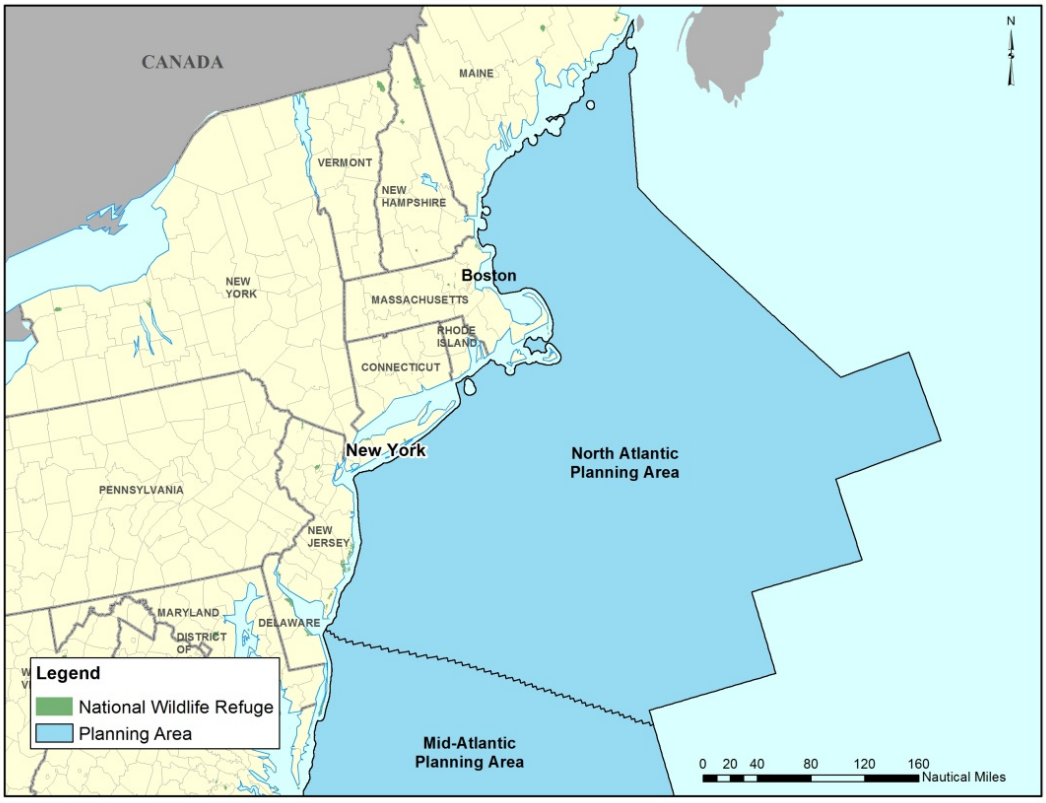
[7] As described below, recreation is an important public use of coastal and marine sources in many coastal areas near the OCS. To characterize the level of recreational activity in coastal areas, many of the chapters that follow rely on data from the National Survey on Recreation and the Environment (Leeworthy and Wiley, 2001), which captures recreational use of coastal resources in 2000. An update to this survey has begun, but survey data are not yet publicly available.

activity for some part of a calendar year, the monetary impact in regional economic terms could be substantial.

Subsistence Use: While not a recreational use, subsistence fishing and harvesting is an important public use of coastal and marine resources across most planning areas. Oil released during a CDE may contaminate large portions of the coastal and marine environment, making it impossible to subsist on resources available in this environment for an extended period of time.

4. The North Atlantic

Figure 4-1: Map of the North Atlantic Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

4.1 Physical and Biological Resources in the North Atlantic and the Nearby Coastal Area

Geologically, the North Atlantic planning area, shown above in **Figure 4-1**, falls into two distinct regions: from the Gulf of Maine to Cape Cod, and from Cape Cod south to the Delaware Bay. The Gulf of Maine extends from the Canadian border to the northern coast of Cape Cod. This coastline was formed through the movement of ancient glaciers, which created rocky shorelines, thin soil, and deep channels. Due to the strong tidal flows in the region, circulation within the region's ecosystems is dominated by tides. The second system extends from Cape Cod and along the New York coast, reaching down into the Mid-Atlantic region. This region includes basin and coastal plain estuaries, as well as several shallow lagoon systems, where circulation is largely wind-dominated, as opposed to tide-dominated (EPA, 2007).

Together, the two regions are comprised of nine National Estuary Program estuarine systems, which span most of the region's coast. This represents a higher concentration of estuarine systems than any other region in the United States. Northern waters in the region are generally deeper and clearer, with less sediment impairing light-penetration, while farther south waters are shallower and more turbid. High population density along the coast has put pressure on the water quality in many of the estuarine systems in the North Atlantic (EPA, 2007).

Ecologically, the North Atlantic planning area is home to an enormous variety of flora and fauna. More than 2,000 benthic invertebrate species have been identified in the region including clams, oysters, scallops, lobsters, crabs, and sea urchins. More than 500 species of fish also inhabit the region including cod, haddock, herring, shark, skate, rays, and flounder. Numerous protected species exist, including the blue, humpback, North Atlantic right, fin, sei and sperm whales, along with multiple species of sea turtles and sea birds (NEFSC, 2011). Given the extent of the important coastal ecosystems in the North Atlantic, a CDE could cause significant ecological damage to the area.

4.2 Economic Activity in the North Atlantic and the Nearby Coastal Area

4.2.1 Commercial Fishing

Commercial fishing is an important economic driver in the North Atlantic and supplies much of the fish consumed in the United States. Given the region's importance to the U.S. seafood industry, a CDE in the North Atlantic could have far-reaching effects. Massachusetts enjoyed the highest value added from commercial fishing in 2009 ($2.6 billion), which reflected more than $6.7 billion in sales, and $1.7 billion in wages in support of nearly 78,000 jobs. New York also supported much commercial fishing, with $5.3 billion in sales, 44,000 jobs, and $1.1 billion in wages. Key species in the North Atlantic include the American lobster, Atlantic herring and mackerel, Bluefin tuna, cod and haddock, flounders, goosefish, Quahog clam, sea scallops, and squid (NOAA, 2009a). **Table 4-1** presents the economic data from commercial fishing for each state in the region. Based on the value added figures in the table, the industry's contribution to state GDP ranges from 0.03 percent in New Jersey to 1.14 percent in Maine (based on state GDP data from BEA, 2011).

Table 4-1: Economic Impacts of the North Atlantic Seafood Industry, 2009

State	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
Connecticut	3,806	$621.5	$129.6	$216.6
Maine	21,200	$1,203.2	$393.3	$570.5
Massachusetts	77,820	$6,711.2	$1,696.2	$2,614.3
New Hampshire	4,951	$651.3	$152.6	$242.8
New Jersey	2,517	$297.0	$78.0	$126.6
New York	44,172	$5,317.6	$1,138.6	$1,882.9
Rhode Island	7,888	$905.7	$219.5	$347.6
Regional Total	**162,354**	**$15,707.5**	**$3,807.8**	**$6,001.3**
Source: NOAA, 2009a.				

Table 4-2 presents commercial landing data by state for the North Atlantic planning region. In total, commercial fisheries harvested more than 767 million pounds of fish and shellfish in the North Atlantic region, for a total landed value of $1.2 billion.

Table 4-2: Commercial Landings for All Species in the North Atlantic, 2010

State	Total Pounds	Total Landed Value (million$)
Maine	199,063,136	$377.8
New Hampshire	11,819,834	$20.7
Massachusetts	282,834,896	$478.6
Rhode Island	77,476,759	$62.7
Connecticut	6,623,416	$18.1
New York	27,720,791	$34.0
New Jersey	161,844,281	$178.1
Total	**767,383,113**	**$1,170**
Source: NMFS, 2012.		

4.2.2 Tourism and Recreation

The coastal counties near the North Atlantic planning area also support a significant tourism industry, for both urban and rural recreation. In addition to the outdoor recreation detailed below, the North Atlantic coast is home to a number of major coastal cities with an array of tourist attractions that may be disrupted if a CDE were to occur. **Table 4-3** presents the economic impacts of tourism and recreation in New York, New Jersey, and New England. The "Ocean" economy data, listed first in the table below, are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data include all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the shore. Therefore, the non-ocean-based tourism attractions in shore-adjacent areas such as New York and Boston are included in the "coastal" economy numbers.

Ocean-dependent tourism in the North Atlantic is an enormous industry, supporting 60,000 jobs in Massachusetts, 72,000 jobs in New Jersey, and nearly 290,000 jobs in New York, where the impacts of both ocean and coastal tourism were by far the highest, as shown in **Table 4-3**. When non-ocean-dependent industries are considered, GDP increases dramatically, with leisure and hospitality contributing at least $1 billion in total value added (GDP) in every state except New Hampshire, and as high as $8.1 billion in Massachusetts, $10.8 billion in New Jersey, and $33.9 billion in New York.

Table 4-3: Measures of the North Atlantic Coast Tourism and Recreation Sector, 2009

Industry	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data (Tourism and Recreation sector)				
Connecticut	2,274	27,352	$567.3	$1,153.1
Maine	2,200	27,973	$479.1	$1,021.7
Massachusetts	4,074	59,913	$1,282.3	$2,523.9
New Hampshire	581	7,759	$130.6	$268.1
New Jersey	6,984	72,437	$1,342.1	$2,551.8
New York	20,647	288,878	$7,238.3	$16,395.2
Rhode Island	1,705	24,322	$436.0	$974.9
Regional Total	38,465	508,634	$11,476.7	$24,889.7
Coastal Economy Data (Leisure and Hospitality sector)				
Connecticut	5,963	83,964	$1,749.7	$3,590.7
Maine	3,151	38,391	$667.7	$1,408.1
Massachusetts	10,445	178,601	$4,199.4	$8,146.7
New Hampshire	1,263	18,884	$316.2	$672.3
New Jersey	15,903	248,113	$5,559.9	$10,823.0
New York	39,252	537,951	$15,499.0	$33,889.4
Rhode Island	3,377	49,606	$853.2	$1,773.4
Regional Total	79,354	1,155,510	$28,845.1	$60,303.6
Source: NOEP, 2012a; NOEP, 2012b.				

4.2.3 Commercial Shipping and Transport

The coastal zone near the North Atlantic planning area is home to the United States' third largest port, New York, which spans parts of the coastlines of both New York and New Jersey. The Port of New York saw 144.7 million short tons of traffic pass through it in 2009, and was the largest port in the United States outside of the Gulf of Mexico. The other eight North Atlantic ports included in the top 100 U.S. ports, as ranked by the U.S. Army Corps of Engineers, are distributed among the rest of the states in the region. **Table 4-4** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the Top 10 largest ports in the U.S. In total, North Atlantic ports handled 220 million tons of traffic in 2009, or 10.0 percent of the United States' 2.2 billion total tons of imports and exports.

Table 4-4: Top 10 Ports in the U.S. and Top North Atlantic Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
33	Portland, ME	21.0	20.9	0.02	0.11
34	Boston, MA	20.5	18.6	1.73	0.09
45	New Haven, CT	10.1	9.22	0.76	0.16
59	Providence, RI	6.93	6.39	0.53	0.01
65	Camden-Gloucester, NJ	5.70	3.33	2.32	0.06
73	Bridgeport, CT	4.58	3.67	0.47	0.43
78	Portsmouth, NH	3.58	3.44	0.15	0
82	Fall River, MA	3.42	3.42	0	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located on the coast near the North Atlantic planning area.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

4.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the North Atlantic. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 3.11 billion barrels of oil-equivalent (BOEM, 2012).

4.3 Public Use in the North Atlantic and the Nearby Coastal Area

4.3.1 Coastal Recreation

The varied coast of the North Atlantic region extends from the Maine border with Canada to southern New Jersey, spanning seven states and nearly 9,800 miles of tidal shoreline (NOAA, 2012). This long coastline provides a vast area for an array of both urban and rural public recreational use along the coast. Massachusetts, New Jersey, and New York are among the most densely populated coastal states in the U.S., and Massachusetts and New Jersey rank in the top five states in marine swimming days, along with Florida, California, and Hawaii. As in other

states on the Atlantic coast, beach visitation, swimming, wildlife viewing, and fishing were the most popular activities across the seven North Atlantic states. Various types of recreational boating, such as sailing and kayaking, were also relatively more popular in Massachusetts and Maine than the rest of the United States (Leeworthy and Wiley, 2001).

In 2000, more than 27.4 million people participated in coastal recreational activities in the states near the North Atlantic planning area. As shown in **Table 4-5**, the most popular recreational activities along the region's coast include swimming, beach visitation, saltwater fishing, and wildlife viewing.

Table 4-5: North Atlantic Coastal Recreation Participation, 2000[8]

RECREATION ACTIVITY	NORTH ATLANTIC (millions of participants)							TOTAL
	CT	NJ	NY	ME	MA	NH	RI	
Visit Beaches	1.10	1.08	2.96	2.53	2.78	1.08	1.43	13.0
Visit Waterside Besides Beaches	0.18	0.45	0.56	0.46	0.35	0.19	0.27	2.5
Swimming	1.06	3.80	2.39	1.64	2.74	0.95	1.56	14.1
Snorkeling	0.06	0.11	0.12	0.05	0.14	0.01	0.13	0.6
Scuba Diving	0.01	0.05	0.06	0.02	0.05	0.01	0.02	0.2
Surfing	0.02	0.14	0.07	0.03	0.05	0.01	0.07	0.4
Wind Surfing	0.02	0.05	0.06	0.02	0.05	0.00	0.03	0.2
Saltwater Fishing	0.48	1.32	1.07	0.41	0.77	0.26	0.37	4.7
Motorboating	0.39	0.89	0.90	0.38	0.61	0.25	0.38	3.8
Sailing	0.25	0.25	0.46	0.20	0.52	0.08	0.33	2.1
Personal Watercraft Use[1]	0.04	0.25	0.28	0.03	0.14	0.05	0.04	0.8
Canoeing	0.05	0.07	0.07	0.22	0.07	0.02	0.15	0.7
Kayaking	0.10	0.10	0.06	0.25	0.17	0.06	0.11	0.9
Rowing	0.04	0.05	0.11	0.10	0.07	0.00	0.02	0.4
Water-skiing	0.04	0.12	0.11	0.01	0.05	0.01	0.02	0.4
Bird Watching	0.45	0.80	0.88	0.89	0.32	0.39	0.56	4.3
Viewing Other Wildlife in Water-based Surroundings	0.25	0.59	0.58	0.66	0.69	0.28	0.26	3.3
Viewing or Photographing Scenery in Water-based Surroundings	0.58	1.08	1.02	1.10	1.32	0.53	0.65	6.3
Hunting Waterfowl	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.0
Any Coastal Activity[2]	**2.29**	**6.22**	**5.50**	**3.75**	**4.90**	**2.12**	**2.64**	**27.4**

Notes:

1 Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.

2 The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy and Wiley, 2001.

The North Atlantic region contains nearly 30 coastal NWRs, primarily in New York (six), Rhode Island (six), Massachusetts (seven), and Maine (seven); three of them lie on the small islands off

[8] Data cited in this source is from a USFS study done in 2001. While some data collection has begun, no comprehensive data set has been compiled since then.

the coasts of Rhode Island and Massachusetts. Many of these NWRs are essential for migratory bird habitats, many species of which winter on Cape Cod or Long Island (USFWS, 2012). The value that the public places on these NWRs is uncertain; however, the U.S. Fish and Wildlife Service estimates that state residents' median valuation of wildlife-viewing ranges from $8 per day in Rhode Island to $26 per day in New York. Values for non-state residents were higher, reaching $30 per day for wildlife viewing in Massachusetts (USFWS, 2009).

The North Atlantic is also home to a number of National Parks and National Seashores, including Acadia National Park, Fire Island, and the Cape Cod National Seashore. The most visited of these in 2011 was Cape Cod National Seashore, in Massachusetts; as **Table 4-6** shows, visitation reached nearly 4.5 million that year. Visitation peaked in August, when more than 1 million people visited for recreational purposes. Similarly **Table 4-7** shows nearly 2.4 million people visited Acadia National Park on the coast of Maine in 2011, where visitation also peaked in July and August. Further south, approximately 519,000 people visited Fire Island National Seashore on the southern coast of Long Island, New York in 2011, and more than 3.7 million people visited the Statue of Liberty and Ellis Island in the same year (NPS, 2012). The states near the North Atlantic also contain many state parks and recreational areas along the coast where the public engages in various recreational activities.

Table 4-6: Cape Cod National Seashore Visitation Statistics, 2011

Month	Rec Visits	Non-Rec Visits	Concession Lodging	Total Overnight Stays
January	103,771	837	0	428
February	99,457	761	0	180
March	166,887	1,384	0	330
April	254,887	3,046	149	786
May	320,760	2,730	373	1,377
June	482,312	2,454	737	1,567
July	860,428	5,211	920	2,711
August	1,025,980	3,214	876	8,199
September	450,950	2,584	741	2,913
October	391,365	3,246	345	1,039
November	168,909	2,650	0	355
December	129,065	1,431	0	361
Year Total	**4,454,771**	**29,548**	**4,141**	**20,246**

Source: NPS, 2012.

Table 4-7: Acadia National Park Visitation Statistics, 2011

Month	Rec Visits	Non-Rec Visits	Total Overnight Stays
January	10,428	600	0
February	9,533	600	0
March	19,510	600	0
April	58,307	600	494
May	132,720	7,500	8,511
June	297,222	7,500	21,020
July	559,892	7,500	46,197
August	583,153	7,500	43,566
September	387,868	7,500	24,943
October	270,477	6,000	9,067
November	34,192	600	0
December	11,343	600	0
Year Total	**2,374,645**	**47,100**	**153,798**
Source: NPS, 2012.			

Several major cities are also located in the coastal zone adjacent to the North Atlantic planning area, the most populated coastal region in the United States. The high population density largely reflects the population of the New York metropolitan area, and to a lesser extent the Boston area. In 2003, the four most densely populated counties in the U.S. were all in New York City, followed by San Francisco (NOAA, 2005). A CDE could have serious adverse effects on the public's use of coastal areas in these cities.

4.3.2 Recreational Fishing

Saltwater fishing is a key public use of the North Atlantic coast for both residents and visitors. In New England, approximately 1.4 million anglers took 7.5 million fishing trips in 2009, and more than 88 percent of these anglers were residents of coastal counties in the region. The trips were divided approximately evenly between fishing from a private or rental boat and fishing from shore. The most frequently caught fish in the New England states was the striped bass; in New York and New Jersey, it was the summer flounder (also a key recreational fish species in New England). In both cases, most of the caught fish were released rather than harvested. Other key recreational fish species in the North Atlantic include Atlantic cod and mackerel, winter flounder, and Bluefin tuna (NOAA, 2009a).

Among the states in the region, the economic impacts of recreational fishing are highest in New Jersey, where approximately $1.4 billion in expenditures contributed $830 million in value added, 9,800 jobs, and $523 million in wages in 2006. New York and Massachusetts were similar, with more than $400 million in value added and between five and six thousand jobs. Overall, the total value added from recreational fishing represented 0.18 percent of state GDP in Maine and New Jersey (based on state GDP data from BEA, 2011). The full economic impacts of recreational fishing in the North Atlantic, including its proportional contribution to state GDP percentages, are presented in **Table 4-8.**

Table 4-8: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the North Atlantic, 2006

State	Expenditures (million$)	Output (million$)	Income (million$)	Employment (Jobs)	Value Added (million$)	Percent of State GDP
Connecticut	$664.9	$664.5	$253.9	4,353	$381.5	0.17%
Maine	$193.3	$174.7	$57.3	2,044	$90.8	0.18%
Massachusetts	$771.4	$802.5	$279.9	6,081	$436.5	0.12%
New Hampshire	$61.9	$56.3	$19.6	497	$30.7	0.05%
New Jersey	$1,391.7	$1,608.7	$523.3	9,814	$830.4	0.18%
New York	$771.0	$812.3	$276.0	5,364	$424.1	0.04%
Rhode Island	$182.6	$166.9	$52.4	1,476	$82.0	0.17%
Regional Total	**$4,036.8**	**$4,285.9**	**$1462.4**	**29,629**	**$2,276.0**	**0.13%**

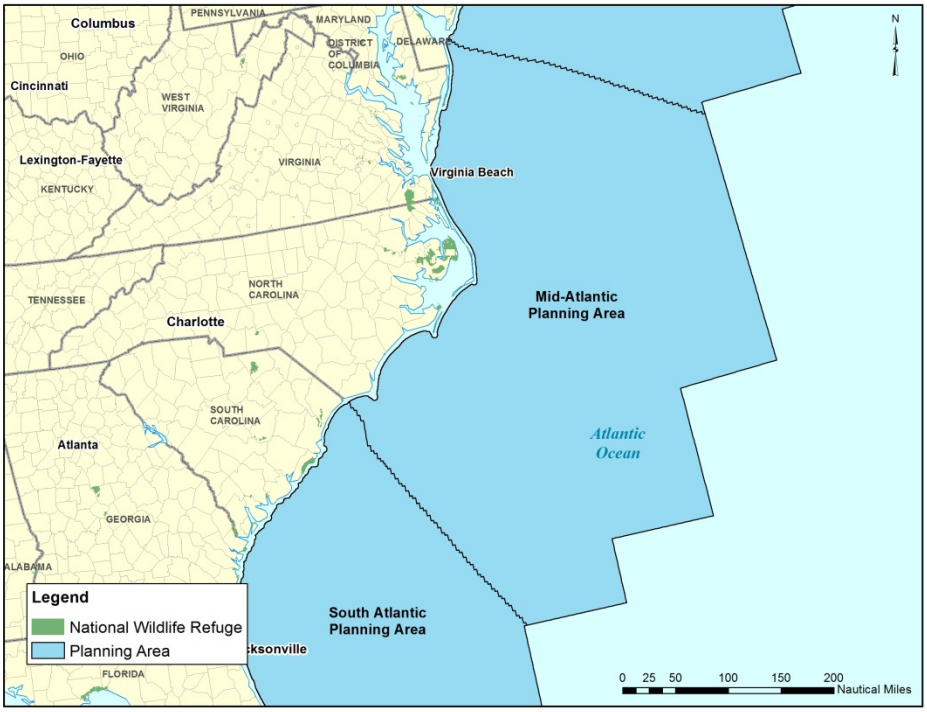
Source: Gentner and Steinback, 2008.

4.3.3 Subsistence Use

Very little data exist on subsistence fishing and shellfish harvesting in the North Atlantic region and what information is available is largely informal or speculative. According to NOAA's profiles of fishing communities in the northeast, subsistence fishing and harvesting appears to be concentrated in urban areas among immigrant populations. The Boston Harbor Association notes that Asian residents are commonly seen harvesting fish and shellfish in the harbor, which are often sold in Chinatown and neighboring towns. In Fall River, Massachusetts, subsistence fishing appears to be fairly common among the Cambodian population, although scientific data do not exist. In New York City, residents who have immigrated from places dependent on subsistence fishing, such as Latin America and the Caribbean, or who cannot afford to purchase fish otherwise, frequently consume at least some of the fish they catch. In less urban areas, such as Provincetown, Massachusetts and Point Pleasant, New Jersey, some subsistence fishing is known to occur, though how much is unclear. In general, many North Atlantic fishermen who consume the fish they catch speak limited or no English, which would likely hinder communication in the event of a CDE and potentially exacerbate its impacts (NOAA, 2008).

5. The Mid-Atlantic

Figure 5-1: Map of the Mid-Atlantic Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

5.1 Physical and Biological Resources in the Mid-Atlantic and the Nearby Coastal Area

The Mid-Atlantic planning area extends from the border of New Jersey and Delaware to the border between North Carolina and South Carolina, as shown above in **Figure 5-1**. Important coastal landscapes include the Chesapeake Bay along with four National Estuaries: the Delaware estuary, Delaware inland bays, Maryland coastal bays, and the Albemarle-Pamlico Sounds. The Albemarle-Pamlico Estuary Complex alone makes up one of the largest lagoonal estuarine systems in the U.S. with 23,000 square miles of estuary extending from Prince George County, Virginia to Carteret County, North Carolina. On the eastern edge of the estuary lies the Outer Banks of North Carolina, forming a unique chain of barrier islands characterized by random wind-driven tides (EPA, 2007).

The Chesapeake Bay is the largest and one of the most productive estuaries in the United States, and the third largest estuary in the world. At 64,000 square miles, the Bay is home to 3,600 species of plants and animals, including 348 species of finfish and 173 species of shellfish. Each year, more than 500 lbs. of seafood are harvested within the Chesapeake Bay area. Habitats within the Bay include riparian forests, freshwater tributaries, shallow water grasses, bay grasses, open water, islands, and inlands. Both bald eagles and osprey thrive within the region along with striped bass and blue crab, with an estimated population of nearly 760 million as of 2011 (Chesapeake Bay Foundation, 2012).

Migrating waterfowl and other birds use the Mid-Atlantic planning area and nearby coastal area as a stopping point for food and shelter. In the winter, nearly one million waterfowl, including tundra swans, Canada geese, and a variety of species of ducks, make their home in the coves and marshes of the Chesapeake Bay. The Mid-Atlantic coast is also a major nesting area for bald eagles and ospreys. Further inland, the Chesapeake's freshwater tidal tributaries provide spawning and nursery sites for important species of fish, including white and yellow perch, striped bass, herring, and shad. In the summer, many species of finfish rely on the bay for food (Chesapeake Bay Program, 2004). Local populations of finfish and shellfish species in the Mid-Atlantic planning area include Atlantic croaker, Atlantic sturgeon, eastern oyster, blue crab, red drum, striped bass, summer flounder, weakfish, and herring (EPA, 2007). A CDE in the region could do major damage to these large ecosystems and National Estuaries.

5.2 Economic Activity in the Mid-Atlantic and the Nearby Coastal Area

5.2.1 Commercial Fishing

The fisheries industry of the Mid-Atlantic, which includes both shellfish and finfish, is a significant part of the region's economy. As **Table 5-1** indicates, the economic impacts of commercial fishing across the entire region totaled $4.1 billion in sales, $1.1 billion in income, 42,700 jobs, and $1.7 billion in total value added (GDP) in 2009. The most important species to the region's commercial fishers include blue crabs, sea scallops, surf clam, menhaden, quahog, summer flounder, striped bass, lobster, squid, and monkfish (NOAA, 2009a).

Among the states in the region, the seafood industry is especially large in Maryland and Virginia. In Maryland, retail and imports accounted for most of the economic activity in the industry in 2009 (particularly for employment), whereas Virginia was more diversified across commercial harvesting, imports, and retail. The total value added of the seafood industry made up 0.25 percent of Maryland's state GDP, 0.20 percent of Virginia's, 0.08 percent of North Carolina's, and 0.03 percent of Delaware's in 2009 (based on 2009 state GDP data from BEA, 2011).

Table 5-1: Economic Activity Related to the Mid-Atlantic Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
DELAWARE				
Commercial Harvesters	158	$13.8	$3.29	$4.45
Seafood Processors and Dealers	32	$5.67	$1.00	$1.92
Importers	63	$17.3	$2.77	$5.28
Seafood Wholesalers and Distributors	30	$4.09	$1.55	$1.85
Retail Sectors	125	$16.4	$2.80	$5.52
Total Impacts	**407**	**$57.3**	**$11.4**	**$19.0**
MARYLAND				
Commercial Harvesters	2,789	$134.1	$38.5	$59.9
Seafood Processors and Dealers	1,744	$154.4	$60.2	$76.8
Importers	3,649	$1,003.7	$160.9	$306.0
Seafood Wholesalers and Distributors	785	$104.2	$35.4	$47.0
Retail Sectors	5,812	$257.7	$113.4	$145.0
Total Impacts	**14,778**	**$1,654.1**	**$408.3**	**$634.7**
NORTH CAROLINA				
Commercial Harvesters	2,371	$130.0	$53.8	$72.8
Seafood Processors and Dealers	944	$63.1	$24.6	$31.7
Importers	1,208	$332.2	$53.2	$101.3
Seafood Wholesalers and Distributors	3,580	$40.8	$14.3	$18.9
Retail Sectors	376	$129.9	$57.4	$74.1
Total Impacts	**8,479**	**$696.1**	**$203.4**	**$298.8**
VIRGINIA				
Commercial Harvesters	4,199	$259.4	$87.2	$126.9
Seafood Processors and Dealers	1,402	$124.1	$48.3	$62.3
Importers	3,083	$848.0	$135.9	$258.5
Seafood Wholesalers and Distributors	1,020	$124.9	$43.2	$57.6
Retail Sectors	9,361	$380.0	$167.9	$216.8
Total Impacts	**19,064**	**$1,736.5**	**$482.4**	**$722.1**
Regional Total	**42,728**	**$4,144.0**	**$1,105.5**	**$1,674.6**
Source: NOAA, 2009a.				

Table 5-2 presents commercial landing data by state in Delaware, Maryland, Virginia, and North Carolina. In total, commercial fisheries harvested approximately 690 million pounds of fish and shellfish in the Mid-Atlantic region, for a total landed value of $375.5 million.

Table 5-2: Commercial Landings for All Species in the Mid-Atlantic, 2010

State	Total Pounds	Total Landed Value (million$)
Delaware	5,214,109	$7.8
Maryland	102,911,316	$104.9
Virginia	509,841,262	$183.9
North Carolina	71,993,699	$79.9
Total	**689,960,386**	**$375.5**
Source: NMFS, 2012.		

5.2.2 Tourism and Recreation

Coastal tourism is a critical component of the regional economy of the Mid-Atlantic. **Table 5-3** presents an overview of the regional economic scale of industries dependent on tourism and recreation. These data describe both the "ocean" and "coastal" economies of each state in the Mid-Atlantic as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the Atlantic shoreline. The table includes data that are available for each state within the Mid-Atlantic for 2009; industries lacking data from 2009 were not included.

The ocean economy data for the Mid-Atlantic indicate that the tourism and recreation sector supported 10,900 establishments and 189,000 jobs in 2009, and accounted for nearly $3.2 billion in wages and $6.7 billion in total value added (GDP). The leisure and hospitality sector across all shore-adjacent counties supported 19,000 establishments, 350,000 jobs, $6.2 billion in wages, and $12.4 billion in total value added for the entire region. The total value added from the tourism and recreation sector in the ocean economy was 0.99 percent of the state GDP in Maryland, 0.81 percent in Delaware, 0.79 percent in Virginia, and 0.23 percent in North Carolina for 2009 (based on 2009 state GDP data from BEA, 2011).

Table 5-3: Measures of the Mid-Atlantic Coast Tourism and Recreation Sector, 2009

Industry	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data (Tourism and Recreation sector)				
Delaware	797	13,408	$214.0	$446.0
Maryland	3,643	59,641	$1,110.0	$2,520.0
North Carolina	1,811	30,380	$424.0	$852.0
Virginia	4,634	85,514	$1,410.0	$2,890.0
Regional Total	**10,885**	**188,943**	**$3,160.0**	**$6,708.0**
Coastal Economy Data (Leisure and Hospitality sector)				
Delaware	2,281	40,426	$743.9	$1,438.7
Maryland	7,530	127,325	$2,500.7	$5,348.7
North Carolina	2,764	46,257	$652.8	$1,248.0
Virginia	6,462	133,664	$2,341.7	$4,401.8
Regional Total	**19,037**	**347,672**	**$6,239.1**	**$12,437.2**
Source: NOEP, 2012a; NOEP, 2012b.				

5.2.3 Commercial Shipping and Transport

The Mid-Atlantic region contains a limited number of mid-sized ports through which more than 100 million tons of imports and exports pass annually. **Table 5-4** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the Top 10 largest ports in the U.S. The largest port in the Mid-Atlantic region is Virginia's Norfolk Harbor, which saw 40.6 million tons of traffic in 2009, making it the United States' fifteenth largest port. Norfolk Harbor is followed in the rankings by Baltimore, which was ranked 26th in total traffic, and a handful of smaller ports in Virginia, North Carolina, and Delaware (USACE, 2009). In 2009 alone, the total waterborne traffic of the United States was 2.2 billion short tons, including both domestic and foreign traffic. The Mid-Atlantic ports listed in **Table 5-4** accounted for 103.1 million short tons, or approximately five percent of total U.S. waterborne traffic (USACE, 2009).

Table 5-4: Top 10 Ports in the U.S. and Top Mid-Atlantic Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
15	Norfolk Harbor, VA	40.6	12.2	27.9	0.241
26	Baltimore, MD	30.1	17.2	12.6	0.312
37	Newport News, VA	18.0	0.369	17.6	0
62	Wilmington, NC	6.72	4.81	1.89	0.017
74	Wilmington, DE	4.48	3.40	1.05	0.030
85	Morehead City, NC	3.28	1.74	1.53	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in the Mid-Atlantic planning area.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

5.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the Mid-Atlantic. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 4.87 billion barrels of oil-equivalent (BOEM, 2012).

5.3 Public Use in the Mid-Atlantic and the Nearby Coastal Area

5.3.1 Coastal Recreation

The Mid-Atlantic coast, which includes the states of Delaware, Maryland, North Carolina, and Virginia, supports a variety of coastal recreation activities for both visitors and residents. **Table 5-5** highlights the major recreational activities of the Mid-Atlantic, as identified by the 2000 National Survey on Recreation and the Environment (NSRE) on coastal recreation participation in the United States. As in other coastal states on the Atlantic, beach visitation and swimming topped the list as the most popular activities, followed by bird- and other wildlife-viewing. Saltwater recreational fishing is also a major recreational activity in the region, as explored further later in this section. The distribution of recreational activity across the four

states near the Mid-Atlantic planning area is roughly proportional to the states' populations. A CDE off the Mid-Atlantic coast could, in causing real or perceived damage, significantly curtail the recreational uses detailed in **Table 5-5**.

Table 5-5: Mid-Atlantic Coastal Recreation Participation, 2000

RECREATION ACTIVITY	MID-ATLANTIC (millions of participants)				
	DELAWARE	MARYLAND	NORTH CAROLINA	VIRGINIA	TOTAL
Visit Beaches	1.26	2.53	3.19	2.33	9.30
Visit Waterside Besides Beaches	0.08	0.47	0.44	0.48	1.47
Swimming	0.99	2.17	3.22	1.70	8.07
Snorkeling	0.02	0.02	0.08	0.06	0.19
Scuba Diving	0.01	0.03	0.04	0.05	0.13
Surfing	0.02	0.03	0.19	0.10	0.34
Wind Surfing	0.02	0.02	0.05	0.01	0.10
Saltwater Fishing	0.55	1.02	1.28	0.92	3.76
Motorboating	0.38	0.97	0.55	0.60	2.50
Sailing	0.07	0.45	0.13	0.11	0.76
Personal Watercraft Use[1]	0.16	0.30	0.18	0.20	0.85
Canoeing	0.04	0.16	0.04	0.15	0.39
Kayaking	0.02	0.03	0.12	0.06	0.23
Rowing	0.02	0.05	0.01	0.01	0.09
Water-skiing	0.09	0.17	0.06	0.16	0.48
Bird Watching	0.43	0.82	1.04	0.86	3.15
Viewing Other Wildlife in Water-based Surroundings	0.22	0.75	0.77	0.85	2.59
Viewing or Photographing Scenery in Water-based Surroundings	0.38	0.98	1.11	1.07	3.53
Hunting Waterfowl	0.02	0.03	0.03	0.04	0.12
Any Coastal Activity[2]	**2.17**	**4.90**	**5.58**	**4.88**	**17.5**

Notes:

1 Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.

2 The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy and Wiley, 2001.

Together, the Mid-Atlantic States have more than two dozen wildlife refuges spread along the coast, ranging from two in Delaware to twelve in Virginia. Throughout the four Mid-Atlantic States, almost all of the NWRs lie on the coast. These coastal NWRs are common destinations for the more than three million visitors who visit these sights for wildlife viewing and other activities. The value that the public places on visits to NWRs is uncertain; however, the U.S. Fish and Wildlife Service estimates that the total value residents place on wildlife viewing in the Mid-Atlantic ranges from a median $8 per day in Delaware to $14 per day in Virginia (USFWS, 2009).

Tables 5-6 and **5-7** present the monthly visitation statistics for 2011 for Cape Hatteras National Seashore, in North Carolina, and Assateague Island National Seashore, which spans parts of the

Virginia and Maryland coasts. Together, approximately four million people visited these national seashores for recreational purposes in 2011. The statistics in the tables indicate that visitation to these parks is seasonal, peaking in the summer months of June, July, and August and falling to much lower rates during the winter. These data suggest that a CDE occurring in the spring or summer could have a significant impact on national seashore visitation in the Mid-Atlantic. However, a CDE with long-term impacts could affect visitation across all seasons of the year.

Table 5-6: Cape Hatteras Visitation Statistics, 2011

Month	Rec Visits	Non-Rec Visits	Tent Campers	RV Campers	Total Overnight Stays
January	58,486	2,327	0	0	56
February	55,783	2,220	0	0	32
March	99,393	3,026	0	0	96
April	162,861	6,665	3,064	2,044	5,389
May	211,158	14,939	7,699	3,710	12,132
June	327,143	19,072	10,917	3,750	15,945
July	398,993	23,335	12,385	5,869	19,232
August	291,721	17,181	7,619	2,572	10,641
September	89,781	4,317	1,373	1,164	2,956
October	86,364	3,066	1,043	1,342	2,763
November	114,360	3,495	0	0	124
December	64,668	2,559	0	0	0
2011 Total	**1,960,711**	**102,202**	**44,100**	**20,451**	**69,366**

Source: NPS, 2012.

Table 5-7: Assateague Island Visitation Statistics, 2011

Month	Rec Visits	Tent Campers	RV Campers	Back Country Campers	Total Overnight Stays
January	34,703	32	128	45	232
February	39,303	55	133	15	206
March	54,783	383	342	164	1,014
April	111,760	3,419	2,436	360	6,770
May	184,592	3,747	2,451	160	7,647
June	284,547	7,151	2,816	361	13,317
July	497,999	7,990	3,416	358	16,186
August	373,661	6,664	2,683	214	12,105
September	269,083	3,080	2,874	109	7,663
October	138,143	2,590	3,089	193	6,559
November	78,879	577	1,407	119	2,384
December	37,966	241	357	2	629
2011 Total	**2,105,419**	**35,929**	**22,132**	**2,100**	**74,712**
Source: NPS, 2012.					

The Mid-Atlantic coast is also home to a variety of state parks and state- and federally-maintained historical sites along the coast of the Chesapeake Bay. For example, Virginia's Colonial National Historical Park, which encompasses Jamestown, Colonial Williamsburg, and Yorktown, hosted more than 3.4 million visitors in 2011, primarily in the summer (NPS, 2012). A CDE could significantly diminish the number of individuals who visit these areas for outdoor recreation.

5.3.2 Recreational Fishing

A CDE associated with oil and gas exploration and development in the Mid-Atlantic planning area could temporarily reduce recreational fishing opportunities in the region. Regionally, the most commonly landed fish by recreational anglers was the summer flounder, with roughly 24 million fish landed in 2009 (most of which were released). Atlantic croaker followed, with 7.6 million fish harvested and 8.3 million released. NOAA estimates that, across the whole Mid-Atlantic coastal area, 2.6 million anglers took 17.1 million trips in 2009, primarily in private boats or from shore (NOAA, 2009a).

Across the region, $4.5 billion in recreational fishing expenditures from both residents and non-residents resulted in total impacts to the Mid-Atlantic economy of $4.8 billion in output (sales), $1.5 billion in wages, 41,000 jobs, and $2.4 billion in total value added (GDP) in 2006. North Carolina accounted for the largest proportion of these impacts, contributing more than 50 percent for each category, despite having a population only slightly larger than Virginia's. Relative to state GDP, the total impacts from recreational fishing ranged from 0.10 percent of GDP in Virginia to 0.30 percent in North Carolina, with both Maryland and Delaware at approximately 0.20 percent (based on state GDP data from BEA, 2011). **Table 5-8** presents the full range of economic activity associated with recreational fishing for each state.

Table 5-8: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the Mid-Atlantic, 2006

Type	Expenditures	Direct Effects	Indirect Effects	Induced Effects	Total
DELAWARE					
Output (million$)	$294.7	$185.5	$36.5	$43.0	$265.0
Value Added (million$)		$74.6	$18.5	$27.3	$120.5
Income (million$)		$51.8	$11.6	$15.8	$79.1
Employment (Jobs)		1,045	248	389	1,681
MARYLAND					
Output (million$)	$1,317.5	$754.9	$245.5	$256.8	$1,257.1
Value Added (million$)		$326.7	$141.4	$160.3	$628.4
Income (million$)		$240.5	$88.8	$88.1	$417.4
Employment (Jobs)		4,917	1,786	2,233	8,935
NORTH CAROLINA					
Output (million$)	$2,031.4	$1,495.4	$530.3	$489.8	$2,515.5
Value Added (million$)		$676.6	$275.6	$288.9	$1,241.1
Income (million$)		$456.4	$170.4	$154.0	$780.8
Employment (Jobs)		15,045	4,203	4,534	23,782
VIRGINIA					
Output (million$)	$840.9	$461.4	$153.7	$159.2	$774.4
Value Added (million$)		$221.3	$85.9	$100.1	$407.4
Income (million$)		$150.9	$53.5	$56.2	$260.6
Employment (Jobs)		4,264	1,101	1,473	6,839

Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. The total represents the sum of the direct, indirect, and induced effects.
Source: Gentner and Steinback, 2008.

5.3.3 Subsistence Use

As noted in prior chapters, information on subsistence fishing, shrimping, and other marine activities in United States waters outside of Alaska is extremely limited. However, some data do exist for the Chesapeake Bay area, particularly urban areas. Although the Chesapeake Bay is not on the OCS, a tanker transporting oil from the OCS to the Port of Baltimore could experience a CDE in the Chesapeake Bay, affecting subsistence fishing in the area. **Table 5-9** presents self-caught fish consumption patterns among residents of Baltimore. The data indicate that between 45 and 65 percent of recreational anglers in Baltimore consume some of the fish or shellfish they catch, with African-Americans reporting higher rates of both individual and household consumption.

Table 5-9: Subsistence Fishing in Baltimore, MD

Rates of subsistence fishing in Baltimore		
Angler Subpopulation	**Consume Self-Caught Fish**	**Also Provide to Household Members**
Whites	45%	43%
African-Americans	65%	100%
Importance of subsistence fishing related motivations		
Angler Subpopulation	**Providing a Fresh Fish Dinner**	**Reducing Food Expenses**
Whites	54%	17%
African-Americans	65%	44%
Source: Gibson and McClafferty, 2005.		

As additional context on subsistence angling in the region, between 30 percent (White) and 64 percent (Asian) of surveyed anglers in Washington, DC reported consuming at least some of the fish or crabs they caught. In Tidewater, Virginia, which includes fishing access points on the Lower James and Elizabeth Rivers, the percentages were much higher than for Baltimore or Washington. Among all Tidewater fishermen, 91 percent reported eating at least some of the fish they caught from the James and Elizabeth Rivers, although many others also reported giving away a substantial portion of their catch. In all of these areas, summer (May through September) was the most popular time for consuming self-caught fish, suggesting that a CDE impacting the Chesapeake Bay area during summertime could have adverse effects on subsistence fisherman (Gibson and McClafferty, 2005). A CDE with longer-term impacts that persist over time, however, could affect subsistence angling in all seasons.

6. The South Atlantic

Figure 6-1: Map of the South Atlantic Planning Area

Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

6.1 Physical and Biological Resources in the South Atlantic and the Nearby Coastal Area

The South Atlantic planning area extends from the border of North Carolina and South Carolina to the central portion of Florida's Atlantic coast, as shown above in **Figure 6-1**. The coast of the South Atlantic is generally characterized by large sounds, strips of salt marsh, networks of tidal creeks and rivers, and coastal plains (NOAA, 2009b). The inshore estuaries of the South Atlantic are dominated by salt marshes, distinguished by their flora and fauna. Although salt marshes are generally less ecologically diverse than other ecosystems, they are among the most biologically productive in the world. Most are drained by a complex network of tidal streams, which serve as a nursery area for fish, crustaceans, and mollusks; a 1987 study (Feierabend and Zelazny 1987 as cited in Mitsch and Gosselink 1993) estimated that more than 95 percent of commercial species in the United States depend on salt marsh estuaries for at least part of their life cycle. Salt marshes also regulate the amount of freshwater, nutrient, and sediment inputs into estuaries, and protect them during coastal storms (South Atlantic Fishery Management Council, 2009).

Offshore, the South Atlantic contains shallow water coral reefs and coral communities, generally at depths of less than 40 meters. These reefs and communities support a variety of corals, finfish, invertebrates, plants, and microorganisms. Reefs off the coast of northern Florida, Georgia, and South Carolina tend to be deep water communities dominated by a single species. Atlantic reefs provide nursery habitat, nutrient recycling, calcium carbonate deposition, refuge

and foraging for other organisms, and modification of local water circulation patterns. They also protect shorelines and shore communities from otherwise high energy wave conditions (South Atlantic Fishery Management Council, 2009). Local populations of finfish and shellfish species in the South Atlantic planning area include shrimp, snapper, spiny lobster, golden crab, striped bass, Atlantic croaker, bluefish and summer flounder. A CDE that damaged the offshore reefs of the South Atlantic would threaten these and other species and could adversely impact the coral communities themselves.

6.2 Economic Activity in the South Atlantic and the Nearby Coastal Area

6.2.1 Commercial Fishing

The South Atlantic supports a significant commercial fishing industry, which could experience a decline in output if a CDE were to occur in the region. Together, the commercial fishing industry in coastal areas near the South Atlantic planning area generated $1.6 billion in sales revenue, $349 million in wages, and 11,500 jobs in 2009 as shown in **Table 6-1**.[9] The total impact of commercial fishing constituted approximately 0.09 percent of Georgia's state's GDP in 2009, 0.03 percent of Florida's total state GDP, and 0.02 percent of South Carolina's state GDP (based on state GDP data from BEA, 2011). Regionally, the most important marine species for commercial fishing are grouper species (for example, gag and black), snapper species (for example, red, vermilion, and yellowtail), king and Spanish mackerel, flounder, shark, tuna, shrimp, lobster, and blue crab (NOAA, 2009a).

[9] Because NOAA provides economic data for marine fishing in the entire state of Florida, these values are estimated from the total landings revenue for the Atlantic and Gulf Coasts. NOAA's National Marine Fisheries Service estimates that landings revenue is split almost exactly 75 percent in the Gulf of Mexico and 25 percent in the Atlantic. Therefore, the values in Table 6-1 were approximated based on that distribution.

Table 6-1: Economic Activity Associated with the South Atlantic Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
EAST FLORIDA – South Atlantic Planning Area Only [1]				
Commercial Harvesters	410	$26.8	$8.4	$11.2
Seafood Processors and Dealers	128.5	$20.6	$4.0	$7.8
Importers	1,085	$298.6	$47.9	$91.0
Seafood Wholesalers and Distributors	259	$29.9	$11.7	$14.6
Retail Sectors	1,106	$134.1	$26.1	$51.3
Total	**2,989**	**$510.0**	**$98.1**	**$175.9**
GEORGIA				
Commercial Harvesters	419	$16.1	$5.5	$7.9
Seafood Processors and Dealers	643	$50.3	$19.4	$25.6
Importers	2,683	$738.1	$118.3	$225.0
Seafood Wholesalers and Distributors	567	$69.9	$24.1	$33.9
Retail Sectors	3,079	$132.7	$57.7	$76.8
Total	**7,390**	**$1,007.1**	**$225.0**	**$369.1**
SOUTH CAROLINA				
Commercial Harvesters	399	$28.0	$11.0	$15.2
Seafood Processors and Dealers	84	$6.43	$2.52	$3.24
Importers	36	$9.86	$1.58	$3.01
Seafood Wholesalers and Distributors	35	$3.59	$1.26	$1.66
Retail Sectors	615	$22.3	$9.9	$12.8
Total	**1,169**	**$70.2**	**$26.3**	**$35.9**
Regional Total	**11,548**	**$1,587.3**	**$349.4**	**$580.9**

Note: All data were estimated by multiplying data for east Florida as a whole by the proportion of establishments in east Florida located in counties near the South Atlantic planning area, as reported by the U.S. Census (2010).
Source: NOAA, 2009a. U.S. Census, 2010.

Table 6-2 presents commercial landing data by county for the South Atlantic region in Florida and by state for South Carolina and Georgia from 2010. In total, commercial fisheries harvested nearly 15 million pounds of fish and shellfish in Florida. In South Carolina and Georgia nearly 11 and 7 million pounds of finfish and shellfish were harvested, for a total landed value of $21.2 million and $13.7 million respectively.

Table 6-2: Commercial Landings for All Species in the South Atlantic, 2010

State	Total Pounds	Total Landed Value (million$)
EAST FLORIDA – South Atlantic Planning Area Only		
Nassau	1,578,093	N/A
Duval	6,058,118	N/A
St. Johns	1,380,957	N/A
Flagler	67,875	N/A
Volusia	1,581,280	N/A
Brevard	4,216,003	N/A
Total	**14,882,326**	N/A
SOUTH CAROLINA		
Total	10,566,854	$21.2
GEORGIA		
Total	7,202,954	$13.7
Regional Total	**32,652,134**	**$34.9**
Source: NMFS, 2012; Florida Fish and Wildlife Conservation Commission, 2012.		

6.2.2 Tourism and Recreation

Coastal tourism is a key component of the regional economy of the South Atlantic states. **Table 6-3** presents an overview of the regional economic scale of various tourism and recreation industries in the area. These data describe both the "ocean" and "coastal" economies of each state in the South Atlantic as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the Atlantic shoreline. The exhibit includes data that are available for each state within the South Atlantic for 2009.

Based on the ocean economy data for the counties near the South Atlantic planning area, tourism and recreation contributed $1.7 billion in total value added in East Florida (0.26 percent of state GDP), $506 million in Georgia (0.14 percent of state GDP), and $2.2 billion in South Carolina (1.61 percent of state GDP) (based on state GDP data from BEA, 2011). A CDE, in causing real or perceived damage to the coast, could reduce tourism in the region and adversely affect any or all of these industries.

Table 6-3: Measures of the South Atlantic Tourism, Recreation, Leisure and Hospitality Sector, 2009

Industry	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data - Tourism and Recreation				
EAST FLORIDA[1]				
Nassau	135	3,202	$67.4	$156.1
Duval	610	8,659	$132.6	$282.7
St. Johns	340	6,404	$119.8	$270.4
Flagler	126	1,395	$20.2	$43.9
Volusia	850	11,692	$185.8	$408.7
Brevard	1,043	14,733	$234.6	$511.0
Total	**3,104**	**46,085**	**$760.5**	**$1,672.8**
GEORGIA				
Amusement and Recreation Services NEC	43	200	$3.1	$9.3
Boat Dealers	19	91	$3.1	$6.8
Eating and Drinking Places	623	10,442	$146.4	$292.5
Other	165	3,194	$76.3	$197.2
Total	**850**	**13,927**	**$228.9**	**$505.8**
SOUTH CAROLINA				
Boat Dealers	63	315	$9.73	$20.2
Eating and Drinking Places	1,312	25,448	$330.8	$627.2
Hotels and Lodging Places	219	3,477	$59.8	$153.4
Marinas	51	312	$8.06	$14.2
Recreational Vehicle Parks and Campsites	17	120	$2.2	$5.7
Scenic Water Tours	39	106	$2.1	$3.9
Sporting Goods Retailers	10	61	$1.6	$4.7
Other	843	25,646	$554.8	$1,398.7
Total	**2,554**	**55,485**	**$969.1**	**$2,227.9**
Regional Total	**6,508**	**115,497**	**$1,958.5**	**$4,406.5**
Coastal Economy Data - Leisure and Hospitality (Shore-adjacent Counties)				
EAST FLORIDA - South Atlantic Planning Area Only				
Nassau	188	4,071	$79.9	$167.2
Duval	2,333	43,091	$830.6	$1,739.1
St. Johns	571	10,982	$212.9	$445.7
Flagler	189	2,359	$35.3	$73.8
Volusia	1,298	20,835	$358.6	$750.8
Brevard	1,320	20,741	$336.7	$704.9
Total	**5,899**	**102,079**	**$1,853.9**	**$3,881.5**
GEORGIA	**1,578**	**30,830**	**$506.3**	**$1,035.4**
SOUTH CAROLINA	**3,376**	**78,415**	**$1,352.4**	**$2,847.7**
Regional Total	**10,853**	**211,324**	**$3,712.6**	**$7,764.6**

Notes:

1. Data for the counties in Florida near the South Atlantic Planning Area were only available on a county-level basis, rather than by county and industry. A CDE in this area is likely to affect ocean-based tourism.
2. NEC – Not Elsewhere Classified.

Sources: NOEP, 2012a; NOEP, 2012b.

6.2.3 Commercial Shipping and Transport

The South Atlantic region supports a relatively small but important commercial shipping industry. **Table 6-4** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the Top 10 largest ports in the U.S. While the South Atlantic does not have as many major ports as other regions (such as the Gulf of Mexico), Savannah, Georgia; Charleston, South Carolina; and Jacksonville, Florida are in the top 40 ports in terms of traffic, according to USACE (USACE, 2009).

In 2009, the total waterborne traffic of the United States was 2.2 billion short tons, including both domestic and foreign traffic. The South Atlantic ports listed in **Table 6-4** made up 68.2 million short tons, or approximately 3.1 percent of total U.S. waterborne traffic.

Table 6-4: Top 10 Ports in the U.S. and Top South Atlantic Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
21	Savannah, GA	32.4	17.1	14.3	0.98
38	Jacksonville, FL	17.7	13.3	4.0	0.4
40	Charleston, SC	15.8	10.0	5.12	0.71
93	Port Canaveral, FL	2.30	2.09	0.16	0.06

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in the South Atlantic.

Source: USACE, 2009.

6.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the South Atlantic. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 0.89 billion barrels of oil-equivalent (BOEM, 2012).

6.3 Public Use in the South Atlantic and the Nearby Coastal Area

6.3.1 Coastal Recreation

The South Atlantic coast provides a wide variety of coastal recreation activities, particularly beach-going and swimming. **Table 6-5** highlights the major recreational activities of the South Atlantic, as identified by the 2000 NSRE on coastal recreation participation in the United States.[10]

Eastern Florida and South Carolina each hosted approximately 4.5 million beach visitors in 2000, totaling more than 10 million for the region when combined with the Georgia coast. Saltwater fishing, boating, and snorkeling also attracted a significant number of visitors across the region. In South Carolina, the Department of Parks, Recreation, and Tourism estimates that 62 percent of state residents took a trip to the beach in 2005. The Department estimates that fishing, hunting, and wildlife viewing contributed more than $1 billion in total value added (South Carolina Department of Natural Resources, 2009). A CDE off the coast of the South Atlantic states could, in causing real or perceived damage to these beaches, significantly curtail any or all of the recreational public uses detailed in **Table 6-5**.

[10] Like comparable data elsewhere in this report, values were estimated based on data from Leeworthy and Wiley (2001). However, because that study presented recreational activity data by state, the data for Florida reflect recreational activity on both the Atlantic and Gulf coasts. To isolate recreational activity on the Atlantic, we apportioned the aggregate Florida data from Leeworthy and Wiley based on County Business Pattern data from the U.S. Census. County Business Patterns is an annual survey that provides county-level economic data by NAICS code. In Florida, the most recent data show that the breakdown between the Atlantic and Gulf Coast counties for the Recreational Goods Rental industry (NAICS Code 532292) was 28 percent and 72 percent, respectively, for employment, and 31percent and 69 percent for the number of establishments. Therefore, this analysis approximated the economic breakdown of coastal recreational in Florida to be 70 percent on the Gulf Coast and 30 percent on the Atlantic Coast.

Table 6-5: South Atlantic Coastal Recreation Participation, 2000

RECREATION ACTIVITY	SOUTH ATLANTIC (millions of participants)			
	EAST FLORIDA[1]	GEORGIA	SOUTH CAROLINA	TOTAL
Visit Beaches	4.57	1.01	4.43	10.0
Visit Waterside Besides Beaches	0.54	0.25	0.37	1.16
Swimming	4.21	0.86	3.80	8.87
Snorkeling	0.86	0.02	0.13	1.01
Scuba Diving	0.24	0.01	0.05	0.30
Surfing	0.17	0.04	0.10	0.32
Wind Surfing	0.03	0.00	0.02	0.05
Saltwater Fishing	1.41	0.36	0.93	2.70
Motorboating	1.00	0.26	0.53	1.79
Sailing	0.28	0.07	0.19	0.55
Personal Watercraft Use[2]	0.49	0.10	0.14	0.73
Canoeing	0.08	0.01	0.03	0.11
Kayaking	0.10	0.02	0.08	0.21
Rowing	0.05	0.01	0.00	0.06
Water-skiing	0.18	0.06	0.06	0.30
Bird Watching	1.01	0.37	0.87	2.25
Viewing Other Wildlife in Water-based Surroundings	0.85	0.37	0.73	1.96
Viewing or Photographing Scenery in Water-based Surroundings	1.18	0.49	0.94	2.61
Hunting Waterfowl	0.02	0.05	0.02	0.09
Any Coastal Activity[3]	**6.62**	**2.26**	**6.47**	**15.4**

Notes:
1. Data for East Florida include counties near the Straits of Florida Planning Area as well as the South Atlantic Planning Area.
2. Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.
3. The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy and Wiley, 2001.

Together, the South Atlantic states have more than fifteen coastal wildlife refuges. These sites are popular destinations for the more than 2 million visitors and residents who use the South Atlantic coast each year to view birds and other wildlife, as well as to explore and photograph the scenery. The U.S. Fish and Wildlife Service estimated that the total value residents place on wildlife viewing in the South Atlantic ranges from a median $15 per day in South Carolina to $44 per day in Georgia (USFWS, 2009).

The region also hosts a variety of small coastal national seashores and historic sites. **Table 6-6** presents visitation statistics for Cumberland Island National Seashore, on the southern coast of Georgia, for 2011. In northern Florida, Canaveral National Seashore hosted more than one million visitors that same year (NPS, 2012). All three states near the South Atlantic planning area also maintain a range of historical sites and national monuments along or near the coast.

The most prominent of these is Fort Sumter, in South Carolina; in 2011 the site saw more than 850,000 visitors.

Table 6-6: Cumberland Island National Seashore Visitation Statistics, 2011

2011	Rec Visits	Tent Campers	Back Country Campers	Total Overnight Stays
January	2,034	526	436	962
February	3,419	907	442	1,349
March	12,025	1,185	770	1,955
April	7,131	1,463	746	2,209
May	5,975	1,490	464	1,954
June	3,857	1,294	319	1,613
July	22,534	1,151	264	1,415
August	2,213	506	75	581
September	3,411	918	243	1,161
October	5,306	1,201	181	1,382
November	3,874	923	512	1,435
December	2,500	637	308	945
2011 Total	**74,279**	**12,201**	**4,760**	**16,961**
Source: NPS, 2012.				

South Carolina and Georgia also support a major golf industry. A survey by the South Carolina Department of Parks, Recreation and Tourism indicated that the top destinations for golfers in South Carolina were coastal courses, primarily in Myrtle Beach (51 percent of trips), Hilton Head (16 percent of trips), and Charleston (13 percent of trips). The study estimated that South Carolina's golf industry supported more than $2 billion in output, $870 million in personal income, $312 million in taxes, and approximately 35,000 jobs (Jackson, 2012). A CDE off the coast of the South Atlantic states could, in causing real or perceived damage to these coastal areas, discourage golfers from visiting the area and reduce the associated economic activity.

6.3.2 Recreational Fishing

Recreational fishing is another important component of public use on the South Atlantic coast. In 2006 recreational fishing expenditures from residents and non-residents in the counties in Eastern Florida closest to the South Atlantic planning area contributed more than $1.3 billion in total value added (GDP), $885 million in wages, and 23,000 jobs. Recreational marine fishing in this area made up approximately 0.20 percent of Florida's total state GDP (based on state GDP data from BEA, 2011). In South Carolina, recreational marine fishing supported almost 6,000 jobs and $180 million in wages, and made up 0.19 percent of the state's GDP. Recreational marine fishing in Georgia supported 1,500 jobs, $65 million in wages, and 0.03 percent of the state's GDP. **Table 6-7** presents the full impacts of marine recreational fishing in the South Atlantic.

Table 6-7: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the South Atlantic, 2006

Type[1]	Expenditures	Direct Effects	Indirect Effects	Induced Effects	Total
EAST FLORIDA – South Atlantic Planning Area Only[2]					
Output (million$)	$3,174.51	$1,497.63	$558.16	$584.21	$2,640.01
Value Added (million$)		$691.62	$323.79	$359.52	$1,374.89
Income (million$)		$491.53	$197.69	$195.95	$885.17
Employment (Jobs)		13,759	4,056	5,198	23,012
GEORGIA					
Output (million$)	$179.5	$106.5	$42.8	$42.4	$191.8
Value Added (million$)		$48.6	$24.9	$26.2	$99.6
Income (million$)		$35.3	$16.0	$14.1	$65.5
Employment (Jobs)		896	304	374	1,574
SOUTH CAROLINA					
Output (million$)	$594.9	$331.7	$94.6	$107.6	$533.9
Value Added (million$)		$172.1	$51.6	$65.4	$289.2
Income (million$)		$114.8	$30.0	$35.2	$180.0
Employment (Jobs)		4,129	776	1,071	5,976

Notes:

1. Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. The total represents the sum of the direct, indirect, and induced effects.
2. For East Florida, values related specifically to counties closest to the South Atlantic planning area were estimated by distributing reported values for East Florida in proportion to the number of saltwater recreational fishing licenses sold in counties near the South Atlantic versus counties near the Straits of Florida, as reported in NOEP (2008).

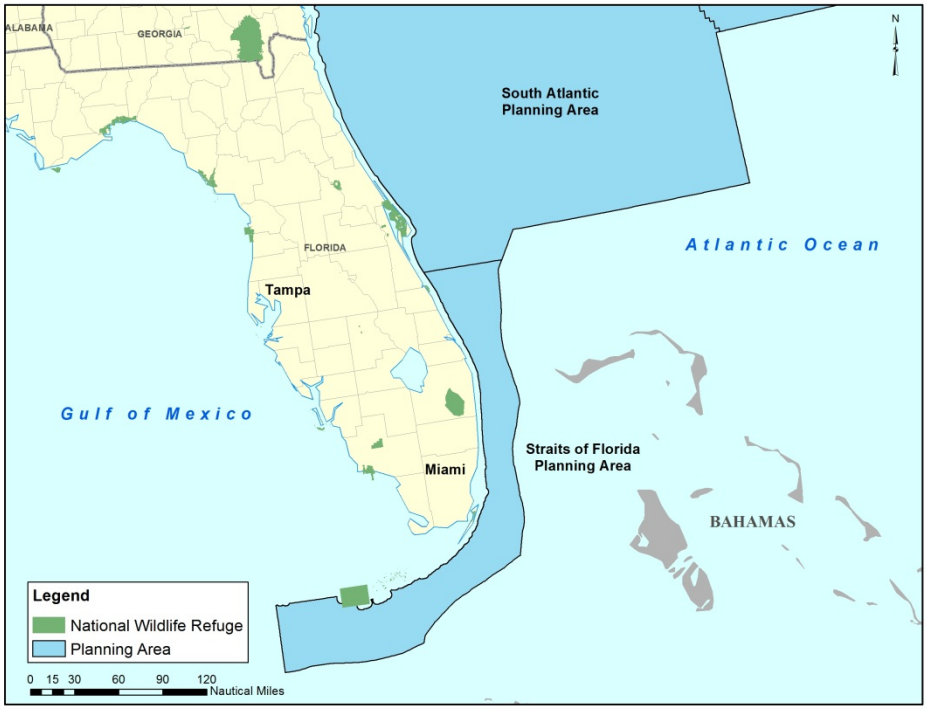
Source: Gentner and Steinback, 2008.

6.3.3 Subsistence Use

As noted in prior chapters, information on subsistence fishing, shrimping, and other marine activities in United States waters outside of Alaska is extremely limited. Insofar as subsistence fishing exists in the South Atlantic, it may be most prevalent in those areas designated as "fishing communities" by NOAA, due to their strong ties to commercial and recreational fishing (see NOAA, 2009b). Saltwater fishing has been increasing near the South Atlantic, particularly in Eastern Florida. Overall, NMFS has identified 47 fishing communities near the South Atlantic planning area: 15 in East Florida (excluding the Straits of Florida), 13 in Georgia, and 19 in South Carolina. In Florida, data suggest that the large fishing communities had the highest poverty rates in the state; others were more comparable to national levels of 9 to 11 percent. In Georgia, poverty rates were higher in fishing communities than the state average, with a maximum of 25.2 percent in Brunswick. A similar trend held in South Carolina, where poverty rates in fishing communities ranged from 9 to 20 percent (NOAA, 2009b).

7. Straits of Florida

Figure 7-1: Map of the Straits of Florida Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

7.1 Physical and Biological Resources in the Straits of Florida Planning Area and the Nearby Coastal Area

The coastline near the northern portion of the Straits of Florida Planning Area, shown above in **Figure 7-1** and encompassing Indian River County through the northern edge of Palm Beach County, covers more than 2,000 square miles of coastal land and has an average elevation of only 20 feet. The topography of the region was formed by changing sea levels, as well as wind and waves. The limestone Atlantic Coastal Ridge is characterized by dune ridges, and varies in width from a few hundred meters to a few kilometers. An array of habitats exists in the region, including coastal dunes, coastal strand, maritime forest, hardwood hammock, and pine flatwoods. Wetland habitats along the coast are critical to the region's biodiversity; both freshwater and saltwater wetlands, along with seagrass and mangrove communities, provide important habitats and breeding grounds for many fish and wildlife species (USFWS, 1999).

Further south, the Atlantic Coastal Ridge extends into Palm Beach, Broward, and Miami-Dade counties, encompassing three major estuaries and marine systems: Lake Worth Lagoon, Biscayne Bay, and West Lake. These are the most populated and urbanized counties of Florida, with 30 percent of the state's residents, and most of the population living along the Atlantic coast. Nevertheless, native plants and wildlife continue to inhabit the region in ecological communities of beach dune, coastal strand, salt- and freshwater marshes, scrub, and mangrove swamps. Most of the water resources in the region are from groundwater sources, particularly

the Biscayne Aquifer, the largest of its kind. The Aquifer supplies Miami-Dade and Broward Counties, as well as the Florida Keys, with public drinking water (USFWS, 1999). Biscayne Bay, at the southeast corner of the state, is protected from the deeper waters of the Straits. The Bay is exceptionally valuable to the state of Florida, as it supports commercial and recreational fishing, and various other types of coastal recreation. Most of the Bay lies within a state park or preserve, national park, or national marine sanctuary (Alleman et al., 2002).

The Florida Keys, which extend into the Gulf of Mexico, comprise a combination of marine and tropical upland habitats and support an enormous wealth of biological diversity, some unique in the world due to the Keys' geographic isolation. The Keys are home to more than 120 species of hardwood trees, shrubs, and other upland plants. Mangrove forests provide food and shelter for an array of birds. Along the shore, mangroves, transitional wetlands, and beaches predominate. These habitats, particularly the mangrove communities, are critical nurseries for fish and other aquatic life. Offshore, the Key's coral reef tract is the third largest living reef system in the world, extending almost 200 miles (USFWS, 1999). These reefs and communities support a variety of corals, finfish, invertebrates, plants, and microorganisms. The outer bank reefs in the Florida tract are the oldest and most ecologically diverse of these reefs; the tract extends approximately 96 kilometers between Fowey Rocks and the Dry Tortugas (South Atlantic Fishery Management Council, 2009).

7.2 Economic Activity in the Straits of Florida Planning Area and the Nearby Coastal Area

7.2.1 Commercial Fishing

Commercial fishing is a major industry in the Straits of Florida Planning Area. Between 1990 and 2000, at least 261 species were recorded in the landings from the region, between both commercial and recreational fishing. For commercial fishing, the composition by sector was 17 percent reef, 43 percent coastal, 20 percent offshore pelagic, and 20 percent invertebrate species (Johnson et al., 2007). Primary finfish species in the Straits of Florida include amberjack, tuna, snapper, mackerel, and swordfish, while important shellfish include crab, spiny lobster, and shrimp (NOEP, 2012c). As shown in **Table 7-1**, commercial fishing in counties near the Straits of Florida planning area generated approximately $2.7 billion in sales revenue, $509 million in wages, 13,200 jobs, and accounted for approximately 0.14 percent of Florida's total state GDP in 2009 (based on state GDP data from BEA, 2011). **Table 7-2** presents commercial fishing catch data by county for the Straits of Florida from 2010. In total, commercial fisheries harvested approximately 14 million pounds of fish and shellfish.

Table 7-1: Economic Activity Associated with the Straits of Florida Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
EAST FLORIDA – Straits of Florida Planning Area Only [1]				
Commercial Harvesters	784	$51.3	$16.1	$21.4
Seafood Processors and Dealers	816	$131.0	$25.4	$49.9
Importers	7,538	$2,073.5	$332.3	$632.1
Seafood Wholesalers and Distributors	1,802	$207.6	$81.6	$101.4
Retail Sectors	2,257	$273.7	$53.3	$104.6
Total	**13,197**	**$2,737.1**	**$508.7**	**$909.4**

Note:
1. For East Florida, values related specifically to counties closest to the Straits of Florida planning area were estimated by multiplying values for East Florida by the proportion of East Florida establishments located in counties near the Straits of Florida, as reported by the U.S. Census (2010).

Source: NOAA, 2009a; U.S. Census, 2010.

Table 7-2: Commercial Catch Estimates for All Species in the Straits of Florida, 2010

County	Total Pounds
Broward	929,878
Martin	3,162,759
Palm Beach	2,913,194
St. Lucie	3,579,233
Indian River	1,151,526
Miami-Dade	2,554,172
Straits Total	**14,290,762**

Source: Florida Fish and Wildlife Conservation Commission, 2012.

7.2.2 Tourism and Recreation

Tourism and recreation is an essential coastal industry in the Straits of Florida region, particularly in the Miami-Dade area and in the Florida Keys. Miami Beach is of enormous importance to the region with 13.3 million annual visitors (U.S. Lifesaving Association, 2012), more than the combined number of visitors to Yosemite (4.0 million), Yellowstone (3.4 million), and the Grand Canyon (4.3 million) in 2011 (NPS Stats, 2011). In 2000, 5.6 million of Miami Beach's visitors were from outside of the United States, and four million stay overnight. Approximately 70 percent of all visitors to Miami visit its beaches. All told, visitors spend approximately $4.4 billion annually, about half of which comes from foreign tourists (Houston, 2002). The economy of the Florida Keys also relies heavily on tourism and recreation, which account for anywhere between 33 and 75 percent of the local economy (National Marine Sanctuaries, 2012).

Table 7-3 presents county impacts for the tourism and recreation sector in 2009 for both "ocean" and "coastal" economy data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy

data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the Straits of Florida. All told, the industry accounted for nearly $6.2 billion in total value added (GDP) in 2009, and $2.6 billion in wages supporting 111,600 jobs. Miami-Dade County accounted for between 32 and 42 percent of all economic activity related to tourism and recreation.

Table 7-3: Economic Activity Associated with Tourism and Recreation in the Straits of Florida, 2009

County	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data: Tourism and Recreation				
Broward	1,235	21,488	$511.7	$1,169.6
Indian River	255	2,936	$50.5	$110.2
Martin	436	5,336	$98.0	$213.5
Miami-Dade[1]	2,074	42,964	$1,067.5	$2,602.2
Monroe	760	9,560	$246.2	$584.5
Palm Beach	1,539	26,792	$619.0	$1,393.3
St. Lucie	264	2,516	$37.9	$82.0
Total	**6,563**	**111,592**	**$2,630.8**	**$6,155.3**
Coastal Economy Data: Leisure and Hospitality				
Broward	4,807	80,381	$1,782.2	$3,731.4
Indian River	356	6,076	$123.7	$259.0
Martin	480	7,489	$146.2	$306.1
Miami-Dade	6,039	102,374	$2,620.0	$5,485.5
Monroe	661	11,002	$308.3	$651.8
Palm Beach	3,578	67,959	$1,508.8	$3,159.0
St. Lucie	457	6,744	$148.9	$311.8
Total	**23,835**	**1,196,110**	**$26,010.1**	**$54,183.8**

Note:
1. Due to source limitations, Miami-Dade County data are from 2008.
Source: NOEP, 2012a; NOEP, 2012b.

Note that the data in **Table 7-3** include Monroe County, in order to reflect economic activity for the Florida Keys. Because Monroe County is also near the Eastern Gulf of Mexico planning area, these data may overstate tourism-related economic activity for the Straits of Florida region.

7.2.3 Commercial Shipping

The Florida Straits are an essential shipping route for the international shipping community. It is one of the most heavily trafficked shipping areas in the world, with more than 40 percent of the world's marine commerce passing through the region every year (NOAA, 2002). A CDE in the region that limited or prevented traffic in the Straits could have significant ramifications for domestic and international shipping.

In addition, the Straits of Florida are home to two important ports: Miami and Palm Beach. Together, these ports account for approximately 9.1 million tons of imports and exports per year,

or 0.4 percent of the total waterborne traffic of the United States. **Table 7-4** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the Top 10 largest ports in the United States.

Table 7-4: Top 10 Ports in the U.S. and Top Straits of Florida Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
61	Miami, FL	6.77	3.33	3.44	0
91	Palm Beach, FL	2.34	0.69	1.65	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in the South Atlantic.

Source: USACE, 2009.

7.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the Straits of Florida. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 0.02 billion barrels of oil-equivalent (BOEM, 2012).

7.3 Public Use in the Straits of Florida Planning Area and the Nearby Coastal Area

7.3.1 Coastal Recreation

Coastal recreation is critically important to the region near the Straits of Florida Planning Area. Beach recreation is essential to the Florida economy, as detailed above. In total, Florida's southeastern beaches hosted 25.3 million visitors in 2003 (Murley et al, 2005). In addition, the region is home to six NWRs, two national parks, and an array of state parks and preserves. Some of the parks, such as Key West NWR, are only accessible by boat. Biscayne National Park hosted more than 467,000 visitors in 2011, while Dry Tortugas National Park, in the Keys, saw more than 75,000 visitors in the same year.

Fishing, hiking, scenery- and wildlife-viewing, and photography are all popular activities for visitors to these parks (USFWS, 2012). The value of coastal recreation in the Straits of Florida is uncertain, but the U.S. Fish and Wildlife Service estimates that Florida state residents place a median value of $25 per day on wildlife viewing, while for out-of-state visitors, the median value is $62 per day, and the mean as high as $117 per day (USFWS, 2009). A CDE that caused real or perceived damage to natural resources in the Straits region would severely limit coastal recreation for both residents and visitors.

7.3.2 Recreational Fishing

Recreational fishing is another important public use of marine resources in the Straits of Florida. In 2011, recreational landings in East Florida totaled 19.0 million fish, of which herring, kingfish, mullet and blue runner accounted for approximately 5.1, 1.7, 1.4, and 1.3 million respectively (NOAA, 2012). Note that these data do not include St. Lucie, Indian River, or Monroe Counties, and therefore exclude the Florida Keys. A 2000 study estimated that visitors to Dry Tortugas National Park, a major recreational fishing destination in the Florida Keys, spent 16,377 visitor days fishing, 1,730 visitor days diving for lobsters, and 1,872 visitor days spearfishing. These activities generated approximately $380 million in profit for commercial and charter sport fishing operations in the region (Leeworthy and Wiley, 2000).

Recreational fishing expenditures from residents and non-residents in the counties near the Straits of Florida planning area contributed nearly $1.95 billion in total value added (GDP), $1.26 billion in wages, and 32,600 jobs in 2006. Recreational marine fishing in this area therefore made up approximately 0.28 percent of Florida's total state GDP (based on state GDP data from BEA, 2011). **Table 7-5** summarizes the economic impacts of recreational fishing in the counties near the Straits of Florida planning area.

Table 7-5 Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the Straits of Florida, 2006

Type[1]	Expenditures	Direct	Indirect	Induced	Total
EAST FLORIDA – South Atlantic Planning Area Only					
Output (million$)	$4,501.29	$2,123.57	$791.44	$828.39	$3,743.39
Value Added (million$)		$980.68	$459.11	$509.78	$1,949.51
Income (million$)		$696.97	$280.31	$277.85	$1,255.13
Employment (Jobs)		19,510	5,750	7,370	32,631

Notes:

1. Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. The total represents the sum of the direct, indirect, and induced economic activity.
2. Values related specifically to counties closest to the Straits of Florida planning area were estimated by distributing reported values for East Florida in proportion to the number of saltwater recreational fishing licenses sold in counties near the South Atlantic versus counties near the Straits of Florida, as reported in NOEP (2008).

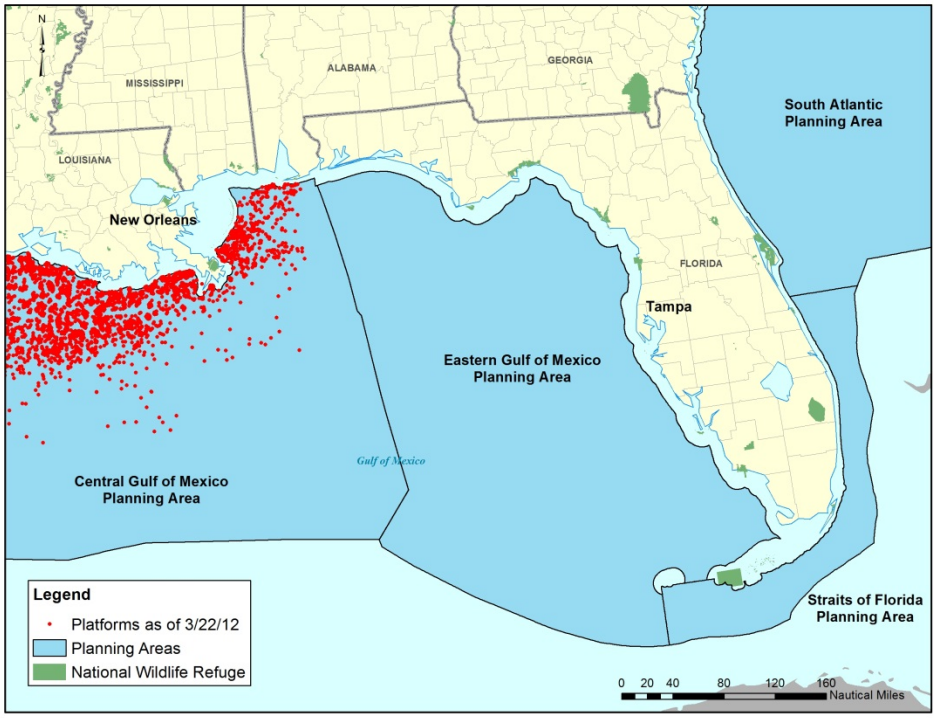
Source: Gentner and Steinback, 2008. NOEP, 2008.

7.3.3 Subsistence

As mentioned elsewhere in this report, data on subsistence fishing outside of Alaska is very limited. Insofar as subsistence fishing exists in the Straits of Florida, it may be most prevalent in those areas designated "fishing communities" by NOAA, due to their strong ties to commercial and recreational fishing (see NOAA, 2009b). Overall, NMFS has identified 9 fishing communities in the Straits of Florida. Demographic data suggest that the large fishing communities in the Straits area, such as Miami, Margate, and Fort Pierce, had the highest poverty rates in the state; others were more comparable to the national levels of 9 to 11 percent.

8. The Eastern Gulf of Mexico

Figure 8-1: Map of the Eastern Gulf of Mexico Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

8.1 Physical and Biological Resources in the Eastern Gulf of Mexico and the Nearby Coastal Area

The Eastern GOM along the western coast of Florida, as pictured in **Figure 8-1** above, exhibits significant ecological diversity. Barrier islands help form tidal estuaries where swamps transition to salt marshes. In addition, tropical coral reefs inhabit the shallow continental shelf along Florida's Gulf Coast, extending from the Florida Keys to the Snapper Banks near Pensacola. These reefs support a wide variety of fish and other marine life, including species found nowhere else in the GOM. In conjunction with intertidal oyster bars, barrier islands, tidal salt marshes, mangroves, and submerged seagrass meadows, these reefs help form a buffer for coastal communities to storms and hurricanes (Gulf Coast Ecosystem Restoration Task Force, 2011).

Sandy beaches along Florida's Gulf Coast and the Florida Keys serve as critical habitat for several endangered birds, beach mice, and sea turtles. To highlight the diversity of bird species that rely on these beaches, **Table 8-1** presents an overview of the most common beach-nesting birds in the Tampa Bay region, as well as their usual nesting dates, hatch dates, and fledge dates.

Table 8-1: Beach-nesting Birds Nesting Schedule for the Tampa Bay Region

Species	Onset Of Nesting	Incubation (Days)	Hatch Date	Age At First Flight (Days)	Fledge Date
Snowy Plover	April 1-May 30	26-32	April 27-July 2	28-32	May 25-Aug 4
Wilson's Plover	April 1-May 30	23-25	April 24-June 25	21	May 15-July 16
American Oystercatcher	March 20-May 30	24-28	April 13-June 27	35	May 18-Aug 2
Willet	March 25-May 30	22-29	April 16-June 28	28	May 14-Aug 3
Laughing Gull	May 7-May 30	20	May 27-June 20	35	July 1-July 25
Caspian Tern	May 7-May 30	20-22	May 27-June 22	30-35	June 26-July 27
Royal Tern	May 1-May 15	28-35	May 29-June 19	28-35	June 26-July 24
Sandwich Tern	May 5-May 15	21-29	May 26-June 13	28-32	May 23-July 15
Gull-billed Tern	May 7-May 30	22-23	May 29-June 22	28-35	June 26-July 26
Least Tern	May 1-May 30	20-25	May 21-June 24	19-20	June 9-July 14
Black Skimmer	May 10 to June 30	21-23	May 31-July 23	23-25	June 23-Aug 17
Source: Audubon of Florida, n.d.					

8.2 Economic Activity in the Eastern Gulf of Mexico and the Nearby Coastal Area

8.2.1 Commercial Fishing

In 2009, the seafood industry in the Eastern GOM generated a total of approximately $13 billion in sales. **Table 8-2** presents an economic summary of the seafood industry for the Eastern GOM, including the impacts of the industry on jobs, sales, income, and total value added. Relative to the other GOM areas, commercial fishing in West Florida yields the most significant economic impacts, generating 65,000 jobs, $2.4 billion in income, and $4.3 billion in value added in 2009, though much of this reflects activity among importers (NOAA, 2009a). In 2010 alone, annual landings of finfish and shellfish in the Eastern GOM were approximately 63.7 million pounds, for a total landed value of approximately $139.0 million (NMFS, 2012). A catastrophic event that resulted in the closure of Eastern GOM fisheries for an extended period would reduce sales, output, and income across the other segments of the industry; import activity could increase if supply from local sources declines.

Table 8-2: Economic Activity for the Eastern GOM Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
Commercial Harvesters	4,775	312.2	98.0	130.3
Seafood Processors & Dealers	3,781	606.5	117.4	230.8
Importers	34,493	9,488.4	1,520.7	2,892.5
Seafood Wholesalers & Distributors	8243	950.0	373.0	464.0
Retail Sectors	13,452	1,631.3	317.4	623.6
Total	**64,744**	**12,988.4**	**2,426.4**	**4,341.2**
Source: NOAA, 2009a.				

8.2.2 Tourism and Recreation

Tourism and recreation in West Florida supported roughly 10,000 establishments, 144,000 jobs, and $3 billion in wages in 2009. **Table 8-3** details the level of activity across the various industries supported by tourism, recreation, leisure, and hospitality in the Eastern GOM by county. The data in the table describe both the "ocean" and "coastal" economies of Western Florida as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the GOM shoreline. Overall, tourism and recreation on the Gulf coast, as measured by the ocean economy data in the table, constituted slightly less than one percent of Florida's total GDP in 2009. This figure grows to 1.6 percent when using the coastal economy data. Within the region, economic activity related to tourism and recreation is concentrated in the south-central counties of West Florida, particularly Pinellas and Hillsborough counties, both in central Florida.

Note that the data in **Table 8-3** include Monroe County, which is onshore from both the Straits of Florida and Eastern Gulf of Mexico planning areas. Tourism-related data for this county are therefore included in the chapter for the Straits of Florida planning area (to capture the economic impacts of tourism in the Florida Keys) as well as this chapter. The data in Table 8-3, therefore, may overstate tourism-related economic activity in the Eastern GOM region.

Table 8-3: Tourism and Recreation in West Florida, 2009

County	Establishments[2]	Employment	Wages (millions of $)	GDP (millions of $)
Ocean Economy Data (Tourism and Recreation Sector)				
Bay	630	9,434	$164.8	$367.6
Charlotte	329	3,830	$61.5	$132.8
Citrus	130	1,260	$20.6	$45.3
Collier	568	10,721	$263.7	$601.5
Dixie	32	184	$2.3	$4.6
Escambia	590	9,406	$140.1	$309.1
Franklin	62	356	$6.7	$13.5
Gulf	31	256	$3.8	$7.7
Hernando	26	227	$3.1	$6.7
Hillsborough	1,016	16,504	$348.2	$766.9
Jefferson[3]	D	D	D	D
Lee	1,103	14,582	$285.8	$644.9
Levy	65	504	$6.6	$14.3
Manatee	535	7,404	$136.3	$259.7
Monroe	715	9,958	$256.6	$582.5
Okaloosa	564	8,928	$154.2	$339.2
Pasco	281	2,837	$43.5	$93.0
Pinellas	2,097	29,478	$540.8	$1,185.8
Santa Rosa	272	3,305	$43.7	$102.4
Sarasota	708	10,738	$216.6	$481.2
Taylor	43	457	$6.2	$14.1
Wakulla	43	267	$3.1	$6.2
Walton	198	3,363	$78.7	$184.7
Total	10,038	143,999	$2,786.9	$6,163.8
Coastal Economy Data (Leisure and Hospitality sector)				
All Counties	15,607	274,413	$5,543.1	$11,605.4

Notes:
1. NEC – Not Elsewhere Classified
2. NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
3. D – Disclosure issues prevent this data from being presented

Source: NOEP, 2012a; NOEP, 2012b.

8.2.3 Commercial Shipping and Transport

Aside from through traffic traveling to other ports, commercial shipping in the Eastern GOM is largely limited to shipments to and from the Port of Tampa, Port Manatee, the Port of Panama City, and the Port of Pensacola. **Table 8-4** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all

foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the Top 10 largest ports in the United States. With approximately 35 million tons of annual shipments and receipts in 2009, the Port of Tampa is the largest of these ports. This figure ranks it as the 17th largest U.S. port. The volume of cargo flowing through the other three ports in the Eastern GOM was approximately 6.1 million tons in 2009 (USACE, 2009).

Table 8-4: Top 10 Ports in the U.S. and Top Eastern Gulf of Mexico Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana, LA	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
17	Tampa, FL	34.9	25.6	9.3	0.00
88	Port Manatee, FL	2.9	1.8	1.1	0.00
90	Panama City, FL	2.5	1.7	0.7	0.00
140	Pensacola, FL	0.8	0.7	0.1	0.00

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in the South Atlantic.

Source: USACE, 2009.

8.2.4 Oil and Natural Gas Production

The Eastern GOM also supports natural gas and, to a lesser extent, oil (condensate) production. Oil and natural gas extraction in this area is currently limited to federal waters, as Florida state law has prohibited offshore drilling in state-controlled waters since the early 1990s (Florida Coastal and Ocean Coalition Steering Committee, 2010). **Table 8-5** summarizes oil and natural gas production in the area for 2010 and 2011. Comparing the data in **Table 8-5** to the data presented in Chapters 9 and 10, production volumes in the Eastern GOM are much lower than in the Central and Western GOM. Natural gas production in the Eastern GOM is approximately one-third that in the Western GOM and less than one-tenth that in the Central GOM. Oil production in the area is several orders of magnitude lower than in the Western and Central GOM. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 7.93 billion barrels of oil-equivalent (BOEM, 2012).

Table 8-5: Oil and Natural Gas Production in the Eastern GOM, 2010 and 2011

	Oil (millions barrels)		Gas (million MCF)	
Year	2010	2011	2010	2011
TOTAL	**0.037**	**0.020**	**122.9**	**105.7**
Federal	0.037	0.020	122.9	105.7
State	0	0	0	0

Key:
MCF= thousands of cubic feet
Source: BOEM, 2012d for federal data. No oil or gas is produced in Florida state waters.

To highlight the economic significance of the offshore oil and natural gas industry in the Eastern GOM, **Table 8-6** summarizes the employment, wages, and GDP for the industry for the 2002 to 2006 period.[11,12] As indicated in the table, the industry directly supported more than 1,100 jobs and contributed more than $170 million to the region's GDP in 2006. As context, the $170 million in GDP represents less than 0.03 percent of Florida's state GDP in 2006.

While informative, the data in **Table 8-6** are limited in that they reflect only the direct economic effects of offshore oil and natural gas production on the Eastern GOM economy. Economic activity within the industry also leads to indirect and induced economic activity. Data on these impacts specific to the Eastern GOM are not readily available, but a 2010 study estimates the indirect and induced effects of oil and gas production for the entire GOM (IHS Global Insight, 2010). Allocating these effects to the individual GOM planning areas in proportion to their offshore oil and natural gas production in 2011 suggests indirect and induced economic impacts of oil and natural gas production in the Eastern GOM include employment impacts of 7,300 jobs, wages of $367 million, and GDP of $684 million.

[11] Data for the oil and gas exploration and production sector in **Table 8-6** are based on four NAICS code industries (1997): Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360).

[12] The data in **Table 8-6** are for establishments in Florida, the state in closest proximity to the Eastern Gulf of Mexico planning area. However, establishments located outside of Florida, most notably in Texas, Louisiana, Mississippi, and Alabama, also support oil and natural gas exploration and development in the Eastern GOM. Similarly, many of the establishments reflected in **Table 8-6** may support offshore oil and gas exploration in other Gulf of Mexico planning areas. A portion of the economic activity shown in **Table 8-6** may therefore apply to other planning areas.

Table 8-6: Economic Activity Related to Offshore Oil and Natural Gas in the Eastern GOM, 2002-2006

Year	Establishments	Employment	Wages (million$)	GDP (million$)
2006	165	1,163	$51.8	$170.2
2005	D	D	D	D
2004	66	431	$16.2	$41.1
2003	58	388	$12.7	$27.3
2002	64	412	$12.8	$24.7

Notes:

1. NOEP defines **e**stablishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
2. D = disclosure issues prevented these data from being presented.
3. Data for the oil and gas exploration and production sector are based on four NAICS code industries: Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360).
4. Data is for establishments in Florida, the state closest in proximity to the Eastern Gulf of Mexico planning area. However, establishments located outside of Florida, most notably in Texas, Louisiana, Mississippi, and Alabama, also support oil and natural gas exploration and development in the Eastern GOM. A portion of the economic activity may therefore apply to other planning areas.

Source: NOEP, 2012a.

8.3 Public Use in the Eastern Gulf of Mexico and the Nearby Coastal Area

8.3.1 Coastal Recreation

Coastal recreation represents a major public use of coastal and marine resources in the Eastern GOM. The Gulf Coast of Florida supports a variety of recreational activities, in particular beach visitation, swimming, and recreational fishing. **Table 8-7** highlights these and other recreational activities and presents participation data for each activity.[13] Of the 15 million coastal recreation participants in Florida's Gulf Coast counties, approximately 10 million went to the beach and 9 million went swimming. Fishing, snorkeling, viewing or photographing scenery, and motorboat use also attracted significant numbers of participants.

[13] Like comparable data elsewhere in this report, values were estimated based on data from Leeworthy and Wiley (2001). However, because that study presented recreational activity data by state, the data for Florida reflect recreational activity on both the Atlantic and Gulf coasts. To isolate recreational activity on the Gulf Coast, the aggregate Florida data from Leeworthy and Wiley was apportioned based on County Business Pattern data from the U.S. Census. County Business Patterns is an annual survey that provides county-level economic data by NAICS code. In Florida, the most recent data show that the breakdown between the Atlantic and Gulf Coast counties for the Recreational Goods Rental industry (NAICS Code 532292) was 28 and 72 percent, respectively, for employment, and 31 and 69 percent for the number of establishments. Therefore, this analysis approximated the economic breakdown of coastal recreational in Florida to be 70 percent on the Gulf Coast and 30 percent on the Atlantic Coast.

Table 8-7: Eastern GOM Coastal Recreation Participation, 2000

Recreational Activity	West Florida (millions of participants)
Visit Beaches	10.6722
Swimming	9.8231
Saltwater Fishing	3.2886
Viewing or Photographing Scenery in Water-based Surroundings	2.744
Bird Watching	2.3611
Motorboating	2.3359
Snorkeling	2.0062
Viewing Other Wildlife in Water-based Surroundings	1.9922
Visit Waterside Besides Beaches	1.2607
Personal Watercraft Use[1]	1.1382
Sailing	0.6482
Scuba Diving	0.5614
Water-skiing	0.4291
Surfing	0.4081
Kayaking	0.2366
Canoeing	0.1932
Rowing	0.1071
Wind Surfing	0.0763
Hunting Waterfowl	0.0504
Any Coastal Activity[2]	**15.442**

Notes:
1. Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft like jet skis and wave runners.
2. The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy & Wiley, 2001.

In addition to several miles of beaches, the Gulf coast of Florida is home to Everglades National Park, the largest subtropical wilderness in the United States (NPS, 2011). Over the past 10 years, annual visitation has hovered around 1 million. Visitation to the Everglades usually peaks in the late winter and early spring. For example, in 2011 the peak month for visitation was February, with more than 130,000 visitors, while September had the fewest visitors, with approximately 42,700 (NPS Stats). **Table 8-8** presents additional detail on visitation to the park in 2011.

Table 8-8: Everglades National Park, 2011 (participants)

Month	Rec Visits	Non-Rec Visits	Tent Campers	RV Campers	Back Country Campers	Total Overnight Stays[1]
January	108,115	629	1,896	2,970	3,368	8,322
February	121,341	789	1,942	4,135	2,836	8,963
March	131,176	884	1,927	1,925	3,186	7,131
April	92,257	771	67	69	1,039	1,176
May	55,073	341	24	13	0	37
June	52,165	195	14	28	68	110
July	56,712	195	6	23	52	81
August	52,814	141	7	9	16	32
September	42,787	102	10	49	124	183
October	54,443	191	62	57	340	459
November	76,578	182	505	348	517	1,378
December	90,890	267	581	405	0	996
Total	**934,351**	**4,687**	**7,041**	**10,031**	**11,546**	**28,618**

Note: Total overnight stays includes some miscellaneous campers; therefore rows may not sum across.
Source: NPS, 2011.

The value of the coastal recreational losses resulting from a CDE in the Eastern GOM would depend on the characteristics of the spill, conditions at the time of the spill and its aftermath (e.g., wind direction, currents, etc.), and the value derived by the public from various recreational activities. As described in previous chapters, the value of recreational activities is uncertain and varies by location and activity. USFWS, however, estimates that the median value the public places on wildlife viewing in Florida is $25 per day (USFWS, 2009).

8.3.2 Recreational Fishing

In 2008, residents of and visitors to the Eastern GOM area took approximately 14 million recreational fishing trips (Pritchard 2009).[14] Residents of Florida accounted for most of the economic impacts associated with recreational fishing in Florida's Gulf Coast counties. According to NOAA, Floridians accounted for 85 percent of the resources expended on recreational fishing in the Eastern GOM. Recreational fishing expenditures from residents and nonresidents supported 75,000 jobs and a total value added (GDP) of $4.2 billion. **Table 8-9** presents a summary of recreational fishing expenditures in the Eastern GOM.[15] Closures of recreational fisheries in response to a CDE in the Eastern GOM could reduce participation in recreational fishing as well as the associated economic activity.

[14] The number of recreational fishing trips exceeds the participation estimates for fishing presented above in **Table 8-7** because a participant may take several fishing trips each year.

[15] Note that the economic impacts from recreational fishing presented here may overlap with some of the impacts of the commercial tourism and recreation sector described above, such as boat rentals. However, the extent of that overlap is not possible to determine given the available data.

Table 8-9: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the Eastern Gulf of Mexico, 2006

Type	Status	Expenditures (million$)	Direct Effects	Indirect Effects	Induced Effects	Total
Output (million$)	Resident	**Resident**: $7,496.3 **Non-resident**:$1,460.2 **Total**: $8,956.6	$3,475.7	$1,305.7	$1,399.9	$6,181.3
	Non-Resident		$899.1	$310.7	$432.6	$1,642.5
	Total		**$4,374.8**	**$1,616.4**	**$1,832.6**	**$7,823.8**
Value Added (million$)	Resident		$1,708.6	$728.8	$854.4	$3,291.8
	Non-Resident		$485.9	$169.6	$287.8	$943.3
	Total		**$2,194.5**	**$898.4**	**$1,142.1**	**$4,235.1**
Income (million$)	Resident		$1,218.8	$456.5	$458.7	$2,134.0
	Non-Resident		$335.2	$105.5	$178.0	$618.7
	Total		**$1,554.0**	**$562.0**	**$636.6**	**$2,752.7**
Employment (jobs)	Resident		37,394	9,603	12,397	59,393
	Non-Resident		9,422	2,412	4,030	15,864
	Total		**46,816**	**12,015**	**16,427**	**75,257**

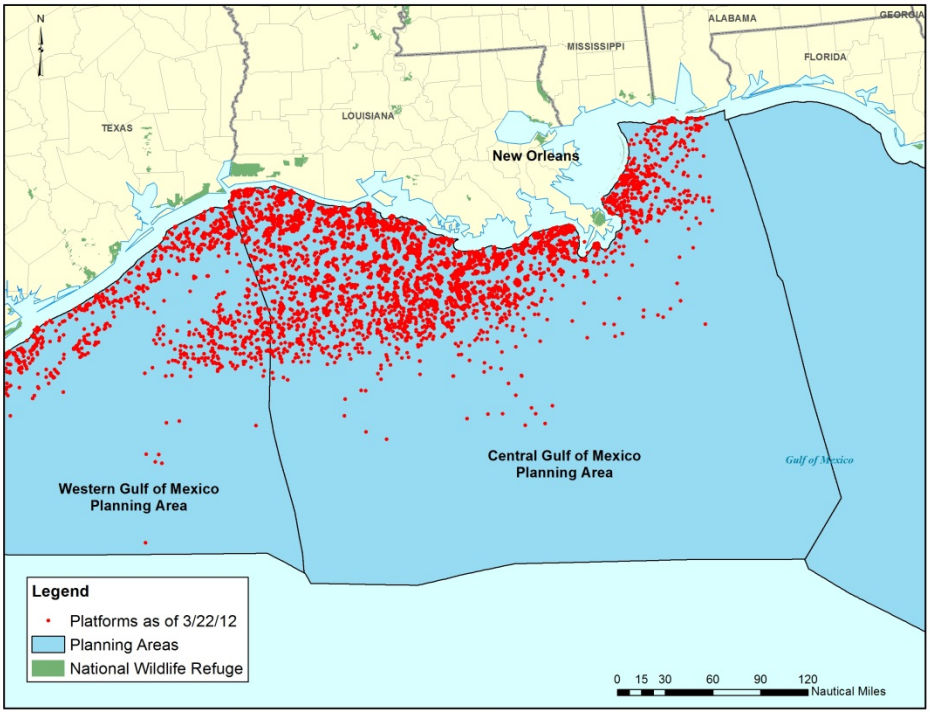
Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption.
Source: Gentner & Steinback, 2008.

8.3.3 Subsistence

As noted in prior chapters, information on subsistence fishing, shrimping, and other activities is extremely limited for U.S. waters outside of Alaska. Subsistence may be most significant in those areas designated as "fishing communities" by NOAA because of their strong ties to commercial and recreational fishing (see NOAA, 2009b). The fishing communities in the Eastern GOM exhibit significant diversity. These communities include some of West Florida's largest cities, such as Tampa and St. Petersburg, and other smaller, more rural communities where individuals are more likely to depend on their harvests for basic subsistence.

9. The Central Gulf of Mexico

Figure 9-1: Map of the Central Gulf of Mexico Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

9.1 Physical and Biological Resources in the Central Gulf of Mexico and the Nearby Coastal Area

The Central GOM coastal area, [16] which is shown above in **Figure 9-1**, contains four broad natural ecosystems, all of which could be adversely affected by a CDE – terrestrial, freshwater, estuarine and marine/continental shelf.[17] These systems support a wide array of plants, animals, and natural habitats, including rich sediments, barrier islands, seagrass beds, pitcher plant bogs, and wet pine savannas. The coasts of Mississippi, Alabama, and Louisiana contain some of the highest rates of biodiversity in the United States (Gulf Coast Ecosystem Restoration Task Force, 2011). The ocean ecosystems of the Central GOM provide a variety of services to the region. These ecological services include "provisioning services" such as food, water, timber, and fiber; "regulating services," which can affect climate, floods, disease, wastes, and water quality; and "supporting services" such as soil formation, photosynthesis, and nutrient cycling. Ecosystems

[16] A small portion of Alabama's coast is in close proximity to the Eastern Gulf of Mexico Planning Area while the remainder is closer to the Central GOM Planning Area. For the purposes of this document, all data for Alabama are included in the Central GOM discussion.

[17] Of these four systems, only the last (marine/continental shelf) is technically within the range of the planning area. A CDE related to exploration and development in the planning area could nonetheless affect resources on or near the coast.

in the area also support "cultural services" that provide recreational, aesthetic, and spiritual benefits (Millennium Ecosystem Assessment, 2005).

Table 9-1 provides an overview of the total acreage for different ecosystem types in Louisiana. More than one-third of Louisiana's coastline is made up of open estuarine water; another third is composed of swamp wetlands, open fresh water, and fresh water marshes. Louisiana has the largest expanse of coastal wetlands in the continental United States and is home to the largest delta in North America (Gulf Coast Ecosystem Restoration Task Force, 2011).

Table 9-1: Total Acreage for Each Ecosystem Type in Louisiana, 2007

Land Cover Type	Acres
Fresh Water Marsh	877,099
Intermediate Marsh	660,933
Brackish Marsh	547,445
Saline Marsh	421,561
Shrub-scrub wetland	172,106
Forested/Swamp Wetland	1,031,561
Open Fresh Water	99,2127
Open Estuarine Water	3,549,990
Upland Shrub-Scrub	84,799
Upland Forest	172,106
Pasture-Agriculture	481,575
Total	8,940,461
Source: Batker et al., 2010.	

9.2 Economic Activity in the Central Gulf of Mexico and the Nearby Coastal Area

9.2.1 Commercial Fishing

The commercial fishing industry represents a major source of jobs and income in the Central GOM. In 2009, the seafood industry in the Central GOM generated total revenues of more than $2.3 billion. This sum comprised $391 million in sales in Alabama, $1.7 billion in Louisiana, and $289 million in Mississippi. **Table 9-2** presents an economic summary of the seafood industry across the entire Central GOM area, including data on jobs, sales, income, and total value added (NOAA, 2009a). As indicated in the exhibit, the seafood industry supports almost 30,000 jobs in Louisiana, nearly 8,800 jobs in Alabama, and almost 6,400 jobs in Mississippi. In addition, the total "value added" of the seafood industry represents approximately 0.12 percent of state GDP in Alabama, 0.39 percent in Louisiana, and 0.16 percent in Mississippi (based on state GDP data from the Bureau of Economic Analysis (BEA, 2011).

Table 9-2: Economic Activity Related to the Central GOM Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
ALABAMA				
Commercial Harvesters	1,378	$66.9	$19.8	$29.5
Seafood Processors & Dealers	1,656	$165.2	$41.2	$52.3
Importers	126	$34.7	$5.56	$10.6
Seafood Wholesalers & Distributors	132	$6.25	$2.19	$2.8
Retail Sectors	5,468	$178.3	$79.6	$101.5
Total	**8,759**	**$391.3**	**$148.4**	**$196.8**
LOUISIANA				
Commercial Harvesters	10,587	$534.7	$177.3	$262.4
Seafood Processors & Dealers	1,794	$152.1	$59.0	$75.2
Importers	1,264	$347.6	$55.7	$106.0
Seafood Wholesalers & Distributors	944	$103.5	$35.2	$45.7
Retail Sectors	14,597	$553.1	$246.9	$313.9
Total	**29,185**	**$1,691.0**	**$574.2**	**$803.1**
MISSISSIPPI				
Commercial Harvesters	1,238	$60.9	$18.8	$27.3
Seafood Processors & Dealers	1,046	$78.9	$31.2	$39.1
Importers	50	$31.7	$2.19	$4.16
Seafood Wholesalers & Distributors	112	$10.5	$3.69	$4.65
Retail Sectors	3,946	$125.4	$56.7	$71.3
Total	**6,392**	**$289.2**	**$112.6**	**$146.5**
Regional Total	**44,336**	**$2,372.5**	**$835.2**	**$1,146.4**
Source: NOAA, 2009a.				

As suggested by the data in **Table 9-2**, a CDE that limited seafood production in the Central GOM area could not only affect fishermen, but could also impact seafood processors and others in the seafood value chain. The magnitude of a CDE on the seafood industry would depend on the timing and geographic scope of the spill and the ability of fishermen to increase harvests from unaffected waters.

Table 9-3 presents commercial landing data by state for Louisiana, Mississippi and Alabama from 2010. In total, commercial fisheries harvested more than 1 billion pounds of fish and shellfish, for a total landed value of $297 million.

Table 9-3: Commercial Landings for All Species in the Central GOM, 2010

State	Total Pounds	Total Landed Value (million$)
Louisiana	1,007,016,021	$247.8
Mississippi	111,241,718	$21.9
Alabama	14,636,666	$27.7
Total	**1,132,894,405**	**$297.4**
Source: NMFS, 2012.		

9.2.2 Tourism and Recreation

To highlight the economic significance of a decline in tourism that may result from a CDE in the Central GOM, **Table 9-4** presents an overview of the economic scale of the tourism and recreation industries in this region. These data describe both the "ocean" and "coastal" economies of each state in the Central GOM coastal area as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the GOM shoreline. The exhibit includes data that are available for each state within the Central GOM coastal area for 2009; industries lacking data from 2009 were not included.

Table 9-4: Measures of the Central GOM Coast Tourism and Recreation Sector, 2009

Industry	Establishments	Employment[2]	Wages (million$)	GDP (million$)
Ocean Economy Data				
ALABAMA				
Amusement and Recreation Services NEC[1]	26	153	$2.9	$8.6
Boat Dealers	24	177	$5.5	$11.9
Eating & Drinking Places	521	8,651	$117.1	$231.2
Hotels & Lodging Places	76	1,731	$33.1	$70.4
Marinas	16	125	$3.8	$6.03
Total	**663**	**10,837**	**$162.3**	**$328.1**
LOUISIANA				
Boat Dealers	27	218	$9.07	$20.8
Eating & Drinking Places	1,185	21,483	$350.4	$694.2
Hotels & Lodging Places	190	6,326	$170.8	$437.6
Marinas	19	98	$2.65	$5.1
Total	**1,421**	**28,125**	**$532.9**	**$1,157.7**
MISSISSIPPI				
Boat Dealers	15	70	$2.21	$5.5
Eating & Drinking Places	577	9,623	$127.0	$267.0
Hotels & Lodging Places	86	1,246	$19.7	$39.5
Recreational Vehicle Parks & Campsites	16	117	$2.77	$5.55
Total	**694**	**11,056**	**$151.7**	**$317.5**
Regional Total	**2,778**	**50,018**	**$846.9**	**$1,803.3**
Coastal Economy Data (Shore-adjacent Counties)				
Alabama	1,335	25,340	$368.4	$711.0
Louisiana	4,424	82,240	$1,809.7	$3,880.0
Mississippi	844	25,852	$545.4	$1,192.1
Regional Total	**6,603**	**133,432**	**$2,723.5**	**$5,783.1**

Notes:
1. NEC – Not Elsewhere Classified
2. NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.

Sources: NOEP, 2012a; NOEP, 2012b.

In total, the tourism and recreation sector, as measured as part of the ocean economy, accounts for 0.20 percent of Alabama's state GDP, 0.57 percent of Louisiana's GDP, and 0.34 percent of Mississippi's economy (based on state GDP data from BEA, 2011). When expanded to include the entire coastal counties, the leisure and hospitality sector accounts for 0.43 percent of Alabama's GDP, 1.9 percent of Louisiana's, and 1.3 percent of Mississippi's, a slightly larger percentage across the board. Louisiana, with significantly more coastline and more coastal population centers than the other two states, relies more heavily on tourism than Alabama or Mississippi.

9.2.3 Commercial Shipping and Transport

A CDE has the potential to significantly disrupt the commercial shipping of domestic and international freight, as well as passenger transportation, within the Central GOM marine transportation system. In particular, a significant CDE could cause delays in vessel movement and economic loss associated with the decontamination of vessels prior to their entry into a port.

Table 9-5: Top 10 Ports in the U.S. and Top Central GOM Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT[1]	All Directions	Receipts[2]	Shipments[2]	Intraport[2]
1	Port of South Louisiana, LA[3]	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
11	Lake Charles, LA	52.2	35.4	15.9	0.92
12	Mobile, AL	52.2	25.1	26.6	0.50
13	Baton Rouge, LA	51.9	22.1	28.2	1.63
14	Port of Plaquemines, LA	50.9	24.7	26.1	0.06
16	Port of Pascagoula, MS	36.6	22.9	13.7	0.03

Notes:
1. Ports shaded gray are located in the Central GOM.
2. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
3. Data available for 2010 suggests the Port of South Louisiana may have seen a 10 percent increase in total traffic.

Source: USACE, 2009.

The magnitude of impacts from a CDE on commercial shipping would depend on the characteristics of the spill, local conditions at the time of the event, and the volume of shipments shipped through affected ports. For shipping volumes, 7 of the 20 largest U.S. ports, as

measured by the amount of cargo flowing through the ports on an annual basis, are located along the Central GOM (USACE, 2009). A significant disruption could hinder or halt the amount of traffic moving in and out of any or all of these ports. **Table 9-5** presents the total domestic (trade between the contiguous 48 states, Alaska, and Hawaii) and foreign (trade between the United States and all foreign countries and territories) commodity traffic at these ports for 2009 and, for perspective, for the top 10 largest U.S. ports. In 2009, the total waterborne traffic of the United States was 2.2 billion short tons, including both domestic and foreign traffic. Together the Central GOM ports listed in **Table 9-5** made up 24 percent of that sum (USACE, 2009).

9.2.4 Oil and Natural Gas Production

Oil and natural gas production in the Central GOM is a significant component of the regional economy. The oil and natural gas sector makes up approximately 6.4 percent of Louisiana GDP and 0.5 percent of state GDP in Alabama (based on state GDP data from BEA, 2011).[18] In addition, as indicated in **Table 9-6,** the industry directly employs nearly 20,000 people in the Central GOM (excluding those employed in Mississippi).

The data in **Table 9-6** reflect only the *direct* impacts of the oil and gas industry in the Central GOM states, but oil and natural gas production in the area also results in indirect and induced economic impacts.[19] Data on these impacts specific to the Central GOM are not readily available, but a 2010 study by IHS Global Insight estimates the indirect and induced effects of oil and natural gas production for the entire GOM (IHS Global Insight, 2010). Allocating these effects to the individual GOM planning areas in proportion to their offshore oil and natural gas production in 2011, we estimate that the indirect and induced economic impacts of oil and natural gas production in the Central GOM include employment impacts of 238,000 jobs, wages of $11.9 billion, and GDP of $22 billion.

[18] Data for the oil and gas exploration and production sector are based on four NAICS code industries (1997): Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360). Data on the oil and gas sector's contribution to state GDP in Mississippi were not readily available.

[19] The data in **Table 9-6** are for the three states in closest proximity to the Central Gulf of Mexico planning area. However, establishments located outside of these three states, most notably in Texas and Florida, also support oil and natural gas exploration and development in the Central GOM. Thus, the data in **Table 9-6** may underestimate the economic activity in the oil and gas sector potentially affected by a CDE in the Central GOM planning area. Similarly, many of the establishments reflected in **Table 9-6** support offshore oil and gas exploration in other Gulf of Mexico planning areas. A portion of the economic activity shown in **Table 9-6** may therefore apply to other planning areas.

Table 9-6: Economic Impacts of Offshore Oil and Natural Gas Exploration and Production in the Central GOM, 2011

Year[1]	Establishments	Employment	Wages (million$)	GDP (million$)
Alabama	15	380	$30.3	$735
Louisiana	612	19,442	$1,737	$13,195
Mississippi	NO DATA AVAILABLE			

Notes:
1. The most recent year for which data are available is 2005 for Alabama and 2009 for Louisiana.
2. NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
3. Data for the oil and gas exploration and production sector are based on four NAICS code industries: Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360).
4. Data are for the three states closest in proximity to the Central Gulf of Mexico planning area. However, establishments located outside of these three states, most notably in Texas and Florida, also support oil and natural gas exploration and development in the Central GOM. Thus, the data may underestimate or overestimate the economic activity in the oil and gas sector potentially affected by a CDE in the Central GOM planning area.

Source: NOEP, 2012a.

Table 9-7 presents offshore oil and natural gas production data for the Central GOM for 2010 and 2011. As indicated in the table, the vast majority of offshore oil and natural gas production in the area occurs in federal rather than state waters. In addition, the offshore production in the Central GOM is more significant than in any other GOM planning area. The Central GOM accounts for approximately 85 to 90 percent of offshore GOM oil production and approximately 75 percent of GOM natural gas production. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in the Central GOM planning area to be 54.76 billion barrels of oil-equivalent (BOEM, 2012).

Table 9-7: Central GOM Offshore Oil and Natural Gas Production, 2010-2011

Location	Oil (millions barrels)		Gas (million MCF)	
	2010	2011	2010	2011
Federal waters	473.5	364.8	1,673.4	1,353.2
State waters	6.63	6.14*	170.4	68.31[1]
TOTAL	**480.1**	**370.9**	**1,843.8**	**1,353.2**

Notes:
1. Alabama data not yet available for 2011.
2. Mississippi state water production is negligible and not included here.

Sources: Federal OCS production data are from BOEM (2012). State production data for Louisiana are from the Louisiana Department of Natural Resources (undated), and data for Alabama are from Geological Survey of Alabama (undated).

9.3 Public Use in the Central Gulf of Mexico and the Nearby Coastal Area

9.3.1 Coastal Recreation

The public makes extensive use of the coastal and marine resources in the Central GOM area for recreational purposes. Each year, members of the public take approximately 15 to 20 million trips to the beaches of Louisiana, Mississippi, and Alabama (Roach et al. 2001). The 2000 NSRE provides state-by-state participation data for all types of coastal recreation. **Table 9-8** presents the number of participants for each recreation activity in the Central GOM states. Beach visitation in Mississippi and Alabama and saltwater fishing in Louisiana were the most popular activities, but wildlife-viewing and photography also drew a significant number of visitors across the entire Central GOM.

Table 9-8: Central GOM Coastal Recreation Participation, 2000

RECREATION ACTIVITY	CENTRAL GOM (millions of participants)			
	MISSISSIPPI	ALABAMA	LOUISIANA	TOTAL
Visit Beaches	1.042	1.249	0.629	2.92
Visit Waterside Besides Beaches	0.164	0.31	0.331	0.805
Swimming	0.563	1.022	0.398	1.983
Snorkeling	0.025	0.107	0.016	0.148
Scuba Diving	0.004	0.018	0.011	0.033
Surfing	0.00	0.045	0.009	0.054
Wind Surfing	0.008	0.027	0.008	0.043
Saltwater Fishing	0.312	0.615	0.975	1.902
Motorboating	0.228	0.272	0.671	1.171
Sailing	0.047	0.103	0.072	0.222
Personal Watercraft Use[1]	0.07	0.139	0.136	0.345
Canoeing	0.01	0.019	0.019	0.048
Kayaking	0.01	0.022	0.00	0.027
Rowing	0.00	0.013	0.015	0.028
Water-skiing	0.039	0.071	0.095	0.205
Bird Watching	0.317	0.351	0.387	1.055
Viewing Other Wildlife in Water-based Surroundings	0.235	0.364	0.385	0.984
Viewing or Photographing Scenery in Water-based Surroundings	0.427	0.441	0.596	1.464
Hunting Waterfowl	0.006	0.062	0.083	0.151
Any Coastal Activity[2]	**1.801**	**2.549**	**2.165**	**6.515**

Notes:

1. Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.
2. The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy & Wiley, 2001.

The Central GOM's coastal zone is also home to a dozen NWRs and numerous state parks. Visitation rates at NWRs in the GOM range from thousands per year at smaller units to tens of thousands per year at larger units. In 2006, the USFWS estimated the per-day values the public placed on hunting and wildlife viewing. For the Central GOM states, these values ranged from a median of $28 to $32 for hunting and from $12 to $28 for wildlife viewing (USFWS, 2009). **Table 9-9** presents a list of NWRs located directly on the Central GOM coast. Others, such as Big Branch Marsh NWR in Louisiana, are slightly further inland, but could also be affected by a CDE if visitors forego trips to the region due to real or perceived degradation of environmental quality along the coast.

Table 9-9: National Wildlife Refuges in Close Proximity to the Central GOM

Louisiana	Mississippi and Alabama
Lacassine NWR (LA) Shell Keys NWR (LA) Bayou Teche NWR (LA) Delta NWR (LA) Breton NWR (LA) Bayou NWR (LA)	Bogue Chitto NWR (MS) Mississippi Sandhill Crane NWR (MS) Grand Bay NWR (MS/AL) Bon Secour NWR (AL)
Source: USFWS, 2009.	

The Gulf Island National Seashore, in Mississippi and Alabama, saw more than 5.5 million visitors in 2011, almost all of whom were visiting for recreational purposes. **Table 9-10** presents visitation statistics and camping data for this National Seashore. As indicated in the table, visits to the National Seashore peak in the summer. Thus, a CDE impacting the late spring or summer could result in more significant recreational use impacts than events that impact other times of the year.

Table 9-10: Gulf Islands National Seashore Visitation Statistics, 2011 (participants)

2011	Rec Visits	Non-Rec Visits	Tent Campers	RV Campers	Back Country Campers	Misc. Campers	Total Overnight Stays
January	232,684	7,736	1,412	2,413	19	127	3,971
February	185,770	7,791	678	4,912	9	193	5,792
March	357,849	9,012	4,072	11,535	48	430	16,136
April	535,857	12,841	5,001	10,988	58	937	16,984
May	628,835	9,322	4,047	9,537	218	937	14,739
June	662,969	8,419	4,033	12,941	497	763	18,294
July	702,600	9,090	3,489	15,933	216	707	20,522
August	542,731	10,061	1,431	5,040	108	247	7,078
September	482,024	8,954	1,680	5,305	133	456	7,574
October	426,116	9,801	4,013	8,212	90	521	12,836
November	374,367	6,484	1,852	6,822	26	360	9,060
December	370,070	8,625	613	4,721	43	317	5,694
2011 Total	**5,501,872**	**108,136**	**32,321**	**98,359**	**1,465**	**5,995**	**138,680**
Source: NPS, 2012.							

9.3.2 Recreational Fishing

Related to coastal recreation, recreational fishing represents a significant use of coastal and marine resources in the Central GOM. Residents of and visitors to the Central GOM took approximately 7 million recreational fishing trips in 2008 (Pritchard 2009). Based on information published by NOAA, a CDE in the Central GOM could result in the closure of recreational fishing areas for a period of several months and cover an area as large as 40 percent of state and federal waters in the GOM at the closure's peak (NOAA, 2011).

Table 9-11 presents a summary of total economic activity in the Central GOM, based on recreational fishing expenditures in 2006. The economic activity from recreational fishing in the region is clearly focused in Louisiana. That state saw more than 70 percent of the Central GOM's recreational fishing expenditures and almost three quarters of the total jobs supported by direct, indirect, and induced impacts from those expenditures. Expenditures and impacts were of similar magnitude for Mississippi and Alabama.[20]

Table 9-11: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in and along the Central GOM, 2006

Type	Expenditures	Direct Effects	Indirect Effects	Induced Effects	Total
ALABAMA					
Output (million$)	$662.5	$384.4	$120.6	$125.1	$630.2
Value Added (million$)		$185.5	$65.2	$74.8	$325.5
Income (million$)		$128.0	$38.5	$40.1	$206.6
Employment (Jobs)		4,457	909	1,206	6,572
LOUISIANA					
Output (million$)	$2,852	$1,435.5	$459.7	$486.8	$2,382.0
Value Added (million$)		$674.7	$237.8	$286.8	$1,199.3
Income (million$)		$481.3	$145.2	$155.1	$781.7
Employment (Jobs)		18,012	3,718	4,881	26,612
MISSISSIPPI					
Output (million$)	$528	$327.0	$88.5	$75.0	$490.5
Value Added (million$)		$102.7	$44.4	$42.3	$189.5
Income (million$)		$75.5	$26.5	$21.7	$123.8
Employment (Jobs)		2,275	716	740	3,731

Note:
1. Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. The total represents the sum of the direct, indirect, and induced impacts.
2. Economic impacts from recreational fishing presented here may overlap with some of the impacts of the commercial tourism and recreation sector described above, such as boat rentals. However, the extent of that overlap is not possible to determine given the available data.

Source: Gentner & Steinback, 2008.

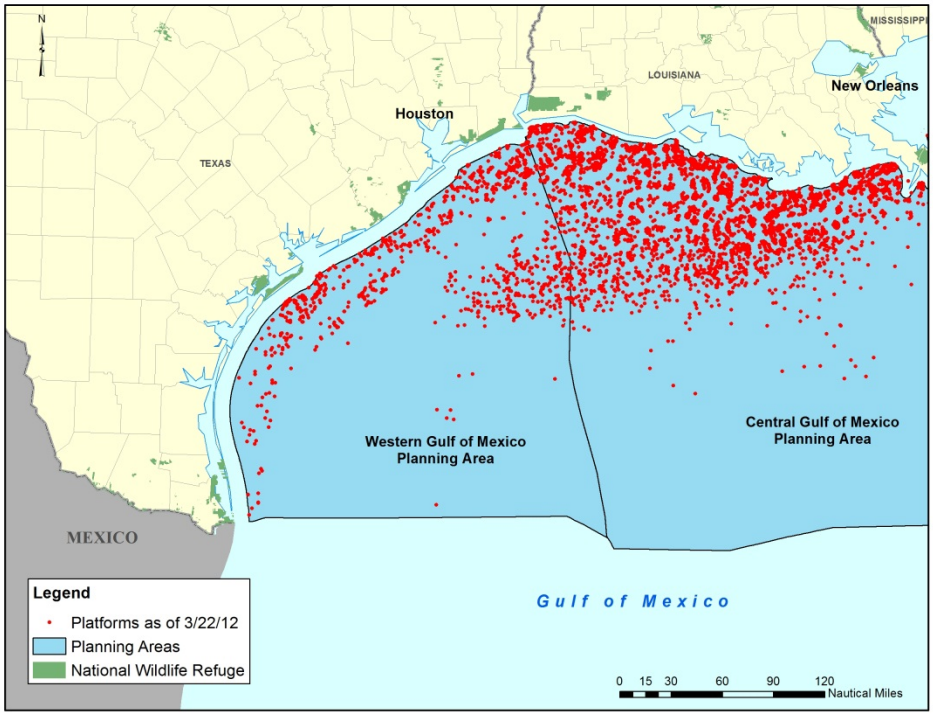
[20] Note that the economic impacts from recreational fishing presented here may overlap with some of the impacts of the commercial tourism and recreation sector described above, such as boat rentals. However, the extent of that overlap is not possible to determine given the available data.

9.3.3 Subsistence Use

Some communities and households in the Central GOM region rely on coastal natural resources, particularly fish and ducks, for basic subsistence. These subsistence uses go largely unrecorded, and systematic research has been virtually nonexistent, so valuing them accurately is extremely difficult (NOAA, 2006). Subsistence fishing and shrimping nevertheless represent an important public use of the GOM's coastal areas, particularly to rural communities. Dellenbarger, Schupp and Kanjilal (1993), in a summary of south Louisiana fishing households, indicate that 70 percent of these families reported fishing in order to obtain fish for family consumption. Kelso et al. (1991) report that almost 89 percent of Louisiana's freshwater anglers and 91 percent of its saltwater anglers stated that they eat at least some of the fish that they catch. Qualitative information regarding barter exists, but is very rare (Gramling et al., n.d.). Similar surveys do not appear to exist for Mississippi and Alabama, although observational data suggest that fishing communities rely on at least part of their harvests for basic subsistence (NOAA, 2006).

10. The Western Gulf of Mexico

Figure 10-1: Map of the Western Gulf of Mexico Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

10.1 Physical and Biological Resources in the Western Gulf of Mexico and the Nearby Coastal Area

A CDE in the Western GOM could pose risks to the region's diverse physical and biological resources. The Texas coast, which is shown above in **Figure 10-1**, contains 12 distinct ecoregions and wide biodiversity, with more than 457 species of fish and 343 species of invertebrates in estuarine and marine waters (Gulf Coast Ecosystem Restoration Task Force, 2011). Coastal marshes in the Western GOM provide habitats for more than one million migrating and wintering bird species and nursery areas for fish and shellfish. Texas' coastal wetlands account for 6 percent of total U.S. wetland acreage, and 12 percent of GOM wetlands (State of the Gulf of Mexico Summit, 2011). These wetlands reduce coastal erosion by providing a buffer against storm surge. Spilled oil that reaches shore could damage these habitats and adversely impact bird, fish, and shellfish species that they serve. To highlight some of the biological resources in the region, **Table 10-1** presents a brief overview of the population status of major bird and fish species in Galveston Bay Estuary.

Table 10-1: Bird Species in Galveston Bay Estuary

BIRDS		
Feeding Guild	**Species**	**20-Year Population Trend**
Marsh Feeders	Great Blue Heron	Declining
	Reddish Egret	Declining
	Roseate Spoonbill	Stable
	Snowy Egret	Stable
	Tricolored Heron	Declining
Open-Water Feeders	White Ibis	Stable
	Black Skimmer	Declining
	Brown Pelican	Increasing
	Least Tern	Stable
	Royal Tern	Stable
	Sandwich Tern	Stable

FISH	
Species	**20-Year Population Trend**
Black Drum	Stable
Red Drum	Stable
Sand Seatrout	Stable
Southern Flounder	Stable
Spotted Seatrout	Stable

Source: EPA, 2007.

Oyster reefs along the Texas coast are also important to the region's ecosystem and economy. These reefs supply habitat for other commercial and recreationally important finfish and shellfish species, improve water quality, reduce turbidity, and provide shoreline protection from erosion (Gulf Coast Ecosystem Restoration Task Force, 2011). Seagrasses also play a key role in the marine ecosystem of the Western GOM for commercially and recreationally important fish species (State of the Gulf of Mexico Summit, 2011). In addition to providing habitat for fish and a variety of other wildlife, seagrass stabilizes the bottom, serves as a source of organic biomass for coastal food webs, and improves water quality.

10.2 Economic Activity in the Western Gulf of Mexico and the Nearby Coastal Area

10.2.1 Commercial Fishing

As an indicator of the commercial fishing activity at risk to a CDE in the Western GOM, the seafood industry in the region generated a total of approximately $1.7 billion in sales revenue and $470 million in income in 2009. **Table 10-2** presents a summary of the economic activity from the seafood industry in the Western GOM, including impacts related to jobs, sales, income, and total value added (NOAA, 2009a). As indicated in the table, the commercial seafood industry in the Western GOM supported almost 19,000 jobs in 2009. In addition, the industry constituted approximately 0.06 percent of Texas' total GDP in 2009 (based on state GDP data from BEA, 2011). In 2010 alone, annual commercial landings in Texas were approximately 89.7 million pounds, for a total landed value of $203.8 million (NMFS, 2012).

Table 10-2: Economic Activity for the Western GOM Seafood Industry, 2009

Seafood Industry Activity	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
Commercial Harvesters	3,674	$318.5	$91.2	$146.8
Seafood Processors & Dealers	1,297	$107.3	$40.4	$53.1
Importers	2,494	$686.1	$110.0	$209.1
Seafood Wholesalers & Distributors	923	$123.3	$41.1	$57.0
Retail Sectors	10,486	$447.0	$191.1	$250.0
Total	**18,874**	**$1,682.1**	**$473.7**	**$716.1**
Source: NOAA, 2009a.				

10.2.2 Tourism and Recreation

A CDE could adversely affect tourism in the Western GOM due to real or perceived degradation of the coastal environment. In 2009, tourism in the area directly supported approximately 33,000 jobs and $500 million in total wages. **Table 10-3** presents a breakdown of this sector by industry. The data in the table describe both the ocean and coastal economies of the Western GOM as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the GOM shoreline. Based on the ocean economy data in **Table 10-3**, restaurants, bars, and other eating and drinking establishments are the largest industry within the Western GOM tourism sector, comprising more than 1,300 establishments and 27,000 jobs in 2009, followed by hotels and lodging places, which supported more than 300 establishments and 5,000 jobs.

Table 10-3: Economic Activity for the Western GOM Tourism & Recreation Sector, 2009

Industry	Establishments[2]	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data (Tourism and Recreation)				
Amusement and Recreation Services NEC[1]	72	453	$6.67	$15.0
Boat Dealers	40	300	$11.3	$24.6
Eating & Drinking Places	1,356	27,107	$371.2	$764.8
Hotels & Lodging Places	309	4,728	$87.4	$229.8
Recreational Vehicle Parks & Campsites	32	132	$2.18	$5.73
Scenic Water Tours	28	261	$4.49	$7.71
Other	389	5,494	$110.4	$274.1
Total	1,994	39,156	$589.7	$1,213.8
Coastal Economy Data (Leisure and Hospitality)				
Texas	11,899	258,646	$4,394.7	$8,367.0

Notes:
1. NEC – Not Elsewhere Classified
2. NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.

Source: NOEP 2012a; NOEP 2012b.

10.2.3 Commercial Shipping and Transport

As measured by the amount of cargo moving in and out of the ports on an annual basis, 4 of the 10 largest U.S. ports are located in the Western GOM. **Table 10-4** presents the total domestic and foreign commodity traffic at these ports for 2009. The Port of Houston was the second largest American port that year, with more than 200 million tons of goods flowing through the port. In past years, Houston has surpassed the Port of Southern Louisiana as the largest port in the United States. Approximately 20 percent of U.S. commodity traffic in 2009 passed through the five Texas ports highlighted in **Table 10-4**. Given this high volume of traffic, a CDE in the Western GOM that limited vessel traffic in and out of ports could cause significant disruptions to the regional economy. Goods and services could be delayed in reaching consumers and businesses, and exports from the region could be delayed in reaching their destinations.

Table 10-4: Top 10 Ports in the U.S. and Top Western GOM Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT[1]	All Directions	Receipts[2]	Shipments[2]	Intraport[2]
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX[3]	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
19	Port Arthur, TX	33.8	18.9	14.8	0.56

Note:
1. Ports shaded gray are located in the Western GOM.
2. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
3. Data available for 2010 suggests Beaumont may have seen a 12 percent increase in total traffic.

Source: USACE, 2009.

10.2.4 Oil and Natural Gas Production

Table 10-5 provides a breakdown of GDP, employment, and other economic statistics for the offshore oil and natural gas industry in Texas.[21,22] In 2009, the industry, which has seen

[21] Data for the oil and gas exploration and production sector are based on four NAICS code industries (1997): Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360).

[22] The data in **Table 10-5** are for establishments in Texas, the state in closest proximity to the Western Gulf of Mexico planning area. However, establishments located outside of Texas, most notably in Louisiana, Mississippi, Alabama, and Florida, also support oil and natural gas exploration and development in the Western GOM. Thus, the

significant growth over the past 5 years, supported 90,000 jobs, $13.2 billion in wages, and 5.3 percent of Texas' state GDP (based on state GDP data from BEA, 2011). The data in **Table 10-5** reflect only the *direct* economic effects (as opposed to indirect or induced effects) of offshore oil and natural gas production in the Western GOM. The exploration, development, and production of offshore oil and natural gas, however, also result in indirect and induced economic impacts in the area. Data specific to the Western GOM are not readily available, but a 2010 study estimates the indirect and induced effects of oil and natural gas production for the entire GOM (IHS Global Insight, 2010). Allocating these effects to the individual GOM planning areas in proportion to their offshore oil and natural gas production in 2011, it is estimated that the indirect and induced economic impacts of oil and gas production in the Western GOM include employment impacts of 46,000 jobs, wages of $2.3 billion, and GDP of $4.3 billion. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 24.74 billion barrels of oil-equivalent (BOEM, 2012).

Table 10-5: Economic Activity for Offshore Oil and Natural Gas Exploration and Production in the Western GOM, 2005-2009

Year	Establishments	Employment	Wages (million$)	GDP (million$)
2009	2,139	90,937	$13,243.5	$61,215.4
2008	2,140	95,223	$14,048.7	$82,416.7
2007	2,058	89,170	$12,861.4	$70,461.9
2006	1,876	82,794	$10,945.5	$63,853.9
2005	1,782	75,506	$9,617.1	$56,534.1

Note:

1. NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
2. Data for the oil and gas exploration and production sector are based on four NAICS code industries: Crude Petroleum and Natural Gas Extraction (211111), Drilling Oil and Gas Wells (213111), Support Activates for Oil and Gas Operations (213112), and Geophysical Exploration and Mapping Services (54360).
3. Data are for establishments in Texas, the state in closest proximity to the Western Gulf of Mexico planning area. However, establishments located outside of Texas, most notably in Louisiana, Mississippi, Alabama, and Florida, also support oil and natural gas exploration and development in the Western GOM. Thus, the data may underestimate or overestimate the economic activity in the oil and gas sector potentially affected by a CDE in the Western GOM.

Source: NOEP, 2012a.

Table 10-6 summarizes the volume of offshore oil and natural gas production in the Western GOM in 2010 and 2011. Production in this area accounts for approximately 10 to 15 percent of offshore oil production and 15 to 20 percent of offshore natural gas production in the GOM. In addition, the data presented in the table show that the vast majority of production in the Western GOM is in federal rather than state waters.

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data in **Table 10-5** may underestimate the economic activity in the oil and gas sector potentially affected by a CDE in the Western GOM. Similarly, many of the establishments reflected in **Table 10-5** support offshore oil and gas exploration in other Gulf of Mexico planning areas. A portion of the economic activity shown in **Table 10-5** may therefore apply to other planning areas.

Table 10-6: Offshore Oil and Natural Gas Production in the Western GOM: 2010-2011

	Oil (millions barrels)		Gas (million MCF)	
Year	2010	2011	2010	2011
TOTAL	**52.2**	**57.2**	**413.0**	**338.2**
Federal	52.1	56.8	412.8	337.4
State	0.059	0.417	0.203	0.834
Sources: Federal production data from BOEM (2012). State production data from Railroad Commission of Texas (2012).				

10.3 Public Use in the Western Gulf of Mexico and the Nearby Coastal Area

10.3.1 Coastal Recreation

The Western GOM area provides an abundance of opportunities for coastal recreation. The Texas coast is home to Padre Island National Seashore, eight NWRs (Laguna Atacosa, Aransas, Big Boggy, San Bernard, Brazoria, Anahuac, McFadden, and Texas Point), and numerous beaches. The public takes more than 30 million trips to the beach and other coastal areas per year in the Western GOM (Roach et al. 2001).

Table 10-7 presents the annual number of participants for coastal recreational activities in the Western GOM in 2000. Beach visitation and swimming are by far the most popular activities, with more than three million annual participants each. Saltwater fishing and wildlife- and scenery-viewing are also significant, with more than one million annual participants.

Table 10-7: Western GOM Coastal Recreation Participation, 2000[23]

RECREATION ACTIVITY	TEXAS (millions of participants)
Visit Beaches	3.851
Swimming	3.076
Saltwater Fishing	1.695
Viewing or Photographing Scenery in Water-based Surroundings	1.193
Motorboating	0.820
Bird Watching	0.805
Viewing Other Wildlife in Water-based Surroundings	0.745
Visit Waterside Besides Beaches	0.488
Personal Watercraft Use[1]	0.272
Snorkeling	0.165
Sailing	0.159
Water-skiing	0.144
Surfing	0.124
Wind Surfing	0.101
Hunting Waterfowl	0.075
Scuba Diving	0.070
Canoeing	0.046
Kayaking	0.021
Rowing	0.020
Any Coastal Activity[2]	**6.168**

Note:

1. Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.
2. The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy & Wiley, 2001.

The economic value that the public places on recreational activities that involve coastal resources, particularly those that do not involve expenditures, is highly uncertain. Nevertheless, the economic literature includes estimates for some activities. For example, USFWS estimated the median per-day values the public places on hunting and wildlife viewing in Texas to be $62 per day for hunting and $25 for wildlife viewing (USFWS, 2009). Another study (Parsons *et al.*, 2009) calculated the value of a trip to the beach by determining economic losses attributable to hypothetical beach closures at the Padre Island National Seashore. Using a travel cost random utility maximization model developed for the National Park Service (NPS), that study established a mean loss of approximately $20 per trip. **Table 10-8** presents recent visitation statistics for Padre Island, approximately 500,000 visitors over the course of 2011.

[23] Data cited in this source is from a USFS study done in 2001. While some data collection has begun, no comprehensive data set has been compiled since then.

Table 10-8: Padre Island National Seashore Visitation Statistics, 2011 (participants)

Month	Rec Visits	Tent Campers	RV Campers	Back Country Campers	Total Overnight Stays
January	33,025	321	4,604	814	5,756
February	26,226	459	4,274	814	5,562
March	57,700	2,028	5,694	819	8,577
April	45,996	1,598	3,788	1,366	6,817
May	41,739	1,966	1,712	1,367	5,112
June	66,525	1,898	875	1,370	4,224
July	100,311	2,770	1,126	1,372	5,357
August	45,681	1,985	861	1,365	4,272
September	49,958	1,337	815	1,361	3,557
October	36,943	1,366	975	1,360	3,739
November	23,399	610	2,271	816	3,722
December	15,370	362	1,941	814	3,133
2011 Total	**542,873**	**16,700**	**28,936**	**13,638**	**59,828**
Source: NPS, 2012.					

10.3.2 Recreational Fishing

The Western GOM accounts for a sizeable portion (10 percent) of recreational fishing expenditures in the United States. Nationally, expenditures by recreational marine anglers in Texas are second behind Florida. For example, Texas expenditures on recreational fishing reached approximately $3.2 billion in 2006, including the costs of travel, equipment, and other goods and services (Gentner and Steinback, 2008). The $3.2 billion spent by anglers resulted in a direct increase of $1 billion in GDP (value added). Indirect and induced effects led to an additional $1 billion in GDP, for a total impact on GDP of $2.0 billion. **Table 10-9** presents a summary of the economic impacts associated with marine recreational fishing expenditures in the Western GOM.[24]

The economic activity summarized in **Table 10-9** reflects approximately 15 million fishing days among 1.1 million residents and nonresidents of Texas in 2006 (Southwick Associates, 2006). A CDE in the Western GOM could result in the closure of offshore waters for an extended period, greatly reducing participation and the associated economic impacts of recreational fishing summarized in **Table 10-9**.

[24] Note that the economic impacts from recreational fishing presented here may overlap with some of the impacts of the commercial tourism and recreation sector described above, such as boat rentals. However, the extent of that overlap is not possible to determine given the available data.

Table 10-9: Total Economic Activity from Marine Recreational Fishing Expenditures in Texas, 2006

Type	Status	Expenditures	Direct Effects	Indirect Effects	Induced Effects	Total
Output (million$)	Resident	$3,109.5	$2,241.4	$992.0	$858.6	$4,092.0
	Nonresident	$68.7	$56.4	$24.4	$24.1	$105.0
	Total	**$3,178.2**	**$2,297.8**	**$1,016.4**	**$882.8**	**$4,197.0**
Value Added (million$)	Resident	$3,109.5	$1,049.0	$538.4	$505.0	$2,092.4
	Nonresident	$68.7	$34.2	$13.0	$15.2	$62.5
	Total	**$3,178.2**	**$1,083.2**	**$551.5**	**$520.2**	**$2,154.9**
Income (million$)	Resident	$3,109.5	$705.9	$325.7	$259.8	$1,291.3
	Nonresident	$68.7	$18.7	$7.32	$8.85	$34.8
	Total	**$3,178.2**	**$724.5**	**$333.0**	**$268.6**	**$1,326.2**
Employment (jobs)	Resident	$3,109.5	19,729	6,670	6,812	33,211
	Nonresident	$68.7	610	143	212	965
	Total	**$3,178.2**	**20,339**	**6,813**	**7,024**	**34,175**

Note:

1. Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. Total impacts are the sum of direct, indirect, and induced impacts.
2. Note that the economic impacts from recreational fishing presented here may overlap with some of the impacts of the commercial tourism and recreation sector described above, such as boat rentals. However, the extent of that overlap is not possible to determine given the available data.

Source: Gentner & Steinback, 2008.

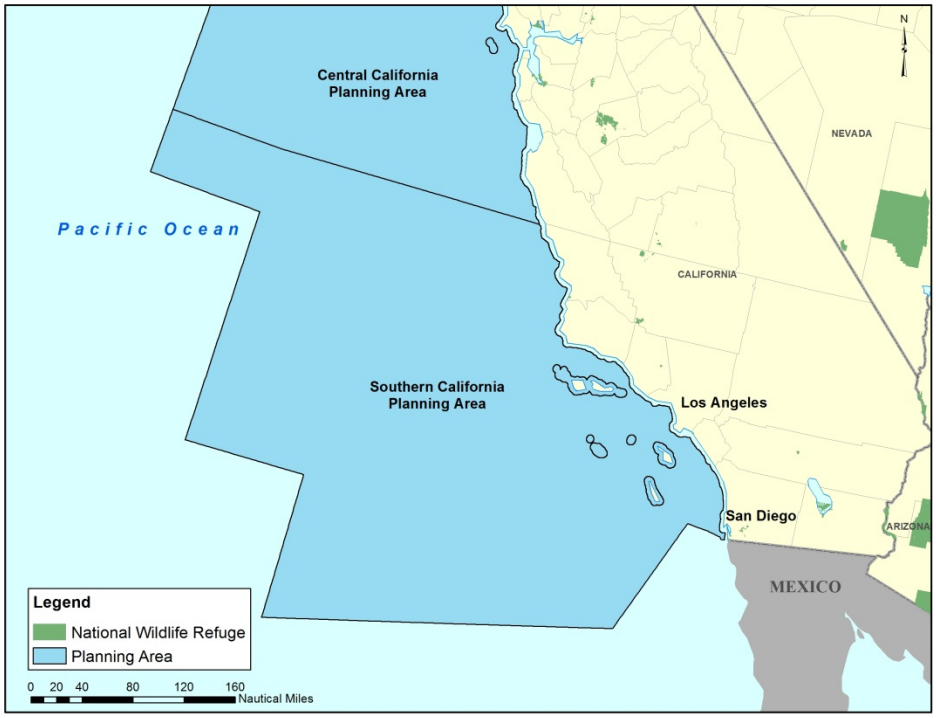
10.3.3 Subsistence

No data were readily available on consumption-oriented fishing for communities on the Western GOM. Surveys, discussions, and observations have suggested the widespread importance of fish, shrimp, crabs, and oysters to the livelihoods of communities on the Gulf coast of Texas. However, no systematic surveys yet exist of subsistence practices in this area (NOAA, 2005).

Subsistence may be highest in those areas NOAA characterizes as fishing communities, those that economically depend on a combination of recreational, commercial, and subsistence fishing, shrimping, oystering, et cetera. In the Western GOM, these communities are primarily rural, with relatively high poverty rates. Of the 68 fishing communities identified by NOAA along the Gulf Coast in Texas, 5 had poverty rates double or more the national average in 2006. In addition, almost all fishing communities in Texas have a median income lower than the national average. These communities also have a relatively high percentage of non-English speaking residents (NOAA, 2009b).

11. Southern California

Figure 11-1: Map of the Southern California Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

The Southern California planning area, shown above in **Figure 11-1**, is in close proximity to six counties along the coast of southern California: Los Angeles, Orange, San Diego, San Luis Obispo, Santa Barbara, and Ventura counties. Wherever possible, this chapter characterizes the resources and activities that could be affected by a CDE in or near the Southern California planning area based on data specific to these counties and the adjacent marine environment.

11.1 Physical and Biological Resources in the Southern California Planning Area and the Nearby Coastal Area

The southern California coast is home to a vast diversity of ecosystems, plants, fish, shellfish, birds, and mammals. These ecosystems are essential to the regional economy near the planning area. Beach recreation, sport and commercial fishing, and coastal property values all depend on the healthy functioning of varied habitats and the flora and fauna they support.

At the northern end of the planning area, near San Luis Obispo County, is Morro Bay, a 3.6 square mile, semi-enclosed estuarine system. The shallow system includes a variety of wetland habitats, including subtidal and intertidal eelgrass beds, mudflats, salt marsh, and brackish and freshwater wetlands. Morro Bay is also an important area for both resident and migratory bird

species, particularly black brant,[25] which use the Bay to winter or to feed and rest during their migration along the Pacific Flyway (EPA, 2007).

Further south, west of Los Angeles, Santa Monica Bay is a 306 square mile estuary, bordered on the north by the Santa Monica Mountains. The Bay receives freshwater inputs from 28 streams, the largest of which are Malibu and Ballona Creeks. More than five thousand species of birds, fish, mammals, plants, and other wildlife live in the Bay, supporting a booming sport fishing industry. The watershed encompasses more than 400 square miles, including the concentrated population centers of Beverly Hills, Malibu, Santa Monica, and West Hollywood – home to a total population of more than three million people (EPA, 2007).

Southern California also supports a Mediterranean ecosystem, a type that exists in only four relatively small areas outside of southern Europe. These areas fall between roughly 30 and 40 degrees latitude, and are characterized by mild, rainy winters and warm, dry summers. This Mediterranean ecosystem lies along the coast and extends inland, supporting extensive biodiversity. The shorelines of the Channel Islands provide prime haul-out and breeding sites for several species of seals and sea lions while the adjacent marine waters support whales and porpoises. In addition, Mediterranean Coast Network parks offer critical refuges to a number of threatened and endangered species including the island fox, California red-legged frog, and steelhead trout, as well as rare plants and habitats found nowhere else (Southern California Research Learning Center, 2012).

11.2 Economic Activity in the Southern California Planning Area and the Nearby Coastal Area

11.2.1 Commercial Fishing

The waters in and near the Southern California planning area are essential to the state of California's commercial fishing industry. Some of the area's major cities, namely Los Angeles and San Diego, serve as the base for several important marine fisheries (NOAA, 2009b). Key species in southern California, by weight, include Pacific mackerel, Pacific sardine, white seabass, short- and long-spine thornyhead, red and yellow rock crab, and California spiny lobster (California Department of Fish and Game, 2011).

Table 11-1 presents the estimated economic activity for commercial fishing in southern California. These estimates are based on data for the entire state of California. To develop estimates specific to the counties near the Southern California planning area, this analysis distributes the state-wide economic data to individual counties in proportion to county-level landings as reported by the California Department of Fish and Game. For example, total jobs among from commercial harvesters were 3,203 for the entire state of California but the impact to southern California, 2,420 jobs, reflects the region's 75 percent share of the state's landings. Based on the data in **Table 11-1,** the seafood industry in the area near the Southern California planning area supports roughly 91,000 jobs and $3.2 billion in wages, as well as roughly $15.2

[25] The black brant is also referred to as the Pacific brent goose.

billion in sales. It also adds $5.4 billion in total value added, or 0.29 percent of California's state GDP (based on state GDP data from BEA, 2011). [26]

Table 11-1: Economic Activity for the Southern California Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
SOUTHERN CALIFORNIA				
Commercial Harvesters	2,420	$228.9	$79.2	$115.9
Seafood Processors and Dealers	3,173	$325.7	$120.8	$160.2
Importers	41,885	$11,521.7	$1,846.5	$3,512.3
Seafood Wholesalers and Distributors	8,203	$1,170.2	$379.6	$530.3
Retail Sectors	35,417	$1,939.7	$814.0	$1,075.3
Total	**91,098**	**$15,186.1**	**$3,240.2**	**$5,394.0**
Source: NOAA, 2009a.				

11.2.2 Tourism and Recreation

Tourism and recreation represent an important part of the regional economy in southern California. The beaches of Santa Barbara, Los Angeles, Orange, and San Diego Counties support a large tourism industry enjoyed by both California residents and out of state visitors. One study estimated $990 million in direct spending annually as a result of beach visitation and recreation at nine major southern California beaches (King, 2003). Near the northern reaches of the planning area, Morro Bay, in San Luis Obispo County, is a major tourist attraction in the region, with more than 25,000 people living within the Bay's watershed and an average of 1.5 million visitors per year. The area's economy is dominated by tourism and visitor-serving businesses, which account for 37 percent of all jobs and one third of the general fund revenues for the City of Morro Bay (EPA, 2007).

A CDE could adversely affect tourism in southern California due to real or perceived degradation of the coastal environment. To provide insight into the level of tourism-related economic activity that may be affected by a CDE in or near southern California, **Table 11-2** presents estimated establishment counts, employment, wages, and total value added (GDP) for the tourism and recreation sector in the six coastal counties closest to the Southern California planning area. The "ocean" economy data in the table are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the southern California shoreline. With regard to the coastal economy data, which show much larger impacts than the ocean economy data, it should be noted that southern California has an enormous tourism industry, much of which is unrelated to the coastal environment (e.g. Disney Land). Los Angeles alone welcomed 26.9 million visitors in 2011, who spent more than $15.2 billion, more than a third of it from international visitors (Los Angeles Tourism Statistics, 2011). Because of the significant inland

[26] Because different species are harvested in different areas of California, this breakdown may overestimate or underestimate the total impacts to the southern California seafood industry. The impacts described in Table 11-1 are an approximation, in order to suggest the magnitude of activity potentially affected by a CDE.

tourism industry in these coastal counties, the ocean-dependent tourism and recreation sector accounts for 0.44 percent of California's state GDP while the leisure and hospitality sector for coastal counties as a whole accounts for 2.46 percent (based on state GDP data from BEA, 2011).

Table 11-2: Measures of the Southern California Coast Tourism and Recreation Sector, 2009

Industry	Establishments	Employment	Wages (million$)	Value Added (million$)
Ocean Economy Data: Tourism and Recreation Sector				
Los Angeles	1,844	40,294	873.2	1,834.4
Orange	1,478	34,771	768.1	1,627.2
San Diego	2,528	57,645	1,277.2	2,769.8
San Luis Obispo	409	6,431	109.2	234.0
Santa Barbara	565	12,148	247.2	523.5
Ventura	639	10,505	173.9	372.7
Total	**7,463**	**161,794**	**$3,448.8**	**$7,362.0**
Coastal Economy Data (Shore-adjacent Counties): Leisure and Hospitality Sector				
Los Angeles	27,210	395,177	$12,672.8	$24,461.7
Orange	7,108	171,076	$3,601.1	$6,951.0
San Diego	6,908	165,835	$3,728.2	$7,196.4
San Luis Obispo	886	14,941	$251.2	$484.8
Santa Barbara	1,174	24,364	$512.9	$989.9
Ventura	1,734	30,596	$563.2	$1,087.2
Total	**45,020**	**801,989**	**$21,329.4**	**$41,171.1**
Source: NOEP, 2012a; NOEP, 2012b.				

11.2.3 Commercial Shipping and Transport

Southern California has two of the United States' 10 largest ports, measured in terms of cargo tonnage, Long Beach and Los Angeles. Together, these two ports oversaw six percent of the United States' total port traffic in 2009. A CDE that disrupted or halted marine traffic to one or both of these ports would likely cause widespread disruption for the southern California region as well as the domestic and foreign trade sources that rely on its ports. These ports are shaded in grey below in **Table 11-3,** along with their total tonnage of imports and exports. The top 10 U.S. ports are displayed for comparison.

Table 11-3: Top 10 Ports in the U.S. and Top Southern California Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
119	Port Hueneme, CA	1.37	1.27	0.09	.007
124	San Diego, CA	1.14	1.09	0.02	0.03

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in California.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

11.2.4 Oil and Gas Production

Southern California is the only offshore oil and gas producing area in the United States outside of Alaska and the Gulf of Mexico. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 6.70 billion barrels of oil-equivalent (BOEM, 2012). Most oil and gas production near the coast of California takes place in or near the Southern California planning area (BOEM, 2012b and BOEM, 2012c). Currently, there are 23 oil and gas platforms in federal waters (more than five miles from shore). In comparison, approximately 3,400 offshore platforms are active in the three Gulf of Mexico planning areas. In 2009, production for state and federal leases combined off the coast of southern California had dropped to 35.6 million barrels for the year, which accounted for 15.5 percent of California's total reported oil production for that year (California Department of Conservation, 2010). **Table 11-4** presents annual production offshore southern California since 1999.

Table 11-4: Annual Oil and Natural Gas Production Offshore Southern California, 1999-2009

Year	Southern California Off-Shore Oil Production (millions bbl)			Southern California Off-Shore Gas Production (millions McF)		
	Total	State	Federal OCS	Total	State	Federal OCS
1999	57.4	18.1	39.3	47.1	6.5	40.6
2000	54.2	18.3	35.9	45.4	6.9	38.5
2001	50.2	17.0	33.2	45.1	6.8	38.3
2002	48.4	16.3	32.1	47.7	6.9	40.8
2003	45.6	15.9	29.7	45.4	6.1	39.3
2004	43.2	15.7	27.5	45.8	6.8	39.0
2005	41.7	15.3	26.4	42.1	6.6	35.5
2006	41.3	15.1	26.2	34.0	6.5	27.5
2007	39.4	14.7	24.7	39.9	6.9	33.0
2008	38.1	14.1	24.0	36.6	6.7	29.9
2009	35.6	13.3	22.3	34.9	5.3	29.6

Notes: Oil measured in barrels (bbl), natural gas measured in thousands of cubic feet (McF).
Source: California Department of Conservation, 2010.

California has not permitted any new leasing in state waters since 1969. Any new leasing in state waters is unlikely to occur in the near future as the 1994 moratorium on offshore drilling in state waters still remains intact (Reuters, 2003).

11.3 Public Use in the Southern California Planning Area and the Nearby Coastal Area

11.3.1 Coastal Recreation

Beach visitation, surfing, boating, and other uses of coastal waters are immensely popular activities in southern California, and would be vulnerable to a CDE in or near the Southern California planning area. Use of the area's beaches is essential to both residents' and out-of-state visitors' decisions to visit the southern California coast and contribute to the region's economy (King, 2003). One study estimated that as many as 146 million visitor days were made to southern California beaches alone in 2002, and another estimated that Los Angeles and Orange County beaches saw more than 79 million visitors in 2000 alone (Kildow and Cogan, 2005).

In addition to beach recreation, southern California has a number of NWR and National Parks along its coasts that attract visitors for wildlife viewing and fishing. These include the Guadalupe Nipomo, Seal Beach, San Diego Bay, San Diego, and Tijuana Slough NWRs (USFWS, 2012). **Table 11-5** displays annual visitation for 2011 to two of southern California's coastal national parks, the Channel Islands and the Santa Monica Mountains. The economic value of these parks is highly uncertain, but the U.S. Fish and Wildlife Service estimates that state residents in California place a median value of $45 per day on wildlife watching in California. For visitors, the figure was higher, at $63 per day (USFWS, 2009).

Table 11-5: Southern California National Park Visitation Statistics, 2011

Month	Channel Islands NP	Santa Monica Mountains NRA	Total
January	14,343	57,061	71,404
February	5,384	42,811	48,195
March	16,432	56,082	72,514
April	24,939	55,783	80,722
May	20,563	71,959	92,522
June	27,136	56,208	83,344
July	38,637	43,273	81,910
August	30,872	58,367	89,239
September	21,264	51,249	72,513
October	19,337	39,061	58,398
November	11,667	38,860	50,527
December	12,182	38,922	51,104
2011 Total	**242,756**	**609,636**	**852,392**

Source: NPS, 2012.

11.3.2 Recreational Fishing

Recreational marine fishing is an important public use of the southern California coast for thousands of residents and visitors alike. Primary species for recreational harvesting in the region are sand bass, surf perch, thresher shark, calico bass, and croaker. To characterize the magnitude of sport fishing on the regional economy, **Table 11-6** presents select economic activity related to recreational fishing expenditures from 2006. Between shore-based fishing, charter boats, and private boats, marine anglers spent more than $2.1 billion in southern California in 2006, supporting approximately 16,600 jobs, $2.6 billion in sales, and $267 million in state and local tax revenues. Recreational fishing along the southern California coast also contributed $1.4 billion to California's state GDP, or 0.08 percent of the total (based on state GDP data from BEA, 2011).

Table 11-6: Economic Activity Related to Marine Recreational Fishing in Southern California, 2006

Type	Expenditures (million$)	Jobs	Total Sales (million$)	Value Added (million$)	State and Local Tax Revenues (million$)
Shore-based	$676.2	5,247	$821.9	$425.9	$84.3
Party/Charter	$697.4	5,671	$868.5	$454.1	$87.0
Private	$768.2	5,722	$930.1	$479.5	$95.8
TOTAL[1]	**$2,141.8**	**16,640**	**$2,620.5**	**$1,359.5**	**$267.1**

Note:
1. Total equals sum of expenditures, jobs, total sales, value added and state and local tax revenues.
2. These data do not include San Luis Obispo County.

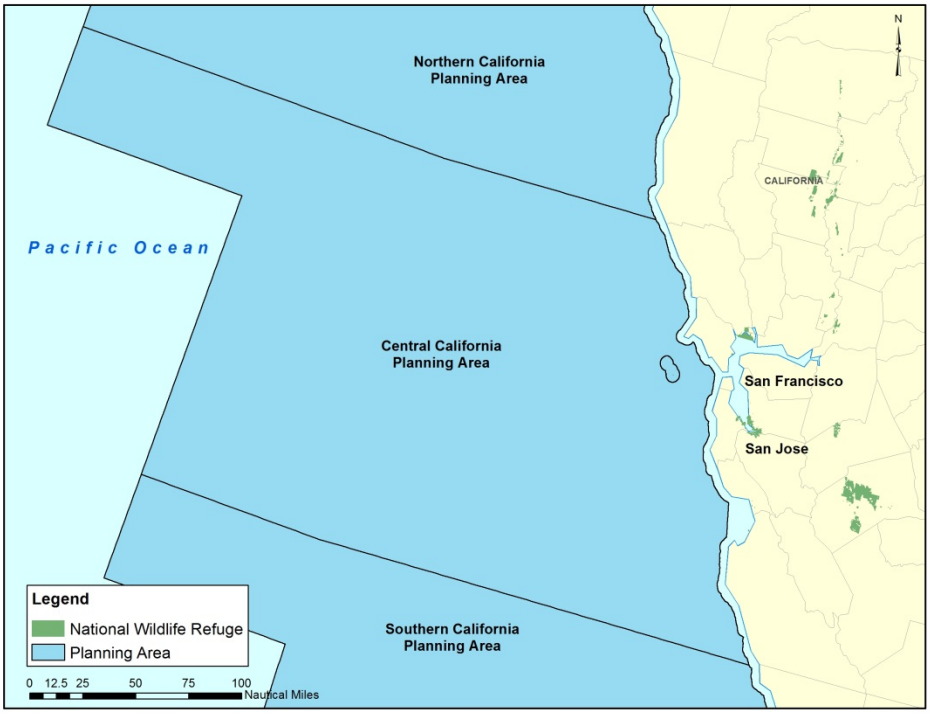
Source: Southwick Associates, 2009.

11.3.3 Subsistence Use

As noted in prior chapters, information on subsistence fishing, shrimping, and other marine activities in United States waters outside of Alaska is extremely limited. Insofar as subsistence fishing exists in southern California, it may be most prevalent in those areas designated as "fishing communities" by NOAA: cities and towns with strong ties to commercial and/or recreational fishing. Demographic data suggest that the percentage of family households below the poverty level was noticeably higher than the state average in many of the NOAA fishing communities in southern California, including Crescent City (33.7 percent) and Point Arena (24.1 percent). By comparison, the state average is 10.6 percent (see NOAA, 2009b).

12. Central California

Figure 12-1: Map of the Central California Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

The Central California planning area, shown above in **Figure 12-1**, is near ten coastal counties in California, extending from Sonoma County in the north to Monterey County in the south. This chapter characterizes the resources and activities that could be affected by a CDE in or near the Central California planning area based on data specific to these counties and the adjacent marine environment. Counties included as part of the central California coast in this chapter are: Sonoma, Marin, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, Santa Cruz, and Monterey counties.

12.1 Physical and Biological Resources in the Central California Planning Area and the Nearby Coastal Area

The central California coast is dominated by the San Francisco Bay Estuary, the largest on the U.S. Pacific Coast. The Bay provides key ecological functions for the entire regional economy, and supports an enormous variety of habitats and wildlife. Cool currents from the Pacific into the Bay help regulate the climate of the Bay Area, while wetlands and floodplains store water during storms, contributing to water quality maintenance and nutrient cycling (Battelle Memorial Institute, 2008). All told, the estuary and its tributaries provide drinking water to roughly 23 million Californians (two thirds of the state's population) and irrigation water for 4.5 million acres of farmland (EPA, 2007).

Ecologically, San Francisco Bay supports a wide variety of life, including one million birds that rest and feed in the Bay during their seasonal migrations, and more than 130 distinct species of fish. Approximately 15,000 gray whales also migrate down the entire Pacific Coast for the winter, from the Arctic to Baja California. The San Francisco Bay is also a hugely popular destination for eco-tourism, with extensive opportunities for recreational boating, wildlife viewing and bird watching, and coastal hiking (Battelle Memorial Institute, 2008).

Further south, the Monterey Bay National Marine Sanctuary includes one of the nation's largest kelp forests and underwater canyons, as well as the closest-to-shore deep ocean environment in the continental United States. In addition to numerous invertebrates and plants, the Bay provides a home to 33 species of marine mammals, 94 species of seabirds, and 345 species of fish, making it one of the most diverse marine ecosystems in the world (Monterey Bay National Marine Sanctuary, 2012).

Offshore from the coast, the interaction of currents influences the distribution of water temperatures, nutrients, and marine organisms. An abundance of food sources support a variety of fish and bird populations, as well as mammals such as sea lions and elephant seals. Humpback and gray whales are also relatively common in California's offshore ocean zone. The marine ecosystem and the near- and on-shore ecosystems are interdependent, and are of enormous importance to the coastal economy of California (Resources Agency of California, 1997).

12.2 Economic Activity in the Central California Planning Area and the Nearby Coastal Area

12.2.1 Commercial Fishing

The waters in and near the Central California planning area are important to California's commercial fishing industry; approximately 17.1 percent of California's total landings, by pound, were harvested from federal and state waters off the coast of San Francisco, Monterey Bay, Bodega Bay, and the Sacramento Delta in 2010. Key fish species off the coast of central California, by weight, include California halibut, sablefish, Dover sole, and swordfish. Dungeness crab and market squid were also important to the major central California fisheries (California Department of Fish and Game, 2011).

Table 12-1 summarizes the economic activity from commercial fishing in central California. The estimates in the table below are based on data for the entire state of California. To derive estimates specific to central California, this analysis distributes the state-wide economic data to individual counties in proportion to county-level landings as reported by the California Department of Fish and Game.[27] For example, the state-wide data show employment of 3,200 jobs for commercial harvesters state-wide, but the impact to central California was 548, which reflects the fact that the region accounts for 17 percent of the state's landings. The commercial fishing industry near the Central California planning area supports roughly

[27] Because different species are harvested in different areas of California, this breakdown may overestimate or underestimate the total economic activity associated with the central California seafood industry. The economic activity presented in **Table 12-1** is an approximation, in order to suggest the magnitude of activity potentially affected by a CDE.

20,600 jobs and $733 million in wages, as well as roughly $3.4 billion in sales. It also generates $1.2 billion in total value added, or 0.07 percent of California's GDP (based on state GDP data from BEA, 2011).

Table 12-1: Economic Activity from the Central California Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
CENTRAL CALIFORNIA				
Commercial Harvesters	548	$51.8	$17.9	$26.2
Seafood Processors and Dealers	718	$73.7	$27.3	$36.3
Importers	9,481	$2,608.0	$418.0	$795.0
Seafood Wholesalers and Distributors	1,857	$264.9	$85.9	$120.0
Retail Sectors	8,017	$439.1	$184.3	$243.4
Total	**20,621**	**$3,437.5**	**$733.4**	**$1,221.0**
Source: NOAA, 2009a.				

12.2.2 Tourism and Recreation

The coastal area adjacent to the Central California planning area is a major tourism destination for California residents, out of state domestic visitors, and international visitors alike. San Francisco Bay alone drew nearly 16 million visitors in 2006, which spent $7.8 billion, an average of $21.3 million per day. These expenditures supported approximately 68,700 jobs and $1.8 billion in income that year, as well as $473 million in taxes to the City of San Francisco (Battelle Memorial Institute, 2008).

To highlight the economic significance of tourism along the coast of central California, **Table 12-2** presents an overview of the economic activity from the tourism and recreation industries in this region. These data describe both the "ocean" and "coastal" economies of each county in the central California coastal area as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the Pacific shore (NOEP, 2012).

As represented by the ocean-economy data, the tourism and recreation sector for the counties near the Central California planning area accounted for more than 8,100 establishments and 143,400 jobs, as well as more than $3.3 billion in wages and $7.0 billion in total value added (GDP). The entire leisure and hospitality sector of all these coastal counties (i.e., as reflected in the coastal economy data) was significantly higher, contributing more than 350,000 jobs and $8.5 billion in wages across 20,000 establishments, as well as $16.4 billion in GDP. With regard to the differences between the ocean economy and coastal economy data, it should be noted that central California has an enormous tourism industry, much of which is unrelated to the coastal environment (e.g., wine-related tourism in Napa Valley).

Table 12-2: Measures of the Central California Coast Tourism and Recreation Sector, 2009

County	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data – Tourism and Recreation Sector				
Alameda	1,406	20,638	$381.8	$796.7
Contra Costa	648	8,924	$144.7	$304.6
Marin	537	7,824	$168.6	$344.0
Monterey	522	12,163	$301.7	$637.2
San Francisco	2,369	49,962	$1,449.1	$3,076.4
San Mateo	1,323	22,296	$501.5	$1,034.3
Santa Clara	291	5,661	$133.74	$279.7
Santa Cruz	478	7,192	$123.8	$259.0
Solano	286	4,053	$58.14	$121.8
Sonoma	276	4,726	$85.04	$177.0
Regional Total	**8,136**	**143,439**	**$3,348.1**	**$7,030.7**
Coastal Economy Data – Leisure and Hospitality Sector				
Alameda	3,462	57,239	$1,450.0	$2,798.9
Contra Costa	1,928	31,935	$596.9	$1,152.2
Marin	865	12,747	$300.4	$579.9
Monterey	1,027	20,512	$481.8	$930.1
San Francisco	3,738	76,241	$2,318.7	$4,475.7
San Mateo	1,869	34,320	$806.6	$1,556.9
Santa Clara	4,147	74,414	$1,763.1	$3,403.2
Santa Cruz	697	11,335	$199.4	$384.8
Solano	750	13,300	$197.7	$381.6
Sonoma	1,282	20,924	$391.5	$755.8
Regional Total	**19,765**	**352,967**	**$8,506.2**	**$16,419.1**
Source: NOEP, 2012a; NOEP, 2012b.				

12.2.3 Commercial Shipping and Transport

The central California region oversaw 46.2 million tons of marine transport traffic in 2009, or 2.1 percent of total U.S. traffic, including both imports and exports. Five ports in the region were among the top 150 ports in that year, according to the U.S. Army Corps of Engineers, all of which are located within the San Francisco Bay area. A CDE that disrupted or halted marine traffic to these ports would likely cause widespread difficulties for both the central California region and the domestic and foreign trade sources that rely on its ports. These ports are listed in **Table 12-3** along with their total tonnage of imports and exports. The top 10 U.S. ports are displayed for comparison.

Table 12-3: Top 10 Ports in the U.S. and Top Central California Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
28	Richmond, CA	25.4	17.4	7.32	0.65
39	Oakland, CA	17.4	6.78	10.6	0.02
113	Stockton, CA	1.63	1.01	0.63	0
133	Redwood City, CA	0.91	0.55	0.35	0
136	San Francisco, CA	0.89	0.78	0.11	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located in California.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

San Francisco also maintains a significant commuter ferry industry. Between 2002 and 2006, daily ferry ridership in the city grew from 8,400 to 9,600, a 15 percent increase. The city's Water Emergency Transit Authority is expected to continue expanding the program, adding new routes and additional boats, and improving coordination (Bay Area Economics, 2008). A CDE affecting San Francisco Bay could pose a major inconvenience to workers who rely on the ferry to commute to and from work on a regular basis.

12.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place off the coast of Central California. All offshore oil and gas production off the coast of California takes place in southern California (BOEM, 2012b and BOEM, 2012c). As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 2.84 billion barrels of oil-equivalent (BOEM, 2012).

12.3 Public Use in the Central California Planning Area and the Nearby Coastal Area

12.3.1 Coastal Recreation

Outdoor coastal recreation is an important use of coastal resources along the central California coast. Beach and other waterside visitation, swimming, surfing, sportfishing, boating, and wildlife viewing were among the many activities undertaken by residents of and visitors to the region. The central California coast is home to a variety of NWR and National Parks. NWRs in the area include San Pablo Bay, Marin Islands, Farallon, and Don Edwards San Francisco Bay, all of which are in San Francisco Bay, and the Salinas River NWR near Monterey Bay. **Table 12-4** presents visitation statistics from 2011 for two national parks in the central California area: Point Reyes National Seashore and the Golden Gate National Recreation Area, the latter of which saw more than 14.5 million visitors in 2011.

Likely in part due to central California's mild climate, there is not a great deal of seasonal variation in visitation at either park, suggesting that a CDE could have an equally detrimental effect on park visitation regardless of when it occurs during the year (Battelle Memorial Institute, 2008). The value that the public places on these parks is uncertain, but the U.S. Fish and Wildlife Service estimates that California residents place a median value of $45 per day on wildlife watching in California, while for visitors, the figure was higher, at $63 per day (USFWS, 2009).

Table 12-4: Central California National Park Visitation Statistics, 2011

Month	Point Reyes NS	Golden Gate NRA	Total
January	146,102	1,111,106	1,257,208
February	135,088	1,102,650	1,237,738
March	168,704	1,236,426	1,405,130
April	175,047	1,213,125	1,388,172
May	209,193	1,240,951	1,450,144
June	194,023	1,409,782	1,603,805
July	246,406	1,265,819	1,512,225
August	208,204	1,343,961	1,552,165
September	199,616	1,181,128	1,380,744
October	166,879	1,247,138	1,414,017
November	138,285	1,085,226	1,223,511
December	141,569	1,130,175	1,271,744
2011 Total	**2,129,116**	**14,567,487**	**16,696,603**
Source: NPS, 2012.			

12.3.2 Recreational Fishing

The coastal zone near the Central California planning area supports a large recreational fishing community. The San Francisco Bay area in particular provides abundant opportunity for recreational fishing for visitors and residents alike. Primary recreational fish species in the San Francisco Bay include rockfish, salmon, sanddabs, halibut, and surf perch (Southwick

Associates, 2008). To assess the potential economic magnitude of a CDE on marine recreational fishing in and near the Central California planning area, **Table 12-5** presents economic activity data for the San Francisco Bay area for San Mateo, San Francisco, Marin, and Sonoma Counties. Because these data do not reflect all 10 counties near the Central California planning area, they represent a low-end view of the total recreational fishing activity. In these four counties, marine recreational fishing contributed $104 million in retail sales; 1,600 jobs; $60 million in salaries, wages, and earnings; and $27 million in federal, state, and local tax revenues.

Table 12-5: Impacts of Marine Recreational Fishing in San Francisco Bay, 2007

Type of Trip	Retail Sales (million$)	Total Multiplier Effect (million$)	Earnings (million$)	Jobs	Federal Tax Revenues (million$)	State and Local Tax Revenues (million$)
Man-Made Structures	$23.7	$42.0	$13.6	366	$3.2	$3.0
Beach and Bank	$58.2	$102.9	$33.2	897	$7.7	$7.3
Party and Charter Boat	$15.2	$26.9	$8.7	234	$2.0	$1.9
Private and Rental Boat	$7.4	$13.0	$4.2	114	$1.0	$0.9
Total	**$104.4**	**$184.8**	**$59.6**	**1,611**	**$13.9**	**$13.0**

Source: Southwick Associates, 2008.

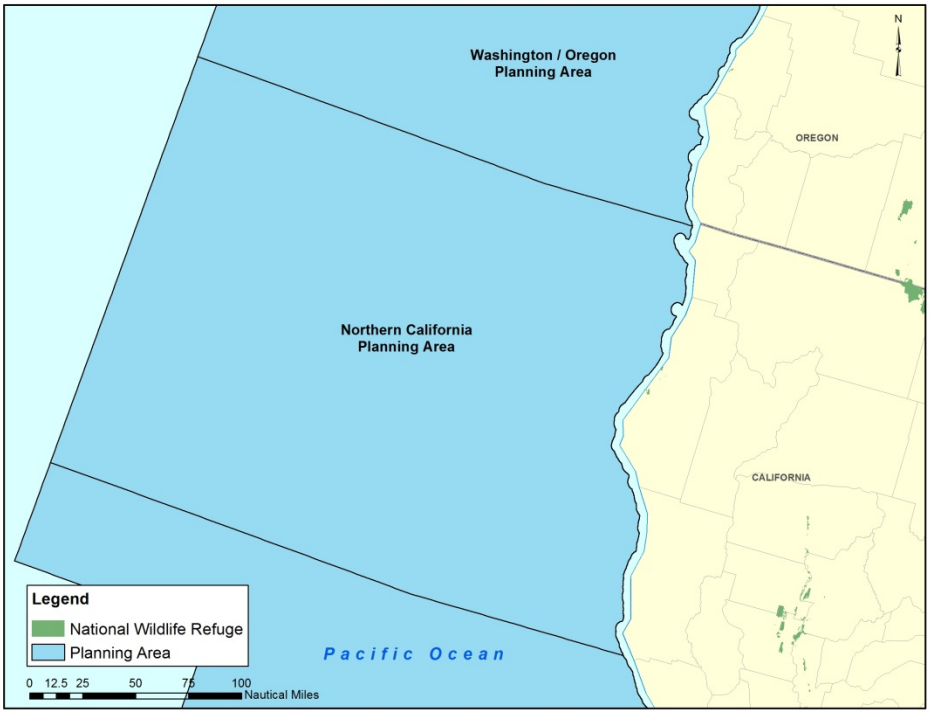
12.3.3 Subsistence Use

As indicated elsewhere in this report, data on subsistence fishing and shellfish harvesting outside of Alaska is generally limited, and primarily anecdotal. In California, official information on subsistence fishing is included within recreational fishing data. Studies focused on other regions of the U.S. tend to focus on urban areas with an eye toward enforcing health advisories for consuming recreationally caught fish or shellfish.

Evidence suggests that subsistence fishing in the San Francisco Bay area is disproportionately undertaken by low-income, native, and immigrant populations, and that these groups rely on their harvests as an important component of their food supply. A 1998 study of a Laotian community in the eastern San Francisco Bay found that 87 percent of those surveyed reported eating seafood at least once a month, and 54 percent of respondents reported consuming fish that they caught by themselves, or their friends or family members. The study found more than 54 percent of the surveyed community consumed fish caught through subsistence fishing (Battelle Memorial Institute, 2008).

13. Northern California

Figure 13-1: Map of the Northern California Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

The Northern California planning area, shown above in **Figure 13-1**, is in close proximity to the coast of three counties in northern California: Del Norte, Humboldt, and Mendocino counties. Wherever possible, this chapter relies on data for these counties and the adjacent coastal waters to characterize the resources and activities that might be affected by a CDE associated with oil and gas production in the Northern California planning area.

13.1 Physical and Biological Resources in the Northern California Planning Area and the Nearby Coastal Area

Ecologically, the coast of northern California is classified as being part of the California Coastal Steppe bioregion. In general, this region is characterized by a Mediterranean climate, with cool, wet winters and warm, dry summers. Along the coast, the Pacific Ocean greatly moderates temperatures, which become more extreme further inland. Low-conifer forests dominate the coasts, interspersed with grasslands and coastal scrub (Sugihara et al., 2006). Offshore, the California Current dominates the marine ecosystem, as it does in the other California planning areas. One of the most intense upwellings of the California Current takes place during the summer off Cape Mendocino. These upwellings support significant productivity of marine plants and large fish populations, due to the nutrient laden subsurface waters being drawn up to surface waters that are blown away from the coast (Wolf, 2001).

Castle Rock National Wildlife Refuge, a small island off the coast of northern California, provides an important habitat for Aleutian Canada geese and nesting seabirds; it is the second largest nesting seabird colony south of Alaska, after the Farallon Islands in San Francisco Bay. More than 21,000 Aleutian Canada geese roost on the island. In addition, the NWR provides an important sanctuary for harbor seals, northern elephant seals, California sea lions, and stellar sea lions. Nearby, Humboldt Bay NWR encompasses a wide expanse of wetland habitats, on which tens of thousands of migratory water birds depend, including shorebirds, ducks, geese, swans, and black brant.[28] More than 200 species of birds regularly use the area around the bay, as do approximately 100 species of fish, many of which are important to recreational and commercial fishing (USFWS, 2012).

13.2 Economic Activity in the Northern California Planning Area and the Nearby Coastal Area

13.2.1 Commercial Fishing

The waters in and near the Northern California planning area are important to California's commercial fishing industry; approximately 7.3 percent of California's total landings, by pound, were harvested from the Eureka and Fort Bragg areas in 2010. Key fish species in northern California, by weight, include sablefish, sole, thornyhead, hagfish, red sea urchin, Dungeness crab, and ocean shrimp (California Department of Fish and Game, 2011).

Table 13-1 summarizes the economic activity related to commercial fishing in northern California. The estimates in the table below are based on data for the entire state of California. To derive estimates specific to northern California, this analysis distributes the state-wide economic data to individual counties in proportion to county-level landings as reported by the California Department of Fish and Game. [29] For example, the state-wide data show employment of 3,203 jobs for commercial harvesters state-wide, but the impact to northern California was 235 jobs, which reflects the region's 7 percent share of statewide landings. The commercial fishing industry in and near the Northern California planning area supports roughly 8,800 jobs and $315 million in wages, as well as roughly $1.5 billion in sales. It also generated $524 million in total value added, or 0.03 percent of California's state GDP (based on state GDP data from BEA, 2011).

[28] The black brant is also referred to as the Pacific brent goose.

[29] Because different species are harvested in different areas of California, this breakdown may overestimate or underestimate the total economic activity associated with the northern California seafood industry. The economic activity data presented in Table 13-2 are an approximation, in order to suggest the magnitude of activity potentially affected by a CDE.

Table 13-1: Economic Activity for the Northern California Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
NORTHERN CALIFORNIA				
Commercial Harvesters	235	$22.2	$7.70	$11.3
Seafood Processors and Dealers	308	$31.6	$11.7	$15.6
Importers	4,069	$1,119.2	$179.4	$341.2
Seafood Wholesalers and Distributors	797	$113.7	$36.9	$51.5
Retail Sectors	3,440	$188.4	$79.1	$104.4
Total	**8,849**	**$1,475.1**	**$314.7**	**$524.0**
Source: NOAA, 2009a.				

13.2.2 Tourism and Recreation

The northern California coast supports a range of ocean-based tourism activities, in particular outdoor activities, but also resorts, spas, and wine touring. Given the importance of the region's outdoor environment to the tourism industry, a CDE could have detrimental effects for businesses near the coast. **Table 13-2** presents an overview of the tourism and recreation sector in northern California, by county. These data describe both the "ocean" and "coastal" economies of each county in the northern California coastal area as derived from county level data. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. This is the tourism-related economic activity that would most likely be affected in the event of a CDE that caused real or perceived damage to the northern California coastline and the surrounding area.

Table 13-2 also presents "coastal" economy data, which comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent to the Pacific shoreline. Given the size of the three counties near the Northern California planning area, these data likely reflect jobs and businesses not in close proximity to the Pacific coast.

Table 13-2: Measures of the Northern California Coast Tourism and Recreation Sector, 2009

County	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data – Tourism and Recreation Sector				
Del Norte	85	1,127	$20.2	$39.0
Humboldt	388	5,988	$92.4	$178.7
Mendocino	354	4,247	$71.0	$137.3
Total	**827**	**11,362**	**$183.6**	**$355.0**
Coastal Economy Data – Leisure and Hospitality Sector				
Del Norte	85	1,127	$20.2	$39.0
Humboldt	388	5,988	$92.4	$178.8
Mendocino	354	4,247	$71.0	$137.3
Total	**827**	**11,362**	**$183.6**	**$355.1**
Source: NOEP, 2012a; NOEP, 2012b.				

13.2.3 Commercial Shipping and Transport

The coastal waters near the Northern California planning area do not have any major ports for commercial shipping and transport. Within California, shipping activity is concentrated in ports near the other California planning areas, with major hubs in San Francisco, Los Angeles, and Long Beach (USACE, 2009).

13.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place off the coast of Northern California. All offshore oil and gas production in California takes place in and near the Southern California planning area (BOEM, 2012b and BOEM, 2012c). As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 2.71 billion barrels of oil-equivalent (BOEM, 2012).

13.3 Public Use in Northern California and the Nearby Coastal Area

13.3.1 Coastal Recreation

The North Coast of California supports a range of outdoor recreational activities, particularly hiking, boating, and wildlife viewing. The region has two major NWRs and one National Park. Castle Rock NWR is half a mile offshore from Crescent City, and covers approximately 14 acres, 334 feet above sea level, while Humboldt Bay NWR encompasses public and private land around Humboldt Bay. Both NWRs provide important habitats for migratory birds and other wildlife, and many species of common recreational fish. Northern California also has a major national park, Redwoods National Park, which hosted just over 380,000 visitors in 2011, as indicated in **Table 13-3**.

The value that society places on these parks is uncertain. The U.S. Fish and Wildlife Service, however, estimates that California residents place a median value of $45 per day on wildlife watching in California, and for visitors, the figure was higher, at $63 per day (USFWS, 2009). A CDE that caused real or perceived damage to the coast could discourage visitors, depriving the region of the economic benefits of visiting tourists.

Table 13-3: Visitation to Redwoods National Park, 2011

2011	Rec Visits	Tent Campers	Back Country Campers	Total Overnight Stays[1]
January	16,364	70	8	168
February	12,468	36	19	107
March	18,385	111	118	449
April	19,784	85	48	539
May	28,613	191	43	798
June	50,231	228	131	1,433
July	74,527	269	407	1,066
August	54,168	0	288	288
September	45,916	237	155	392
October	33,542	67	65	132
November	12,248	0	26	26
December	13,921	0	22	22
2011 Total	**380,167**	**1,294**	**1,330**	**5,420**

Note:
1. Includes miscellaneous overnight stays.
Source: NPS, 2012.

13.3.2 Recreational Fishing

Recreational fishing represents one of the most significant public uses of coastal resources located near the Northern California planning area. Common species for recreational anglers include salmon, groundfish, albacore, halibut, abalone, and crab. Recreational anglers in northern California also participate in winter crab harvesting (Pomeroy, 2010). A CDE that resulted in closures of recreational fishing waters and/or damage to these species could severely hinder recreational fishing activity along the northern California coast.

To quantify the magnitude of recreational fishing activity that may be affected by a CDE, **Table 13-4** presents the number of trips taken by marine anglers on California's North Coast between 2005 and 2007. In total, anglers took 648,000 trips over these three years, or approximately 216,000 per year. Roughly two thirds of these trips took place in the "Redwood District" (Humboldt and Del Norte Counties) and the rest in the "Wine District" (Mendocino County). Approximately 36 percent of these trips were taken from private or rental boats, 29 percent from the beach, 26 percent from manmade structures, and 9 percent from charter boats.

Table 13-4: Number of Ocean Recreational Angler Trips in Northern California, 2005-2007

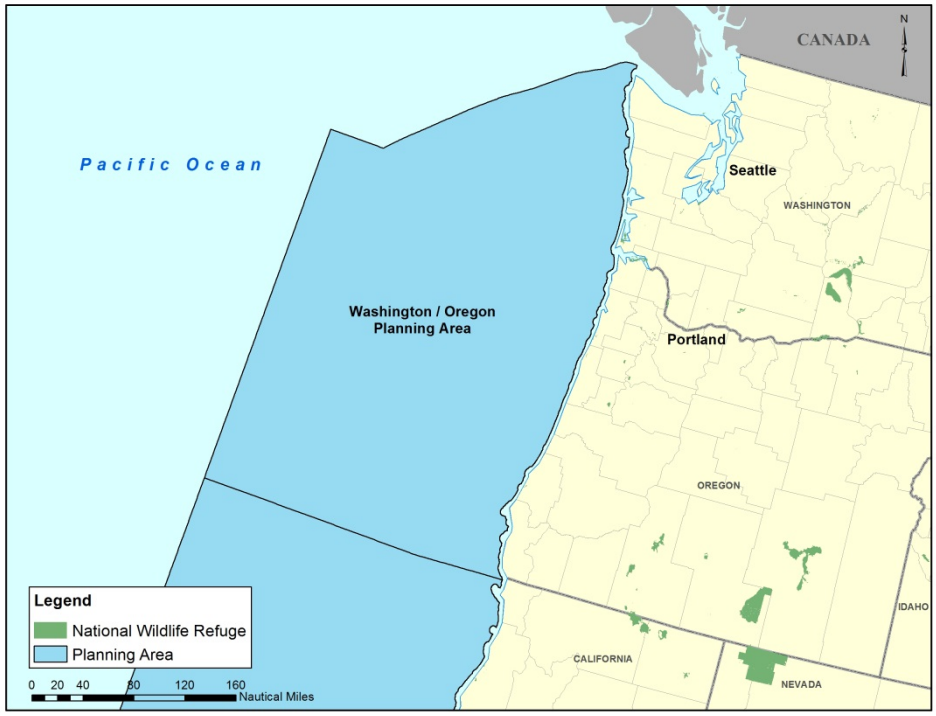
Year	Trips Taken (thousands)				
	Manmade	Beach or Bank	Charter	Private or Rental	Total
Wine District (Mendocino County)					
2005	7	14	35	42	98
2006	5	13	4	29	51
2007	13	23	6	27	69
Average	**8**	**17**	**15**	**33**	**73**
Redwood District (Humboldt, Del Norte Counties)					
2005	53	43	3	42	141
2006	52	58	5	46	161
2007	43	36	5	44	128
Average	**49**	**46**	**4**	**44**	**143**
Total North Coast					
2005	60	57	38	84	239
2006	57	71	9	75	212
2007	56	59	11	71	197
Average	**57**	**63**	**19**	**77**	**216**
Source: Pomeroy, 2010.					

13.3.3 Subsistence Use

As indicated elsewhere in this report, data on subsistence fishing and shellfish harvesting outside of Alaska is generally limited, and primarily anecdotal. In California, official information on subsistence fishing is included within recreational fishing data. According to NOAA, the fishing communities of northern California are Albion, Crescent City, Eureka, Fields Landing, Fort Bragg, Kneeland, McKinleyville, Point Arena, Trinidad, and Ukiah (Norman et al., NOAA, 2007). The Klamath River, running through Del Norte, Humboldt, and Siskiyou counties, also plays an important role in the diets of the Yurok and Tolowa tribes. In 2011, the fall harvest of chinook salmon by the Yurok Tribe was estimated to be around 13,000 fish (Stubblefield, 2012). Because salmon are an anadromous species, a CDE in or near the Northern California planning area could have a major adverse impact on the Yurok and other populations in northern California that subsist on salmon.

14. Washington/Oregon

Figure 14-1: Map of the Washington/Oregon Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

14.1 Physical and Biological Resources in the Washington/Oregon Planning Area the and Nearby Coastal Area

Ecologically the waters in and near the Washington/Oregon planning area, shown above in **Figure 14-1**, are among the richest temperate marine ecosystems in the world. Together, the coasts of Washington and Oregon span 4,400 miles of tidal shoreline, comprising estuaries, sandy beaches, rocky headlands, and a vast array of fish, birds, and mammals, both onshore and in open water. A CDE associated with oil and gas production in the area could cause significant damage to the various coastal and offshore ecosystems in the region, damaging natural resources that support both commercial and recreational use.

Oregon's 360-mile stretch of coastline contains 22 major estuaries, more than 1,400 rocky outcrops and islands, and approximately 82 miles of rocky intertidal habitat, all of which support significant biological diversity. The tidal shoreline supports important ecological functions, particularly as nursery grounds for fish and invertebrates. Many commercially important species, including Dungeness crabs and Pacific herring, nest in seagrass beds along the coast. At least fourteen species of seabirds also nest and breed along the coast; more than one million birds rely on the Oregon coast for their habitat, including the endangered snowy plover. Various species of aquatic marine mammals also rely on Oregon's rocky outcrops and shores, including California sea lions, Pacific harbor seals, stellar sea lions, and northern elephant seals. Oregon's waters provide a critical stop for gray whales' migratory route between the Arctic and southern

California, and each year roughly 200 gray whales remain in the waters off the Oregon coast rather than continuing on to Alaska. In addition, hundreds of species of fish and invertebrates live offshore from the Oregon coast in rocky reefs and kelp forests (Oceana, 2011).

Washington's estuaries are characterized by salt marshes, sandflats, and mudflats, all of which are important habitats for a variety of flora and fauna. More than 80 percent of the shoreline in the state's estuaries is composed of sand, mud, or organic material. Estuaries that lie on Washington's north coast, in Willapa Bay and Grays Harbor, are strongly influenced by ocean tides and wind-driven upwellings and downwellings, much more so than Washington's southern coast. Washington's salt marshes are important habitats for shorebirds and seals, as well as hunting grounds for various raptor species, given the abundance of voles, insects, spiders, and other invertebrates. Elk, deer, grant, ducks, and snow geese also frequent the salt marshes to scavenge for food. Washington's shore line is dominated by sandy beaches and is home to a variety of beach-adapted species that are important food sources for birds and other animals. In northern Washington, however, the coast is dominated by rocky shores and tidepools, home to kelp, algae, shellfish, small mammals, and shorebirds. Like other coastal areas, Washington's coastal ecosystems support a variety of important commercial fish and shellfish species (Skewgar and Pearson, 2011).

14.2 Economic Activity in the Washington/Oregon Planning Area and the Nearby Coastal Area

14.2.1 Commercial Fishing

In 2009, commercial fisheries in and near the Washington/Oregon planning area harvested 362 million pounds of finfish and shellfish generating total landings revenue of $330 million. The most widely harvested finfish in the region were hake, at 90 million pounds; pacific sardine, at 46 million pounds; and salmon, at 34 million pounds. Among shellfish, crab was most common, at 42 million pounds harvested across fisheries off the coasts of both Washington and Oregon. Revenue for fish and shellfish were roughly even in Oregon, while the high price of clams ($17 per pound) in Washington contributed to a total landings revenue of $228 million, nearly three quarters of which came from shellfish (NOAA, 2009a).

Table 14-1 presents a summary of the economic activity from the seafood industry in and near the Washington/Oregon planning area in 2009.[30] Overall, the industry is much larger in Washington than in Oregon. Together, the two states' seafood industries supported 71,400 jobs in 2009 and $2.2 billion in wages. The industry accounted for $501 million of Oregon's state GDP (value added), or 0.30 percent, and $2.9 billion in Washington, or 0.88 percent of that state's GDP (based on state GDP data from BEA, 2011).

[30] In contrast to the landings revenues presented above, the estimated economic activity data presented in **Table 14-1** are from NMFS Commercial Fishing Industry Input/Output model.

Table 14-1: Economic Activity from the Washington/Oregon Seafood Industry, 2009

Industry	Jobs	Sales (million$)	Income (million$)	Value Added (million$)
OREGON				
Commercial Harvesters	3,507	$194.3	$78.9	$111.7
Seafood Processors and Dealers	1,173	$100.3	$38.6	$50.4
Importers	1,749	$481.1	$77.1	$146.7
Seafood Wholesalers and Distributors	618	$74.5	$25.3	$33.9
Retail Sectors	6,708	$277.1	$121.5	$157.9
Total	**13,754**	**$1,127.4**	**$341.3**	**$500.5**
WASHINGTON				
Commercial Harvesters	5,491	$453.3	$194.3	$273.2
Seafood Processors and Dealers	15,928	$1,511.8	$567.8	$751.4
Importers	15,104	$4,154.9	$665.9	$1,266.6
Seafood Wholesalers and Distributors	2,454	$318.1	$106.6	$145.4
Retail Sectors	18,667	$862.2	$371.9	$488.3
Total	**57,643**	**$7,300.3**	**$1,906.5**	**$2,924.9**
Regional Total	**71,397**	**$8,427.7**	**$2,247.8**	**$3,425.4**
Source: NOAA, 2009a.				

14.2.2 Tourism and Recreation

Washington and Oregon support a significant coastal tourism industry that could be affected by a CDE, due to real or perceived damage to coastal areas. As displayed in **Table 14-2**, the tourism industry near the Washington/Oregon planning area supported 91,500 jobs and $1.6 billion in wages at nearly 7,000 establishments in 2009. These data reflect ocean economy data limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. **Table 14-2** also includes "coastal economy" data that comprise all industries and activities in the "leisure and hospitality" sector in counties that are adjacent, in whole or in part, to the Pacific shore. Based on the data in **Table 14-2**, ocean-dependent tourism made up 0.32 percent of Oregon's state GDP in 2009, and 0.92 percent of Washington's. Overall shore-adjacent leisure and hospitality (based on the coastal economy data) was more significant, composing 0.52 percent of Oregon's state GDP and 2.6 percent of Washington's (based on state GDP data from BEA, 2011).

Table 14-2: Measures of the Washington/Oregon Coastal Tourism and Recreation Sector, 2009

Industry	Establishments	Employment	Wages (million$)	GDP (million$)
Ocean Economy Data (Tourism and Recreation)				
OREGON				
Amusement and Recreation Services NEC[1]	55	210	$3.6	$8.9
Boat Dealers	23	162	$6.0	$10.6
Eating and Drinking Places	1,033	12,569	$188.3	$336.3
Hotels and Lodging Places	285	4,961	$88.6	$164.7
Marinas	19	93	$2.6	$4.2
Recreational Vehicle Parks and Campsites	60	318	$5.1	$9.6
Scenic Water Tours	23	81	$1.7	$3.4
Other	12	160	$4.08	$6.7
Total	**1,510**	**18,554**	**$300.0**	**$544.3**
WASHINGTON				
Boat Dealers	89	440	$15.0	$36.0
Eating and Drinking Places	4,454	58,043	$952.0	$1,997.6
Hotels and Lodging Places	454	10,786	$274.0	$836.3
Marinas	70	315	$9.6	$13.3
Recreational Vehicle Parks and Campsites	50	253	$4.8	$14.6
Scenic Water Tours	47	372	$12.7	$21.0
Sporting Goods Retailers	26	1,080	$47.0	$88.5
Other	273	1652	$25.2	$42.6
Total	**5,463**	**72,941**	**$1,340.3**	**$3,049.9**
Regional Total	**6,973**	**91,495**	**$1,640.3**	**$3,594.2**
Coastal Economy Data (Leisure and Hospitality)				
Oregon	2,500	31,526	$470.8	$869.8
Washington	12,946	204,839	$4,179.3	$8,765.5
Regional Total	**15,446**	**236,365**	**$4,650.1**	**$9,635.3**

Notes:
1. NEC – Not Elsewhere Classified.

Source: NOEP, 2012a; NOEP, 2012b.

14.2.3 Commercial Shipping and Transport

In the event of a CDE associated with oil and gas production in the Washington/Oregon planning area, commercial transport to and from marine ports in the region could be disrupted or halted for a sustained period of time, thereby disrupting the regional economy. The largest port near the Washington/Oregon planning area is Seattle, Washington, the 29th largest port in the United States as measured in terms of the total tonnage of cargo shipped. **Table 14-3** presents a summary of the total traffic in the Washington/Oregon planning area's largest ports, as defined by total traffic (USACE), and for comparison also includes the top ten ports in the country. Together, the seven ports near the Washington/Oregon planning area highlighted in gray accounted for 103 million tons of traffic in 2009, including both imports and exports, or 4.7 percent of total marine traffic in the United States.

Table 14-3: Top 10 Ports in the U.S. and Top Washington/Oregon Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.28
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.87
5	Corpus Christi, TX	69.2	44.2	22.0	2.06
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.94
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.24
9	Los Angeles, CA	58.4	35.7	21.9	0.77
10	Texas City, TX	52.6	37.6	14.5	0.45
…					
29	Seattle, WA	24.6	9.82	14.1	0.64
31	Portland, OR	23.3	9.06	13.8	0.41
32	Tacoma, WA	23.2	7.71	15.3	0.18
44	Anacortes, WA	10.4	7.71	2.70	0.02
46	Kalama, WA	9.91	0.84	9.07	0.00
60	Vancouver, WA	6.82	1.83	4.99	0
68	Longview, WA	5.10	1.89	3.21	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located near the Washington/Oregon planning areas.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

14.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place off the coasts of Washington or Oregon. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be 0.81 billion barrels of oil-equivalent (BOEM, 2012).

14.3 Public Use in the Washington/Oregon Planning Area and the Nearby Coastal Area

14.3.1 Coastal Recreation

The coasts of Washington and Oregon together span more than 4,400 miles of tidal shoreline and are home to more than 1.3 million inhabitants who use coastal resources for a range of recreational purposes. Between the two states, more than 6.5 million residents and visitors partook in at least one of a variety of outdoor activities in the coastal environment in 2000, primarily beach visitation, bird watching, and wildlife and scenery viewing. Washington was also one of the top five states in the nation for scuba diving, in terms of the number of participants, and one of the top five for viewing and photographing scenery, in terms of number

of days (Leeworthy and Wiley, 2001). Washington's Puget Sound and Straits of Juan de Fuca also support an active whale-watching industry (NOAA, 2009b).

Table 14-4 presents a breakdown of recreational activities in the region in 2000, as identified by the 2000 NSRE on coastal recreation participation in the United States.

Table 14-4: Washington/Oregon Coastal Recreation Participation, 2000

RECREATION ACTIVITY	Washington/Oregon (millions of participants)		TOTAL
	Oregon	Washington	
Visit Beaches	2.08	2.02	4.10
Visit Waterside Besides Beaches	0.29	0.44	0.73
Swimming	0.64	0.70	1.34
Snorkeling	0.04	0.05	0.09
Scuba Diving	0.01	0.07	0.08
Surfing	0.01	0.02	0.03
Wind Surfing	0.00	0.01	0.01
Saltwater Fishing	0.34	0.49	0.83
Motorboating	0.15	0.46	0.61
Sailing	0.03	0.19	0.22
Personal Watercraft Use[1]	0.01	0.03	0.04
Canoeing	0.01	0.16	0.17
Kayaking	0.02	0.14	0.16
Rowing	0.03	0.03	0.06
Water-skiing	0.02	0.06	0.08
Bird Watching	0.57	0.86	1.43
Viewing Other Wildlife in Water-based Surroundings	0.68	0.74	1.42
Viewing or Photographing Scenery in Water-based Surroundings	1.05	1.19	2.24
Hunting Waterfowl	0.01	0.02	0.03
Any Coastal Activity[2]	**3.18**	**3.43**	6.61

Note:
1. Personal watercraft use likely includes some other recreational categories in the table, such as canoeing and kayaking, but also includes the use of watercraft such as jet skis and wave runners.
2. The total number of coastal activity participants is not the sum of the rows that precede it, because the categories do not account for double counting. For example, people who go to the beach and swim are counted under both activities.

Source: Leeworthy and Wiley, 2001.

Washington and Oregon also contain almost a dozen NWRs along their coasts. These NWRs, listed in **Table 14-5**, are important sites for the public's viewing and photography of birds, wildlife, and scenery. The value that the public places on these resources is uncertain, but the U.S. Fish and Wildlife Service's 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation estimates that state residents in Washington place a median value of $25 per day on wildlife watching in the state, while for Oregonians the median value was $15 (for wildlife watching in Oregon). The survey placed visitors' valuation significantly higher: $76 per day in Washington, and $50 per day in Oregon.

Table 14-5: National Wildlife Refuges in the Washington/Oregon Coastal Area

Oregon	Washington
San Juan Islands	Lewis and Clark (WA and OR)
Dungeness	Cape Meares
Protection Island	Three Arch Rocks
Flattery Rocks	Nestucca Bay
Quillayute Needles	Siletz Bay
Copalis	
Source: USFWS, 2009.	

In addition to wildlife refuges, Washington and Oregon are home to a few large national parks. **Table 14-6** presents the monthly visitation for the two largest of these parks in 2011, Lewis and Clark National Historical Park and the San Juan Islands. As indicated in the table, visitation peaked during the summer months, with more than half the visitors coming between May and September and nearly a third in July and August alone. These data suggest that a CDE that occurs during the summer could severely curtail the outdoor public uses of these parks. However, a CDE that occurs during other times of year and results in long-term effects could also affect the use of these parks during the summer months.

Table 14-6: Washington/Oregon National Park Visitation Statistics, 2011

Month	Lewis and Clark NHP	San Juan Islands NHP	Total
January	5,610	13,931	19,541
February	5,933	11,241	17,174
March	10,662	18,575	29,237
April	12,511	19,064	31,575
May	17,672	22,553	40,225
June	24,427	29,856	54,283
July	36,905	36,857	73,762
August	33,331	37,865	71,196
September	19,768	28,653	48,421
October	12,950	25,691	38,641
November	6,692	11,091	17,783
December	5,406	11,340	16,746
2011 Total	**191,867**	**266,717**	**458,584**
Source: NPS, 2011.			

14.3.2 Recreational Fishing

Recreational fishing is another important component of public use in and near the Washington/ Oregon planning area. Key recreational fishing species in the region include baitfish, rockfish, salmon, surfperches, and smelt and herring, the last of which have dominated recreational harvests in Washington for the past ten years (NOAA, 2009a). In terms of the economic impacts of recreational fishing, Washington far outpaced Oregon as indicated in **Table 14-7**. Expenditures on recreational fishing in Oregon were approximately $253 million, whereas in

Washington they exceeded $1.3 billion. The total value added (GDP) associated with recreational fishing in Oregon was $155 million, or 0.10 percent of the state's GDP in 2006; in Washington, recreational fishing accounted for $607 million in value added, representing 0.20 percent of state GDP in 2006 (based on state GDP data from BEA, 2011).

Table 14-7: Total Economic Activity Generated from Marine Recreational Fishing Expenditures in the Washington/Oregon, 2006

Type	Expenditures	Direct	Indirect	Induced	Total
OREGON					
Output (million$)	$253.1	$160.3	$55.8	$67.5	$283.6
Value Added (million$)		$82.3	$29.9	$42.8	$155.0
Income (million$)		$59.5	$18.6	$25.7	$103.8
Employment (Jobs)		1,436	443	648	2,527
WASHINGTON					
Output (million$)	$1,358.0	$664.3	$225.5	$237.1	$1,126.9
Value Added (million$)		$339.9	$125.3	$141.3	$606.5
Income (million$)		$237.8	$79.9	$77.3	$395.0
Employment (Jobs)		7,502	1,527	1,996	11,025

Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. The total represents the sum of the direct, indirect, and induced impacts.
Source: Gentner and Steinback, 2008.

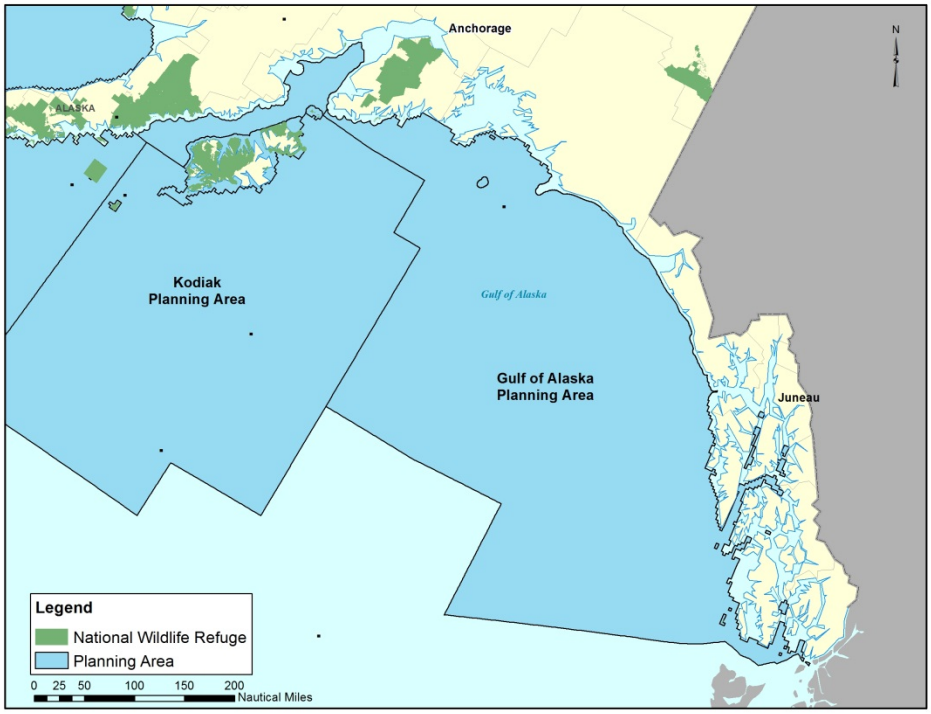
14.3.3 Subsistence Use

As mentioned elsewhere in this document, data on subsistence fishing outside of Alaska are rare, and tend to be anecdotal. Washington and Oregon are home to a variety of indigenous, Asian, and Pacific Islander communities who rely on subsistence fishing as both a cultural tradition and an important economic staple. Though limited, consumption of fish and shellfish by subsistence fishermen in Washington and Oregon is a critically important public use that could be affected by a CDE.

The limited data available on subsistence fishing near the Washington/Oregon planning area include a 1999 study of ten Asian and Pacific Islander communities in King County, Washington. The survey results revealed a mean fish consumption rate for all fish consumed, self-caught and bought, of 117.2 grams per day and a maximum value of 733.46 grams per day, well above the national average 6.5 grams per day. In addition, a survey of first- and second-generation Asian and Pacific Islanders in the region revealed that those communities primarily harvested and consumed shellfish, rather than finfish (National Environmental Justice Advisory Council, 2002). In the event of a CDE, these fish and shellfish could become scarce or contaminated, adversely affecting the communities that rely on them.

15. Gulf of Alaska

Figure 15-1: Map of the Gulf of Alaska Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

In 1989, the Gulf of Alaska experienced significant adverse impacts from a CDE when the Exxon Valdez oil tanker was grounded on a nearby coastal reef. According to the Exxon Valdez Oil Spill Trustee Council, many resources in and near the Gulf of Alaska have recovered from the spill, including bald eagles, dolly varden, harbor seals, pink and sockeye salmon, and river otters. Some resources and human services are still recovering, however, and some have shown no clear improvement from the injuries they sustained due to the spill (i.e., Pacific herring and pigeon guillemots). Commercial fishing (especially for Pacific herring), tourism and recreation, and subsistence fishing are all still considered to be recovering from the spill as of 2010 (Exxon Valdez Oil Spill Trustee Council, 2012). This chapter does not attempt to quantify any impacts from the Exxon Valdez spill but instead describes resources and activities that could be affected in the event of another CDE.

15.1 Physical and Biological Resources in the Gulf of Alaska and the Nearby Coastal Area

The Gulf of Alaska region is the most temperate area along Alaska's coast. As visible in **Figure 15-1** above, millions of acres of small islands create a web of rivers, inlets, sounds, and bays, as well as a unique habitat for a wide variety of plants and wildlife. These islands, which form part of a temperate rain forest region along the coast, receive close to 300 inches of rain annually. Dense conifer forests dominate the landscape at elevations below 500 meters, provide shelter for undergrowth consisting largely of ferns and mosses, and are bordered by high mountain ranges. Offshore, the continental shelf in the Gulf of Alaska is relatively narrow until it reaches the

southern boundary of the Aleutian Islands, leaving little area for shelf habitat (Alaska Department of Fish and Game, 2006).

The waters of the Gulf of Alaska are influenced by the movements of the offshore Alaska Current, which originates from the westward North Pacific Current and runs north along the Alaskan coast, and the near-shore Alaska Coastal Current, which is fed by runoff from glaciers, snowmelt, and rainfall. These two currents create an important ecological transition zone between the Gulf of Alaska's shallow, nearshore ecosystems and the ecological communities of the outer-shelf and pelagic ecosystems. The Alaska Coastal Current distributes plankton throughout the region, filling protected inside waters and sounds and providing foraging zones for fish, birds, and marine mammals while the Alaska current carries warmer water to the region from the North Pacific (Mundy, 2010).

Further offshore, the Alaska Current supports a variety of nursery habitat, which forms the basis for a diverse and complex food web. The Gulf of Alaska supports more than 35 species of migrating shorebirds, as well as dense populations of swans, terns, loons, ducks, and jaegers (Alaska Department of Fish and Game, 2006). Nine major stocks of herring reside in Gulf of Alaska waters, along with pink salmon, sablefish, rockfish, perch, and tanner and dungeness crab, all important commercial species for the Alaskan seafood industry. In addition, the Gulf of Alaska serves as a key habitat for various species of marine mammals, including stellar sea lions; sea otters; and beluga, killer, and humpback whales (Mundy, 2010).

15.2 Economic Activity in the Gulf of Alaska and the Nearby Coastal Area

15.2.1 Commercial Fishing

Commercial fishing is critical to the regional economy along the Gulf of Alaska. Petersburg and Ketchikan are the largest commercial fishing ports in the region. Primary commercial species include crab, shrimp, sea cucumber and sea urchins, geoduck clams, herring, and salmon (Alaska Department of Fish and Game, 2012a). Most of the state's crab harvests come from the southeast region, primarily dungeness, tanner, golden, and red king. Beyond the state of Alaska, the Gulf of Alaska is a major source for commercial finfish and shellfish both nationally and globally (Northern Economics, 2009a).

The Gulf of Alaska's commercial fishing industry accounts for approximately 40 percent of Alaska's total ex-vessel value,[31] and 36 percent of the state's total wholesale commercial fisheries value. In 2009, ex-vessel volume for the Gulf of Alaska was 212,000 metric tons, at a total value of $386.8 million. The wholesale value for the region in 2010 was $663.5 million. The Gulf of Alaska area also supports a sizeable seafood processing industry, employing 8,000 people in processing in addition to the 18,000 employed in harvesting (Marine Conservation Alliance, 2011).

15.2.2 Tourism and Recreation

[31] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

The Gulf of Alaska is home to a vibrant tourism industry. Since the mid-1980s, tourism to the Gulf of Alaska has grown rapidly, primarily due to the cruise ship industry. Visitation to the region increased from 473,000 in 1985 to more than 700,000 in 2001. During this same period, the percentage of guests visiting on cruises rose from 64 percent in 1985 to 75 percent in 2001 (Cerveny, 2005). From October 2007 through September 2008, visitors, crew members, cruise lines, and tour operators spent an estimated $210 million in Juneau, with nearly $100 million of that total coming from expenditures on retail and dining. During this same period, visitor industry-related employment generated nearly 2,800 jobs, accounting for 13 percent of all employment in Juneau. The tourism industry also accounted for $8.6 million in sales tax revenues in Juneau during this period, or twenty percent of all sales tax revenue collected by the city (McDowell, 2009).

The Gulf of Alaska attracts many outdoor tourists seeking to fish, hike, kayak, and sightsee in the region. While many of these individuals visit on packaged tours, some also visit on their own. These visitors generally have a large impact on the region's local economies (Cerveny, 2005). Even small numbers of visitors have a relatively large economic effect on many of these towns' revenues, given their small size. The tourism industry also creates seasonal jobs for displaced timber workers and fishermen, including both residents and seasonal workers (Cerveny, 2005). Because many tourists visit the region for outdoor activities, a CDE in the Gulf of Alaska could reduce tourism to the area, adversely affecting the economy of many communities across the region.

15.2.3 Commercial Shipping and Transport

The coastal zone near the Gulf of Alaska planning area is home to the United States' 18th largest port, Valdez. The Port of Valdez saw 34.5 million short tons of traffic pass through it in 2009, largely due to oil shipments, and was the largest port in Alaska (USACE, 2009). In addition, between 3,000 and 3,500 commercial vessels pass through the Gulf of Alaska annually along the "Great Circle" route from the Pacific Northwest to Asia. A CDE in or near the Gulf of Alaska Planning Area could disrupt this route, limiting or halting shipping traffic (NOAA, 2007). **Table 15-1** presents a summary of the total traffic near the Gulf of Alaska planning area's largest ports, as defined by total traffic (USACE), and for comparison also includes the top ten ports in the country. Together, the two ports near the Gulf of Alaska planning area highlighted in gray accounted for approximately 35.4 million tons of traffic in 2009, including both imports and exports.

Table 15-1: Top 10 Ports in the U.S. and Gulf of Alaska Ports by Total Traffic, 2009 (Million Short Tons)

U.S. Rank	PORT	All Directions	Receipts	Shipments	Intraport
1	Port of South Louisiana	212.6	106.3	102.0	4.3
2	Houston, TX	211.3	113.1	83.7	14.5
3	New York, NY and NJ	144.7	78.3	46.1	20.3
4	Long Beach, CA	72.5	48.7	23.7	0.9
5	Corpus Christi, TX	69.2	44.2	22.0	2.1
6	New Orleans, LA	68.1	34.4	31.3	37.1
7	Beaumont, TX	67.7	45.3	20.5	1.9
8	Huntington-Tristate, WV	59.1	20.9	34.1	4.2
9	Los Angeles, CA	58.4	35.7	21.9	0.8
10	Texas City, TX	52.6	37.6	14.5	0.5
…					
18	Valdez, AK	34.5	0.1	34.3	0
134	Seward, AK	0.9	0	0.9	0

Notes:
1. "Receipts" represent imports, "Shipments" represent exports, and "Intraport" represents traffic within a given port.
2. Ports shaded gray are located on the coast near the Gulf of Alaska planning area.
3. Ranking includes inland ports (Huntington-Tristate is the largest).

Source: USACE, 2009.

15.2.4 Oil and Gas production

No offshore oil or natural gas production currently takes place in the Gulf of Alaska. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 1.3 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Gulf of Alaska planning area are shipped via tanker through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Gulf of Alaska oil or gas could impact those planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

15.3 Public Use in the Gulf of Alaska and the Nearby Coastal Area

15.3.1 Coastal Recreation

Each year the Gulf of Alaska area attracts an array of adventure-seeking visitors to fish, hike, boat, hunt, and view wildlife. The largest federal park in the region is Glacier Bay National Park and Preserve, which spans 3.3 million acres of mountains and glaciers, and nearly 1,200 miles of shoreline. Coastal recreation in the park includes kayaking, whale-watching, flightseeing (taking in the sights via air), and recreational fishing, which are discussed further in the following section. In 2011, nearly 432,000 visitors came to Glacier Bay National Park, as indicated in **Table 15-2**. Three quarters of these visitors came to the park between June and August, and more than 99 percent of them came between May and September. A CDE in or near the Gulf of

Alaska that impacted Glacier Bay National Park during the summer could therefore have a significant impact on visitation. A CDE with long-term impacts that occurred during other times of the year could also affect summer visitation in the park.

Table 15-2: Visitation Statistics for Glacier Bay National Park, 2011

2011	Recreational Visits	Concession Lodging	Tent Campers	Back Country Campers	Misc. Campers	Total Overnight Stays
January	173	0	0	22	70	92
February	175	0	0	22	70	292
March	162	0	0	0	40	40
April	178	0	0	79	0	259
May	45,959	224	50	443	0	1,547
June	104,190	3,410	235	1,152	2,195	8,567
July	102,477	5,375	277	1,500	4,220	12,817
August	111,359	4,319	214	1,212	2,918	9,428
September	66,794	337	34	240	0	871
October	173	0	0	22	70	132
November	173	0	0	22	70	132
December	173	0	0	22	70	132
2011 Total	**431,986**	**13,665**	**810**	**4,736**	**9,723**	**34,309**
Source: NPS, 2012.						

15.3.2 Recreational Fishing

The Gulf of Alaska is a popular destination for recreational anglers, and the industry is important to many local communities. One recent study estimated that 32 percent of non-cruise travelers to Alaska came specifically for recreational fishing. Many of these visitors stay in local lodges, often in remote areas, and hire professional guides from the area (Cerveny, 2005). A study from 2010 estimated the value of recreational fisheries for trout and salmon in Southeast Alaska to be $204.4 million, including angler expenditures of $174.4 million from both visiting and resident anglers. Overall, the region accounted for roughly 20 percent of statewide economic activity associated with recreational fishing (TCW Economics, 2010).[32] As a sign of the growth in recreational fishing in the region, between 1982 and 2001, the number of charter fishing boats in the Gulf of Alaska increased from 139 to 1,343 (Cerveny, 2005).

15.3.3 Subsistence

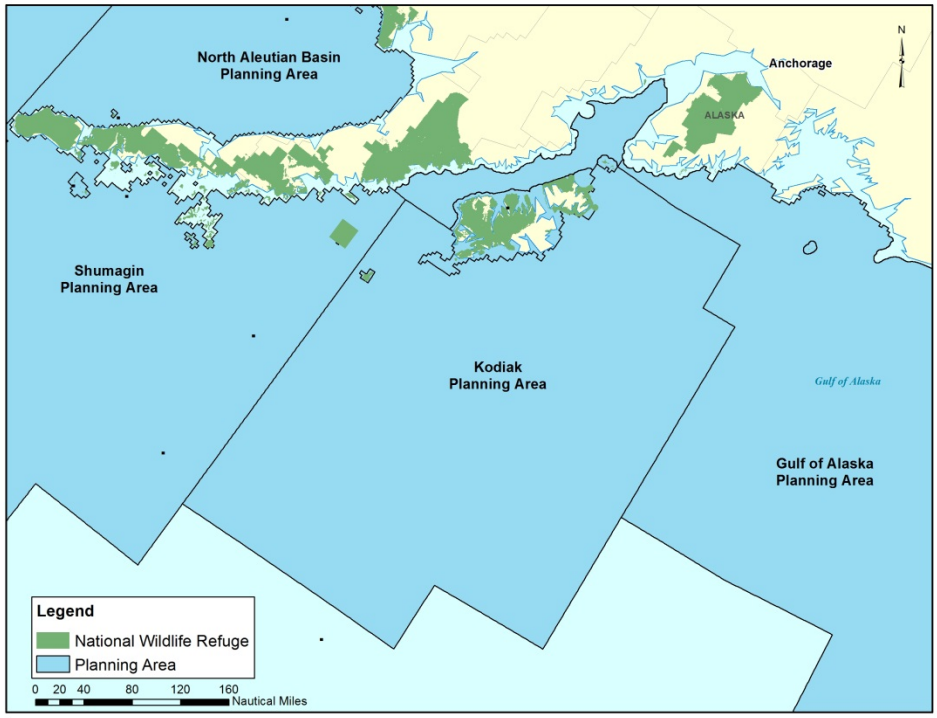
Subsistence fishing and hunting is an important aspect of life in and near the Gulf of Alaska and could be temporarily or permanently curtailed by a CDE in the region. Primary species caught and consumed by residents of the Gulf of Alaska include halibut, king salmon, red salmon, shrimp, deer, crab, clams, and cod (Ballew et al., 2004). In 2007, nearly 50,000 salmon were harvested for subsistence purposes, particularly in the communities of Haines, Juneau, and

[32] It should be noted that these figures are primarily for Southeast Alaska, which does not compose the entirety of the Gulf of Alaska, and therefore are conservative estimates for the region.

Yakutat, each with approximately 7,000 harvests, and Sitka, with more than 16,000 harvests. Sockeye was the primary subsistence species of salmon, followed by pink, coho, chum, and chinook (Fall et al., 2009). Typical diets in the region also included wild-harvested blueberries, huckleberries, salmonberries, and seaweed (Ballew et al., 2004).

16. Kodiak

Figure 16-1: Map of the Kodiak Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

16.1 Physical and Biological Resources in the Kodiak Planning Area and the Nearby Coastal Area

Ecologically the Kodiak region bears similarities to the Gulf of Alaska region, described in the previous chapter of this report, insofar as the movements of the Alaska Current heavily influence the ecological environment. The upwelling of the Alaska Current in the region supports one of the most productive marine environments in the world, as well as a wealth of natural resource deposits. Some examples of resources found in and near Kodiak Island include salmon, marine fishes and invertebrates, coal, oil and gas, minerals such as copper and gold, and mammals including moose, sea otters, whales, and bears. The relatively moderate climate, as well as the accessibility of wilderness areas and recreational opportunities, makes the Kodiak region a popular Alaskan site for residents and visitors alike (Wildland Studies, 2012). The natural resources of the region are of critical importance to both the regional economy and recreational public use in the area, both of which could be dramatically impacted by a CDE that caused real or perceived damage to the region's physical resources.

The Kodiak area islands, including Kodiak Island (shown above in **Figure 16-1** on the upper boundary of the Kodiak planning area), Afognak Island, and the Trinity Islands, also contain coastal rain forests. Most of Kodiak Island is covered in willow and alder thickets or wet sedge meadows; however, because trees did not survive glaciation, only Sitka spruce and black cottonwood grow in the area. The climate of the islands does not change seasonally, instead

averaging 38 to 41 degrees Fahrenheit year-round. The islands support diverse and productive ecosystems in both fresh- and salt-water, with offshore waters containing halibut, cod, sea otters, stellar sea lions, and whales. Fresh water fish on the island include salmon, char, dolly varden, and trout. Several bird species, including puffins, auklets, and kittiwakes, nest in the islands' rocky cliffs. Native land mammals on the island include Kodiak brown bears, red fox, black-tailed deer, elk, hare, and mountain goat (Alaska Department of Fish and Wildlife, 2006).

16.2 Economic Activity in the Kodiak Planning Area and the Nearby Coastal Area

16.2.1 Commercial Fishing

Commercial fishing is a tremendously important industry in the Kodiak region. Fish harvesting and processing represent the largest source of jobs and earnings on Kodiak Island, particularly in processing. In addition, the island's commercial fishing industry supports other industries, such as trade and services that provide supplies and other goods to the fishing industry. Many of those employed in the fishing industry in Kodiak are not local residents, however, limiting the portion of industry earnings that are re-spent in the local economy (Goldsmith et al., 2003).

Primary species harvested in the Kodiak region are salmon (chinook, sockeye, coho, pink, and chum) and crab (dungeness, tanner, and king), as well as Pacific cod, sablefish, and Pollock (Alaska Department of Fish and Game, 2012a). In total, the seafood industry in and near the Kodiak region accounted for approximately 6,600 jobs, or 35 percent of the private-sector payments to labor in 2009. During that same year, the Kodiak area accounted for $130 million in ex-vessel value[33] and $261 million in wholesale value (Northern Economics, 2011).

16.2.2 Tourism and Recreation

The tourism industry in the Kodiak region consists almost exclusively of outdoor eco-tourism by Alaska residents and visitors from out of state. The island is inaccessible by cruise ships and is largely inaccessible to the major population centers of Alaska (Colt, 2002). The types of recreation in the area and their estimated economic impacts are addressed in section 16.3.

Commercial Shipping and Transport

The Kodiak region does not have any major commercial ports. However, the "Great Circle" shipping route between the northwest United States and Asia passes through the Kodiak Planning Area. An estimated 1,600 container ships, 30 to 40 tankers and a number of smaller commercial vessels take the Great Circle route from the Pacific Northwest through the Unimak Pass to the Bering Sea annually. Including the smaller commercial tugs, barges, and freighters, an estimated total of between 3,000 and 3,500 vessels pass through the region in any given year (NOAA, 2007). A CDE in the Kodiak Planning Area could disrupt this important international shipping route, adversely affecting industries that ship their goods via this route.

[33] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

16.2.3 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the Kodiak region. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 0.4 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Kodiak planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Kodiak planning area oil or gas could impact those planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

16.3 Public Use in the Kodiak Planning Area and the Nearby Coastal Area

16.3.1 Coastal Recreation

The Kodiak region is a major destination for outdoor recreation, particularly hunting, sport fishing, wildlife viewing, flightseeing, kayaking, and sailing. One popular destination in the region is the Kodiak NWR, which spans 1.9 million acres on the southwestern two-thirds of Kodiak Island, Uganik Island, the Red Peaks area on northwestern Afognak Island, and all of Ban Island. No place in the Refuge lies further than 15 miles from the Pacific Ocean, suggesting that a CDE that caused real or perceived damage to the area could significantly limit visitation for recreational purposes (USFWS, 2012). Visitors to the Kodiak NWR typically enjoy hunting, fishing, wildlife observation, photography, rafting and camping. The refuge also maintains several remote public-use cabins (Caudill et. al, 2005). To gauge the magnitude of recreational activity potentially affected by a CDE, **Table 16-1** presents visitation data to the Kodiak NWR in 2004.

Table 16-1: Kodiak NWR Recreational Visits, 2004

Activity	Total	Non-Alaska Resident	Alaska Resident
Non-Consumptive			
Nature Trails	120	36	84
Observation Platforms	450	315	135
Other Wildlife Observation	1,250	375	875
Beach/ Water Use	20	6	14
Other Recreation	20,272	6,082	14,190
Hunting			
Big Game	4,542	2,271	2,271
Small Game	333	83	250
Migratory Birds	510	51	459
Fishing			
Freshwater	2,600	520	2,080
Saltwater	0	0	0
Source: Caudill et. al, 2005.			

16.3.2 Recreational Fishing and Hunting

Recreational fishing and hunting are important public uses of resources in and near the Kodiak planning area, drawing many out-of-state visitors to the remote islands. As presented in **Table 16-1** above, big game hunting trips by Alaskan residents in 2004 were nearly equal to the number of trips made by non-Alaskan residents. Freshwater fishing trips by Alaskan residents, however, accounted for nearly four times as many recreational visits to Kodiak NWR than non-Alaskan residents in 2004. Visitors are estimated to have spent approximately $1.8 million, of which $1.5 million was associated with non-resident visitation in 2004. A CDE that caused real or perceived damage to fish populations or onshore wildlife could substantially decrease the number of visitors to the Kodiak region, depriving the region of these expenditures (Caudill et. al, 2005).

Table 16-2 presents the total direct, indirect, and induced economic effects associated with recreational visits to the Kodiak NWR for sport fishing and hunting, along with impacts from non-consumptive recreational activity (wildlife viewing).[34] As indicated in the table, recreational visits to the Kodiak NWR in 2004 contributed nearly $2.6 million in final demand to the local economy and accounted for 34 jobs, $946,000 in income, and $557,000 in tax revenue (Caudill et. al, 2005).

[34] Direct effects occur when visitors purchase goods at retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption.

Table 16-2: Local Direct, Indirect, and Induced Economic Effects Associated with Recreational Visits, Kodiak NWR, 2004 (Thousands $)

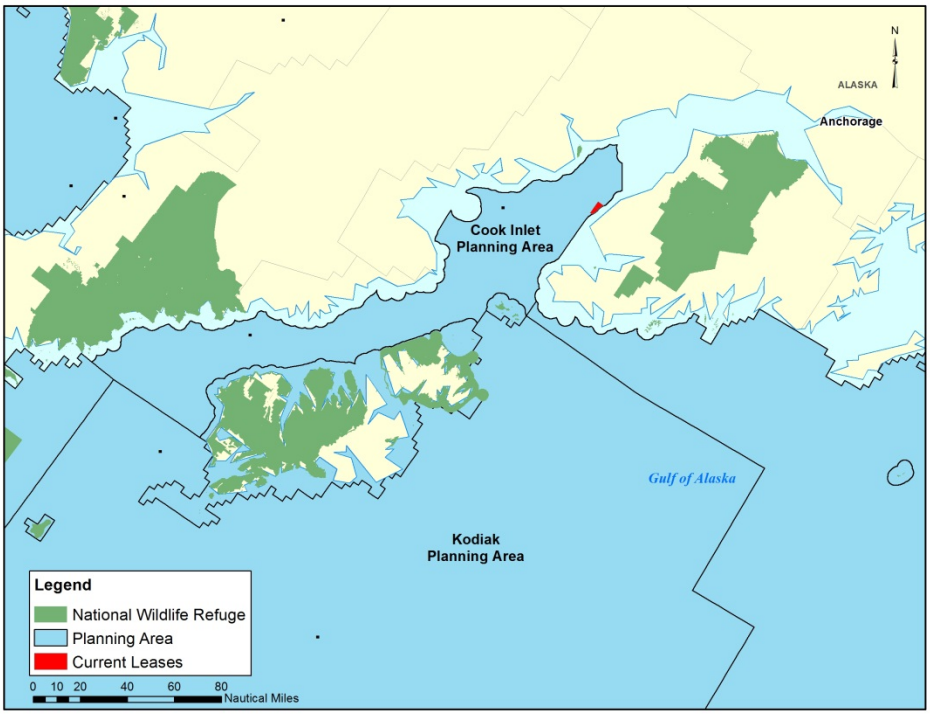
	Residents	Non-Residents	Total
Final Demand	$407	$2,165	$2,572
Jobs	5	29	34
Jobs Income	$147	$799	$946
Total tax Revenue	$84	$473	$557
Source: Caudill et. al, 2005.			

16.3.3 Subsistence

Subsistence fisheries in the Kodiak region include salmon, shellfish (primarily crab), and halibut. Additional fish species commonly harvested for subsistence include Pacific cod, flounders, lingcod, rockfishes, and char (Alaska Department of Fish and Game, 2012b). From 2002-2006, subsistence fisherman reported an average annual catch of approximately 38,000 salmon, nearly three fourths of which were sockeye. Since 2003, NMFS has managed a program for subsistence halibut fishing for rural Alaska residents (Alaska Department of Fish and Game, 2009). A CDE in or near the Kodiak planning area could have a major impact on residents in the region who engage in subsistence fishing to meet their dietary needs or who subsist to continue their cultural traditions.

17. Cook Inlet

Figure 17-1: Map of the Cook Inlet Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.
Note: Current Leases in Cook Inlet as of 2008. No oil or gas exploration is currently taking place in Cook Inlet's Federal waters (Associated Press, 2012).

17.1 *Physical and Biological Resources in Cook Inlet and the Nearby Coastal Area*

A wide array of natural resources in and along Cook Inlet support south-central Alaska's recreational and commercial activities. The Cook Inlet marine ecosystem is a semi-enclosed tidal estuary, extending approximately 230 miles into south-central Alaska, as pictured above in **Figure 17-1**. The Inlet's salt water input flows from Shelikof Strait and the Gulf of Alaska, while its fresh water flows from several large rivers, including the Chuitna. Surface currents within the inlet, which could move hazardous material toward shore in the case of a CDE, are affected by both tidal movements and winds, which can be highly variable. The large tidal range in Cook Inlet also continually breaks up ice-floes, the size and thickness of which change constantly (Alaska Ocean Observing System, 2005).

Cook Inlet's marine ecosystems are among the most productive in the world, particularly with respect to fisheries. These fisheries include salmon, herring, scallops and halibut (Alaska Ocean Observing System, 2005). Migratory marine and land birds are common. Some endangered species, including stellar sea lions and beluga whales, live in the region as well, which has led to some restrictions on water use to relieve human pressure on these species, such as commercial fishing and construction on bridges (Resource Development Council for Alaska, Inc. (RDC), 2010). Like other parts of coastal Alaska, Cook Inlet's ecosystems are prone to damage due to

regular human activities, such as marine transport, commercial fishing, and oil and natural gas production. A CDE could severely compound these pressures.

17.2 *Economic Activity in Cook Inlet and the Nearby Coastal Area*

17.2.1 Commercial Fishing

A CDE in the waters of Cook Inlet could significantly damage the area's commercial fishing industry. Within the Cook Inlet, salmon (particularly sockeye salmon) accounts for most of the economic value derived by the fishing industry. In 2008, the commercial fishing industry harvested approximately 21 million pounds of salmon with a value of $22.3 million (RDC, 2010). Other species harvested in Cook Inlet include lingcod, Pacific cod, sablefish, rock fish, and herring. The harvesting of salmon and other species supports the region's seafood processing industry. **Table 17-1** summarizes the economic activity from Cook Inlet's salmon and seafood processing industries, for both the region itself and Alaska more broadly. As indicated in the table, these two industries combined account for nearly 4,000 jobs and $130 million in GDP (RDC, 2010).

Table 17-1: Economic Effects of Salmon Fishing in Cook Inlet, 2008

Type	Output (million$)	Employment	Income (million$)	Value Added (million$)
Cook Inlet Salmon Fishing: Effect on Cook Inlet Economy in 2008				
Direct Effect	$22.3	628.7	$4.72	$5.13
Indirect Effect	$11.0	34.2	$2.22	$4.13
Induced Effect	$5.71	45.9	$1.78	$3.37
Total Effect	**$39.0**	**708.7**	**$8.72**	**$12.6**
Cook Inlet Salmon Fishing: Effect on Alaska Economy in 2008				
Direct Effect	$22.3	628.7	$4.72	$5.13
Indirect Effect	$11.7	35.3	$2.30	$4.27
Induced Effect	$5.79	46.6	$1.81	$3.41
Total Effect	**$39.8**	**710.5**	**$8.83**	**$12.8**
Cook Inlet Seafood Processing: Effect on Cook Inlet Economy in 2008[1]				
Direct Effect	$204.5	616.2	$21.2	$23.7
Indirect Effect	$161.8	2,145.2	$40.3	$63.0
Induced Effect	$49.8	400.0	$15.6	$29.4
Total Effect	**$416.1**	**3,161.5**	**$77.2**	**$116.1**
Cook Inlet Seafood Processing: Effect on Alaska Economy in 2008				
Direct Effect	$204.5	616.2	$21.2	$23.7
Indirect Effect	$165.0	2,159.7	$41.0	$64.1
Induced Effect	$50.6	405.9	$15.9	$29.8
Total Effect	**$420.1**	**3,181.8**	**$78.1**	**$117.6**

Notes:
1. Processing data include species besides salmon, such as herring.
2. Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption. Total effects are the sum of direct, indirect, and induced effects.

Source: RDC, 2010.

17.2.2 Tourism and Recreation

Tourism is a critical component of the Alaskan economy, particularly in the Cook Inlet region. The sector has grown at a higher rate than any other in the state or region for the past few decades. Anchorage is a focal point for visitors to the state, and Cook Inlet is a major destination for outdoor tourism and recreation, particularly for recreational fishing (ECONorthwest, 2010). Other recreational activities popular among tourists and local residents include camping, hunting, hiking, kayaking, mountain biking, and diving. **Table 17-2** highlights the importance of the tourism sector in the Kenai Peninsula Borough, which surrounds most of Cook Inlet. These data describe both the "ocean" and "coastal" economies of the borough. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in boroughs that are adjacent, in whole or in part, to the shoreline. As indicated in the table, tourism accounted for more than $70 million in GDP in 2009 and

employed approximately 2,000 individuals.[35] For perspective on these figures, the Census Bureau estimates that the borough's population was approximately 55,000 in 2010 (U.S. Census 2012).

Table 17-2: Kenai Peninsula Borough Tourism and Recreation Sector, 2009

Year	Establishments	Employment	Wages (million $)	GDP (million $)
Ocean Economy Data				
2009	264	2,026	$37.3	$73.7
2008	262	2,120	$39.3	$81.5
Coastal Economy Data (Shore-adjacent Boroughs)				
2009	299	2,308	$39.1	$78.4
2008	300	2,518	$45.7	$92.3

Note: NOEP defines **e**stablishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
Source: NOEP, 2012a; NOEP, 2012b.

17.2.3 Commercial Shipping

The Port of Anchorage on the eastern end of Cook Inlet is an essential port for many Alaska residents. Ninety percent of all consumer goods are provided to 80 percent of Alaska's population through Anchorage, totaling 4.4 million tons in 2008 (State of Alaska, 2007). In addition to serving as the conduit through which many Alaskans receive goods, the port itself generates significant economic activity. To illustrate the importance of this activity, **Table 17-3** presents the total economic activity associated with the port in 2008. As shown in the table, the port is responsible for more than $100 million in value added (GDP) for the Cook Inlet region. Given the port's significance to the economy, a CDE in Cook Inlet could cause substantial public and economic damage if it were to seriously disrupt the port's activities.

[35] The values presented here for all recreation in Kenai Peninsula Borough are similar to the direct economic effects presented in **Table 17-5** for recreational fishing in Cook Inlet. Because recreational fishing makes up only part of the tourism industry in Cook Inlet, one would expect the economic effects from all tourism to be significantly higher than for the recreational fishing only. However, a significant portion of the economic effects from recreational fishing presented in **Table 17-5** include types of expenditures not reflected in the NOEP data. For example, these data include angler expenditures, vehicle fuel, groceries, fish processing, and airfare, none of which are included in the NOEP data.

Table 17-3: Economic Activity Related to the Port of Anchorage, 2008

Economic Effect of the Port of Anchorage on Cook Inlet				
Type	**Output (million$)**	**Employment**	**Income (million$)**	**Value Added (million$)**
Direct Effect	$132.7	500.0	$36.0	$59.0
Indirect Effect	$36.7	222.4	$11.5	$20.7
Induced Effect	$38.9	311.8	$12.2	$23.0
Total Effect	$208.4	1,034.2	$59.7	$102.8
Economic Effect of the Port of Anchorage on the State of Alaska				
Type	**Output**	**Employment**	**Income**	**Value Added**
Direct Effect	$132.7	500.0	$36.0	$59.0
Indirect Effect	$40.2	251.3	$13.4	$23.0
Induced Effect	$40.1	320.9	$12.6	$23.6
Total Effect	$213.0	1,072.2	$62.0	$105.7

Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption.
Source: RDC, 2010.

17.2.4 Oil and Gas Production

The oil and natural gas sector has a strong presence within Cook Inlet.[36] The Alaska Department of Natural Resources (DNR) estimates that 4.5 million barrels of oil were produced in Cook Inlet in 2008, along with 149.7 billion cubic feet of natural gas. At an estimated first purchase price of $95.04 per barrel of oil and a wellhead price of $6.14 per mcf of natural gas, the total value for Cook Inlet's oil and natural gas production sector in 2008 was approximately $1.4 billion. Accounting for indirect and induced effects, a 2010 study estimates that the full economic impact of this sector in terms of value added totaled nearly $1.3 billion in 2008, as summarized in **Table 17-4** (RDC, 2010). Lease sale 244 in Cook Inlet is also included in BOEM's Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017 and is scheduled for 2016 (BOEM, 2012b and BOEM, 2012c). As of 2011, BOEM estimates that the Cook Inlet planning area's mean availability of undiscovered technically recoverable oil and gas resources is approximately 1.2 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Cook Inlet planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Cook Inlet planning area oil or gas could impact these planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

[36] No oil or gas exploration is currently taking place in Cook Inlet's federal waters (Associated Press, 2012).

Table 17-4: Economic Impact of Oil and Natural Gas Development in Cook Inlet, 2008

Economic Effect of Cook Inlet Oil and Natural Gas Development on Cook Inlet Economy				
Type	**Output (million$)**	**Employment**	**Income (million$)**	**Value Added (million$)**
Direct Effect	$1,388	1,143	$301	$889
Indirect Effect	$337	1,430	$102	$182
Induced Effect	$322	2,580	$101	$190
Total Effect	$2,047	5,153	$505	$1,261
Economic Effect of Cook Inlet Oil and Natural Gas Development on Alaska Economy				
Type	**Output**	**Employment**	**Income**	**Value Added**
Direct Effect	$1,388	1,143	$301	$889
Indirect Effect	$353	1,469	$105	$189
Induced Effect	$324	2,612	$103	$193
Total Effect	$2,067	5,224	$508	$1,271

Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption.
Source: RDC, 2010.

17.3 *Public Use in Cook Inlet and the Nearby Coastal Area*

17.3.1 Recreational Fishing

Most of south-central Alaska's recreational activity is based in the Cook Inlet area. The Kenai River, on the south side of the Inlet, is a popular destination for recreational salmon fishing. Other species, such as halibut, are also popular in the communities along Cook Inlet. Almost three quarters of all sport fishing in Alaska in 2007 took place in the south-central region of Alaska. In that year, Cook Inlet anglers spent approximately $733 million, which supported approximately 8,100 jobs and generated $55 million in state and local taxes (Alaska DNR, 2007).

The economic impacts of recreational fishing in Cook Inlet reflect fishing activity among area residents as well as nonresidents. In 2007, residents accounted for approximately 761,000 angler days in the area and nonresidents for 482,000 days (Southwick Associates *et al.*, 2008, as cited in RDC, 2010). **Table 17-5** presents the economic activity associated with *nonresident* recreational fishing activity in Cook Inlet, highlighting the importance of tourist recreation to the local economy. Similar data associated with recreational fishing among residents were not readily available.

Table 17-5: Economic Activity from Sport Fishing in Cook Inlet, 2008 (million$)

Type	Output (sales)	Employment	Income	Value Added
Effect of Non-Resident & Non-Local Sports Fishing in Cook Inlet on the Cook Inlet Economy –2008				
Direct Effect	$193	1,438	$38	$63
Indirect Effect	$76	508	$23	$41
Induced Effect	$50	398	$16	$29
Total Effect	$319	2,345	$76	$134
Effect of Non-Resident & Non-Local Sports Fishing in Cook Inlet on the Alaska Economy –2008				
Direct Effect	$193	1,438	$38	$63
Indirect Effect	$79	540	$24	$43
Induced Effect	$51	406	$16	$30
Total Effect	$323	2,383	$77	$136

Note: Direct effects occur when anglers purchase goods at fishing retailers and other businesses. Indirect effects occur when those businesses pay operating expenditures and purchase supplies from wholesale trade businesses and manufacturers. Finally, induced effects occur when employees in both the directly affected and indirectly affected sectors expend their income in the normal course of household consumption.
Source: Resource Development Council for Alaska, Inc. 2010.

17.3.2 Subsistence Use

Most of the waters of the Cook Inlet Management Area are within the Anchorage-Matsu-Kenai Nonsubsistence Area and as such are not authorized by the Alaska Board of Fisheries for subsistence uses.[37] Because of this, most subsistence fishing in this area occurs through sport and person use fishing regulations. Outside of the nonsubsistence area, however, subsistence fisheries are welcome. Communities included within the Cook Inlet area but excluded from the Cook Inlet nonsubsistence area include Port Graham and Koyuktolik, Seldovia, Tyonek, and Upper Yentna River. **Table 17-6** below details the average annual subsistence harvest by community from 2002-2006. In total, subsistence fisherman reported an average annual catch during the period from 2003 to 2006 of approximately 11,000 salmon, nearly half of which were sockeye (Alaska Department of Fish and Game, 2009).

Table 17-6: Subsistence Fishing in Cook Inlet, average annual harvest 2002-2006

Community	Permits Issued	Number of Fish Caught: Cook Inlet					
		Chinook	Sockeye	Coho	Pink	Chum	Total Fish
Port Graham and Koyuktolik	66	338	4,873	1,152	342	1,748	8,453
Seldovia	17	84	136	7	21	50	297
Tyonek	89	1,107	99	88	3	3	1,300
Upper Yentna River	21	0	399	112	18	18	548
Total	193	1,529	5,507	1,359	384	1,819	10,598

Source: Alaska Department of Fish and Game, 2009.

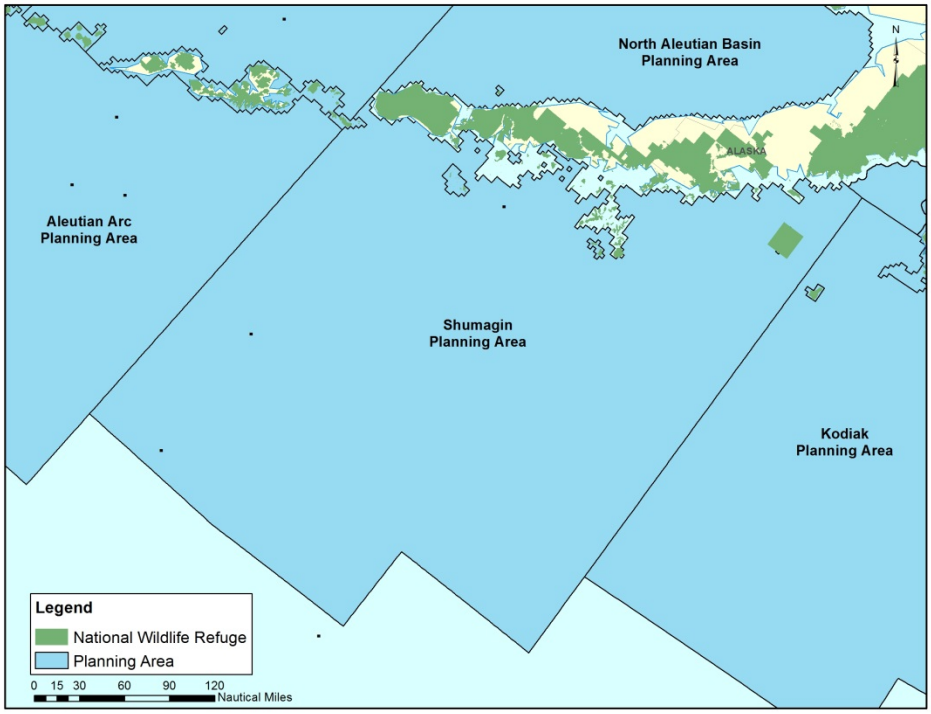
[37] Under Alaska's subsistence statute, the State's Joint Board of Fisheries and Game is required to identify nonsubsistence areas where "dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community" (Alaska Department of Fish and Game, 2009).

A 2009 report commissioned by the Alaska Department of Administration (ADA) summarizes a survey of nearly 2,500 Alaska households to determine what percent of their food supply was obtained through hunting, fishing, gardening, and berry picking. The survey found that 33 percent of Kenai Peninsula residents (18 percent in Anchorage) reported that they obtained 25 to 50 percent of their food supply from subsistence (McDowell Group, 2009).

A CDE in or near the Cook Inlet planning area could have a major impact on residents in the region who engage in subsistence fishing to meet their dietary needs or who subsist to continue their cultural traditions.

18. Shumagin

Figure 18-1: Map of the Shumagin Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

18.1 Physical and Biological Resources in the Shumagin Planning Area and the Nearby Coastal Area

The Shumagin planning area lies near the southern side of the Alaska Peninsula, terminating where the Aleutian Island chain begins, and is located in Alaska's maritime climate zone, as shown in **Figure 18-1** above. The climate in the region is conducive to wind and fog, although the harshest storms occur on the northern side of the Peninsula, in the Bering Sea, rather than in the Shumagin region. Shoreline communities on the Peninsula experience relatively mild winters compared with other parts of Alaska, with temperatures ranging from 10 degrees to 35 degrees Fahrenheit. Summers are generally cool, with temperatures averaging between 45 and 65 degrees Fahrenheit (NOAA, 2011).

Offshore, the Alaska Peninsula NWR and the Becharof NWR are home to sea otters, harbor seals, sea lions, and migrating whales. Onshore, the region supports a large population of brown bears, wolverine, caribou, wolves, and moose. The Alaska Peninsula NWR is made up of active volcanoes, towering mountain peaks, rolling tundra and rugged, wave-battered coastline and provides habitat for various migratory birds. The refuge is also home to the westernmost black cottonwood forests in America, which serve as both a migration stop-over and nesting habitat for neotropical land birds. The Becharof NWR, like the Alaska Peninsula NWR, is comprised of rugged coastline and active volcanoes. What makes Becharof NWR unique, however, is Becharof Lake. Approximately 35 miles long, 15 miles wide and deep as 600 feet, Becharof

Lake is the largest lake in the entire U.S. National Wildlife Refuge System and is a breeding ground for salmon. It is estimated that Becharof Lake and its tributaries provide the Bristol Bay fishery alone with nearly six million salmon per year (USFWS, 2012).

18.2 Economic Activity in the Shumagin Planning Area and the Nearby Coastal Area

18.2.1 Commercial Fishing

Fishing is the most important commercial industry in the Shumagin region. The abundance of salmon, including chum, chinook, sockeye, coho, and pink, is essential to the health of commercial fishing in the region. Other key commercial species include dolly varden, cod, and black rockfish. Commercial shellfish species in the Shumagin region include crab (tanner and dungeness), octopus, and razor clam. Shellfish stocks in the region are depressed, however, and commercial fisheries for shrimp and red king crab have not been in operation since 1982 (Stichert, 2010). **Table 18-1** presents harvest data for select species in the South Alaska Peninsula and Chignik areas for the 2008-2009 season, while **Table 18-2** presents the total salmon catch in the Chignik Management Area for the past five years. Together, both management areas make up nearly all of the Shumagin planning area. The Chignik Management Area accounts for approximately half of the shoreline area near the Shumagin planning area, and around an eighth of the total sea area.

Table 18-1: Commercial Crab and Octopus Harvests in Chignik Management Area, 2008-2009 Season

Species	Vessels	Number Harvested	Pounds	Average Weight (lbs.)	Average Price per Pound	Ex-Vessel Value[38]
Tanner Crab	12	122,441	265,560	2.2	$1.31	-
Dungeness Crab	7	266,075	542,831	20	$1.49	-
Octopus	74	-	273,823	-	$0.38	$98,576
Source: Stichert, 2010.						

Table 18-2: Total Commercial Salmon Harvests from the Chignik Management Area, 2007-2011

Year	Permits Making Deliveries	Chignik Management Area Harvest, number of fish					
		Chinook	Sockeye	Coho	Pink	Chum	Total Fish
2007	56	1,773	834,547	73,277	2,019,748	78,553	3,007,898
2008	55	970	681,270	161,536	2,389,958	209,325	3,443,059
2009	56	3,319	1,198,105	110,373	1,408,339	256,425	2,976,561
2010	66	10,380	1,379,785	159,198	489,781	581,329	2,620,473
2011	65	6,586	2,497,004	76,792	905,166	269,503	3,755,051
Source: Anderson, 2011.							

[38] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

18.2.2 Tourism and Recreation

The Shumagin region does not support a major tourism industry. Most visitors to the Alaska Peninsula travel to the northeastern portion of the peninsula, near the Cook Inlet planning area on the southern (Pacific) side and the North Aleutian Bay planning area on the northern (Bristol Bay) side. Insofar as these visitors travel to the Shumagin region, they do so in order to participate in various coastal recreation activities, as described in the coastal recreation section below.

18.2.3 Commercial Shipping and Transport

The Shumagin area does not contain any major commercial ports. The "Great Circle" shipping route between the United States and Asia, however, passes through the Shumagin region as it extends from the Pacific Northwest through the Unimak Pass to the Bering Sea. Traffic on the Great Circle is estimated to be 1,600 container ships per year and 30 to 40 tankers, along with smaller commercial tugs, barges, and freighters. In total, between 3,000 and 3,500 vessels pass through the Shumagin region in any given year. A CDE in or near the Shumagin planning area could disrupt this important shipping route (NOAA, 2007).

18.2.4 Oil and Gas production

No offshore oil or natural gas production currently takes place in the Shumagin planning area. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 0.1 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Shumagin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Shumagin planning area oil or gas could impact these planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

18.3 Public Use in the Shumagin Planning Area and the Nearby Coastal Area

18.3.1 Coastal Recreation

As described above, the Shumagin region contains two NWRs, the Alaska Peninsula NWR and the Becharof NWR. Visitors to these refuges engage in sport fishing, hunting, and wildlife observation and photography. The primary draw for sport hunters is the brown bear, although caribou, wolves, and moose are also hunted. Sport anglers primarily pursue salmon, arctic char, lake trout, northern pike, and arctic grayling. The economic activity associated with fishing and hunting in the region includes guide services for visitors wishing to fish and/or hunt, and aircraft charters and boat rentals (USFWS, 2012).

18.3.2 Subsistence

Subsistence fishing and hunting is a critically important public use of the coastal zones in and near the Shumagin planning area. Residents of the communities of Sand Point, King Cove, Cold Bay, and False Pass all rely on subsistence hunting and fishing for their livelihoods. **Table 18-3**

presents the estimated subsistence harvests in these communities for the five major types of Pacific salmon. A CDE that decreased the populations of these species or made them unsafe to eat could have a detrimental effect on the health and wellbeing of these communities.

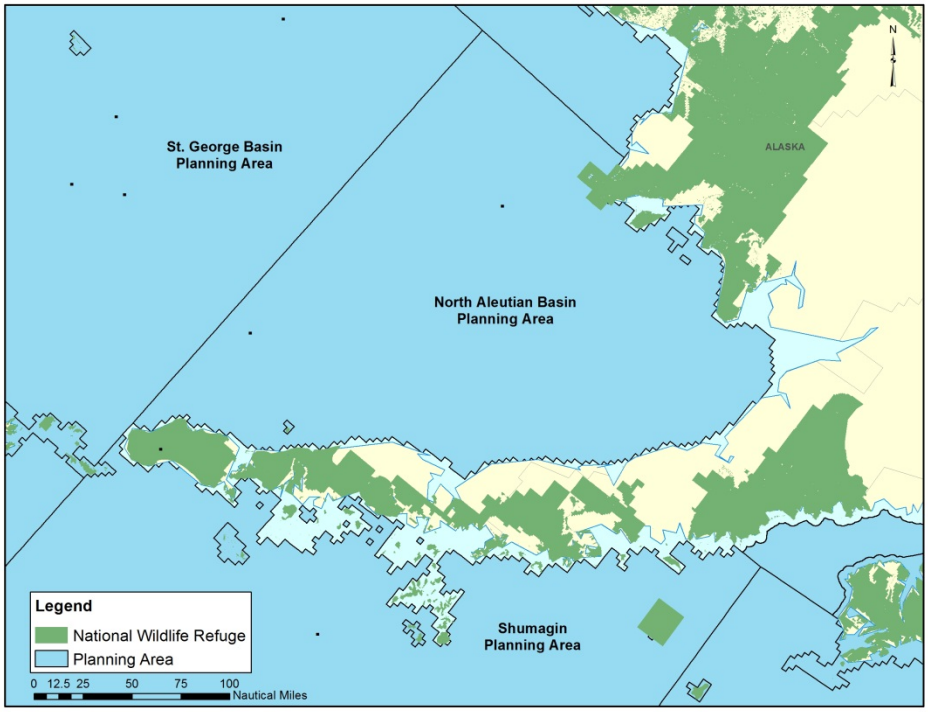
Table 18-3: Subsistence Salmon Harvest in Shumagin Region by Community and Species, 2010

Community	Estimated Harvest (fish)					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Sand Point	103	2,588	336	818	816	**4,661**
King Cove	0	2,406	1,809	87	286	**4,588**
Cold Bay	0	830	0	1	9	**840**
False Pass	6	137	45	50	30	**268**
Source: Hartill and Keyse, 2011.						

Communities in the Shumagin region also hunt land animals for subsistence, such as caribou. While these are not marine species, discharged oil transported upstream by the tides could damage onshore habitats for these animals.

19. North Aleutian Basin

Figure 19-1: Map of the North Aleutian Basin Planning Area



Data Source: Esri, North American Albers Conic Equal Area Conic, Alaska Cadastral Data, BOEM.

19.1 Physical and Biological Resources in the North Aleutian Basin Planning Area and the Nearby Coastal Area

The North Aleutian Basin, as pictured above in **Figure 19-1**, is approximately 100 miles wide and 400 miles long. Offshore it is characterized by a flat and shallow seafloor, with a typical water depth of 100-300 feet, although some areas reach depths of 700 feet. The region's sparsely populated coastline includes numerous bays and small islands, and the nearby onshore environment consists of a combination of rugged mountainous peaks and rolling hills (Minerals Management Service, 2007). Bristol Bay accounts for a large portion of the planning area, extending into the Bering Sea on the planning area's western edge.

The watersheds around Bristol Bay, which include the Togiak, Nushagak, Kvichak, Naknek, Egegik, and Ugashik, are relatively pristine, with minimal human development and almost no current resource extraction activity. The region provides a habitat for all five species of Pacific salmon and a large population of rainbow trout, both essential sources of food for the Alaska brown bear (Duffield, 2007). Offshore, the North Aleutian Basin supports large populations of whales, including right, humpback, beluga, gray, killer, and others. Other maritime mammals residing in the region include ringed seals, fur seals, stellar sea lions, and walruses (Minerals Management Service, 2007). The Bay is most important as a habitat for wild salmon, which support the survival of wildlife and human populations in the region. The full life cycle of salmon is essential to the health and productivity of the Bristol Bay ecosystem, including the

marine-derived nutrients provided during their death and decomposition after spawning (Chambers, 2012).

As described below, the critical mainstays of the North Aleutian Basin economy – commercial, sport, and subsistence fishing – rely on the sustained health of the region's coastal and offshore ecosystems (Duffield, 2007). A CDE in or near the region may cause significant harm to these biological resources and endanger both the living resource habitats and human communities onshore that depend on them for survival.

19.2 Economic Activity in the North Aleutian Basin Planning Area and the Nearby Coastal Area

19.2.1 Commercial Fishing

Commercial fishing is the primary source of employment for residents of the North Aleutian Basin area and fits well into the dominant culture of the region in part because it is a form of self-employment. Many of the same skills as traditional hunting and fishing are required and its compressed seasonal nature causes little disruption to traditional seasonal activities for residents. In general, most commercial fishing permit holders and crew members, as well as some workers in the seafood processing sector, reside in Bristol Bay's primarily native Alaskan communities. In 2004, there were 952 resident commercial fishing permit holders in the Bristol Bay area, as well as 920 crew members (Duffield, 2007). For perspective on the importance of this level of employment to the region, approximately 7,500 people lived near the waters of the North Aleutian Basin planning area in 2010, with 997 living in Bristol Bay Borough, 4,847 in Dillingham, and 1,631 in Lake and Peninsula Borough in 2010 (U.S. Census, 2012).[39]

To illustrate the importance of the commercial fishing industry in the North Aleutian Basin, and the magnitude of potential impacts should a CDE occur in the region, **Table 19-1** presents the total landings revenue for the major species of fish and shellfish in the region, as reported by the Alaska Department of Fish and Game, for 2008.

[39] It should be noted that Lake and Peninsula Borough is bordered by both the North Aleutian Basin to the north and Cook Inlet to the south.

Table 19-1: Landings by Species Group for the North Aleutian Basin, 2008 (millions $)

Species	2005	2006	2007	2008	Annual Average	Percent of Total
Salmon	$142.7	$146.7	$159.8	$166.0	$153.8	33.2%
Pollock	$135.7	$126.5	$105.3	$112.3	$120.0	25.9%
King Crab	$88.1	$60.6	$91.0	$100.9	$85.1	18.4%
Pacific Cod	$39.0	$52.9	$49.4	$64.4	$51.4	11.1%
Halibut	$26.8	$29.7	$27.8	$31.4	$28.9	6.2%
Sablefish	$13.0	$15.5	$15.7	$14.7	$14.7	3.2%
Tanner Crab	$1.4	$0.9	$3.1	$3.9	$2.3	0.5%
Herring	$4.2	$3.8	$2.8	$3.3	$3.5	0.8%
Flatfish	$0.9	$1.2	$2.0	$1.2	$1.3	0.3%
Dungeness Crab	$0.6	$0.4	$1.3	$1.1	$0.9	0.2%
Scallops	-	$0.6	$0.4	$0.3	$0.4	0.1%
Rockfish	$0.3	$0.3	$0.3	$0.3	$0.3	0.1%
Total	**$453.1**	**$439.6**	**$459.0**	**$500.1**	**$463.0**	**--**

Source: World Wildlife Fund, 2011.

As suggested by **Table 19-1**, salmon is the most important commercial species in the North Aleutian Basin region, followed by Pollock. All five species of Pacific salmon are found in the region, and are a major focus of the region's commercial fisheries. Annual commercial harvests for sockeye salmon, typically the highest-priced species, averaged nearly 24 million fish per year between 1984 and 2003. Other average salmon harvests were 971,000 for chum, 69,000 for chinook, 133,000 for coho, and 593,000 for pink. The Bristol Bay area is one of the largest Alaska fisheries, in terms of total fish harvested and processed; in 2009 nearly 86.6 million tons of fish were harvested and processed with an ex-vessel[40] volume of $119 million (Northern Economics, 2011).

19.2.2 Tourism and Recreation

Tourism in the North Aleutian Basin revolves almost exclusively around outdoor recreation, and is dependent on the substantial acreage of wilderness set aside by the state and Federal government, as well as the health and natural beauty of the surrounding on- and off-shore ecosystems. Tourists visit the Bristol Bay area primarily for recreational fishing, sport hunting, and wildlife viewing. **Table 19-2** highlights the economic activity from the tourism sector in the Bristol Bay Area, which makes up a large portion of the land area near the North Aleutian Basin planning area. These data describe both the "ocean" and "coastal" economies of the borough. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in the borough that are adjacent, in whole or in part, to the shoreline. As indicated in the table, tourism accounted for approximately $6.4 million in GDP in 2009 and employed approximately 70 individuals. For perspective on

[40] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

these figures, the Census Bureau estimates approximately 7,500 people lived in the onshore areas [or regions] neighboring the North Aleutian Basin planning area, with 997 living in Bristol Bay Borough, 4,847 in Dillingham, and 1,631 in Lake and Peninsula Borough in 2010 (U.S. Census 2012).[41]

Table 19-2: Bristol Bay Tourism and Recreation Sector, 2009

Year	Establishments	Employment	Wages (million $)	GDP (million $)
Ocean Economy Data				
Bristol Bay	8	26	$1.6	$3.1
Dillingham	9	5	$0.1	$0.2
Lake and Peninsula	10	41	$1.6	$3.1
Total	27	72	$3.3	$6.4
Coastal Economy Data (Shore-adjacent Boroughs)				
Bristol Bay	18	92	$3.3	$6.6
Dillingham	23	87	$2.3	$4.6
Lake and Peninsula	27	102	$4.7	$9.5
Total	68	281	$10.3	$20.7

Note: NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
It should be noted that Lake and Peninsula Borough is bordered by both the North Aleutian Basin to the north and Cook Inlet to the south, and therefore is an overestimate for population in the region.
Source: NOEP, 2012a; NOEP, 2012b.

19.2.3 Commercial Shipping and Transport

Due to the lack of roads and railroads linking the North Aleutian Basin area to Anchorage or any other major city, the region depends heavily on both air and barge shipments of goods. Small airlines fly scheduled and charter flights out of Dillingham, King Salmon, and Iliamna, and most freight is hauled via by-pass mail or barge from Anchorage, or Seattle. Commercial fisheries also rely on planes and, to a lesser extent, barges to export their goods (Bristol Bay Native Association, 2004).

The largest commercial freight dock in Bristol Bay, and the main shipping hub of the region, is the Port of Bristol Bay, which is in operation from April through November. The Port handled more than 300 million pounds of cargo in 2010, including 120 million pounds of exported fish worth more than $55 million. The port serves more than 30 southwestern Alaska communities and provides fuel to 11 of these communities (McDermott, 2010). A CDE that disrupted or halted activity at the Port of Bristol Bay, or ship movements in or near the North Aleutian Basin planning area, could cause extensive economic harm to the communities that depend on the import and/or export of goods through the port.

[41] Again, it should be noted that Lake and Peninsula Borough is bordered by both the North Aleutian Basin to the north and Cook Inlet to the south, and therefore is an overestimate for population in the region.

19.2.4 Oil and Natural Gas production

No offshore oil or natural gas production currently takes place in the North Aleutian Basin planning area. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources of 2.3 billion barrels of oil-equivalent (BOEM, 2012). In March, 2010, however, President Obama excluded Bristol Bay from oil and gas exploration leases through 2017 (DOI, 2010).

To the extent that oil and natural gas resources extracted from the North Aleutian Basin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving North Aleutian Basin planning area oil or gas could impact these planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

19.3 Public Use in the North Aleutian Basin Planning Area and the Nearby Coastal Area

19.3.1 Coastal Recreation

Recreational angling represents the most economically significant public use of natural resources in and near the Bristol Bay area. The quiet, clean, remote setting of the region attracts numerous non-resident recreational anglers, who travel to the region for the express purpose of sport fishing. Alaska resident anglers account for approximately 65 percent of all trips while non-residents account for approximately 35 percent. Non-residents, however, account for a large majority of regional spending. In 2005, visitors spent an estimated $48 million on fishing in the Bristol Bay area out of the total $61 million spent by all marine anglers (Duffield, 2007). These expenditures contribute more than $100 million annually to the overall Alaskan economy, supporting more than 1,200 full time jobs (Chambers, 2012).

While sport fishing is the most prevalent recreational public use in the region, visitors and residents make several thousand trips annually for sport hunting and wildlife viewing (Duffield, 2007). Although there are no national parks or forests in the North Aleutian Basin area, there are five NWRs in the onshore Bering Sea subregion (Minerals Management Service, 2007). **Table 19-3** presents an overview of the estimated expenditures associated with coastal recreation in the Bristol Bay region in 2005. A CDE that damaged the natural habitats of fish and wildlife in or near the North Aleutian Basin could severely limit this source of revenue for local communities.

Table 19-3: Estimated Recreational Trips and Direct Spending in Bristol Bay, 2005

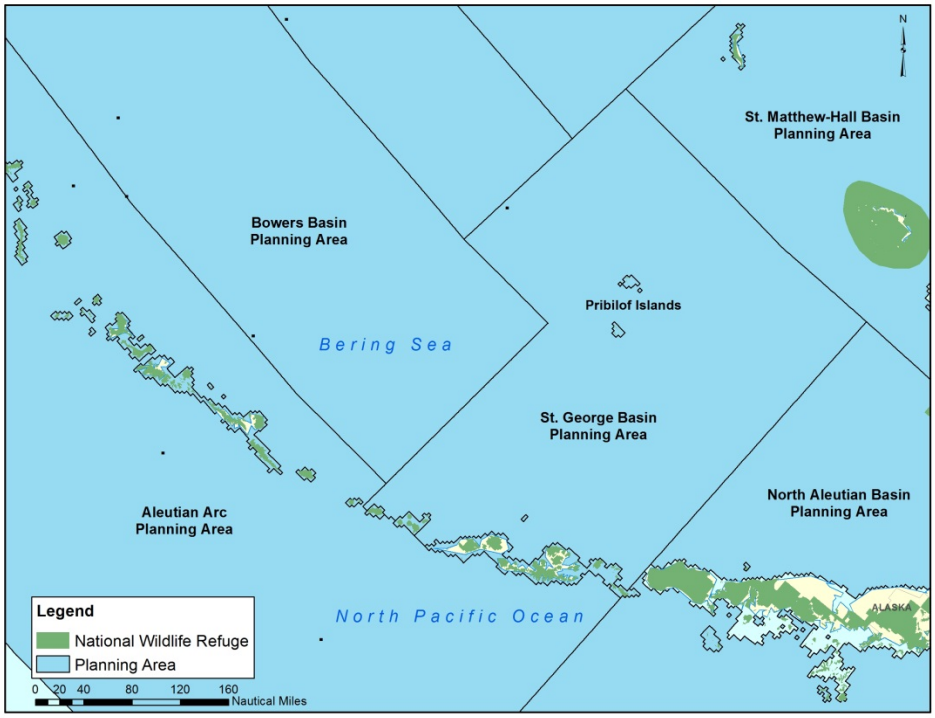
Sector	Local Residents	Non-local Residents	Non-residents	Total
Trips				
Sport fishing	19,488	4,450	12,966	36,904
Sport hunting	–	1,538	2,310	3,848
Non-consumptive recreation	–	1,000	9,000	10,000
Total trips	**19,488**	**6,988**	**24,276**	**50,752**
Spending (million$)				
Sport fishing	$6.61	$6.40	$48.2	$61.2
Sport hunting	–	$2.21	$10.9	$13.1
Non-consumptive recreation	–	$0.97	$16.2	$17.1
Total direct spending	**$6.61**	**$9.58**	**$75.3**	**$91.4**
Source: Duffield, 2007.				

19.3.2 Subsistence

The economy of the North Aleutian Basin area is mixed cash-subsistence, and relies on a variety of natural resources, household and community production, and large-scale noncommercial distribution and exchange of resources. The three primary indigenous cultures represented in the area are the Aleuts, Yupik Eskimos, and Dena'ina Athapaskan Indians. Alaska Natives make up approximately 70 percent of the regional population, compared to 16 percent for the entire state of Alaska. The primary resources for subsistence hunters and fishers in the area include salmon and other freshwater fish, caribou, and moose. Surveys taken in the late 1980s and early 1990s suggest that total annual subsistence harvests of wild fish, game, and plants across the 25 communities in the region are roughly 2.4 million pounds (Duffield, 2007). From 2002-2006, the five-year average of total fish harvested was around 124,000, nearly three fourths of which were sockeye salmon (Alaska Department of Fish and Game, 2009). A CDE that damaged fish, wildlife, and/or plants in the North Aleutian Basin region could have serious consequences for the communities who depend on these resources for survival.

20. St. George Basin

Figure 20-1: Map of the St. George Basin Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

20.1 Physical and Biological Resources in St. George Basin Planning Area and the Nearby Coastal Area

The Pribilof Islands, which are comprised of St. George, St. Paul, and two smaller uninhabited islets, make up the only land mass in or near the St. George Basin planning area, other than the northern facing side of the east Aleutian Islands, as shown in **Figure 20-1**. The Pribilof Islands support high concentrations of marine mammals, seabirds, fish, and invertebrates due to their isolation and proximity to the continental shelf break. These islands are treeless wet to dry tundra, with tall grasses, dwarf shrubs, and small-patch wetlands (NOAA, 2005).

The Aleutian east islands separate the waters of the North Pacific from the Bering Sea, and are bordered by warmer North Pacific water to the south and colder Bering Sea water to the north. The oscillating currents between the two seas create extreme tidal flows, with net northward movements of water from the Pacific to the Bering Sea, transporting essential nutrients and biota throughout the region (NOAA, 2007). The Bering Sea and Aleutian Islands also support one of the richest assemblages of marine mammals in the world with over 25 species, including seals, sea lion, walrus, whales, dolphins, porpoises, polar bears and sea otters. Seven species of whales on the Endangered Species List also reside within the area, including the north Pacific right whale, fin whale, sei whale, blue whale, sperm whale, bowhead whale, and the humpback whale (NOAA, 2005). A CDE in or near the St. George Basin planning area could adversely affect these biological resources.

20.2 Economic Activity in St. George Basin Planning Area and the Nearby Coastal Area

20.2.1 Commercial Fishing

Commercial fishing is an important economic activity in and near the St. George Basin planning area, with the epicenter of commercial fishing in the region located in Unalaska. Dutch Harbor, which lies within Unalaska, has a large commercial fleet and boasts both onshore and offshore processors. Landings within a given year are typically in the hundreds of thousands of tons, with the most revenue generated by groundfish (NOAA, 20111). For both the 2011 and 2012 seasons, the Pribilof District blue king crab fishery has remained closed due to very-low abundance of blue king crab. For the fishery to open, Pribilof District blue king crab must meet a minimum threshold of 13.2 million pounds of total mature biomass (TMB) in two consecutive years. Because the 2011 and 2012 estimates of TMB were well below this threshold, the fishery will also remain closed in 2013 (Alaska Department of Fish and Game, 2012).

20.2.2 Tourism and Recreation

Recreational activity in and near the St. George Basin planning area is limited due to its remoteness. Sportfishing had historically been a popular pastime among the military population on various Aleutian Islands, but has declined significantly in recent years due to the closure of military bases in the area (NOAA, 2007). Ferries run from island to island for visitors, and some charter services for recreational fishing are available. Most fishing and hunting in and near the St. George Basin planning area, however, is for subsistence, rather than recreation. The region's two NWRs, Izembek NWR and Alaska Maritime NWR, are destinations for serious bird-watchers, especially those looking to sight Asiatic birds whose migration along Asia's east coast brings them to the NWR. Commercial sightseeing boats for bird- and wildlife-watchers run out of Seward, Sitka, and Homer (USFWS, 2012a).

The Pribilof Islands are also destinations for serious bird-watchers. Each summer, an estimated 3 million seabirds and 1 million marine mammals come to breed and raise their young on the Pribilof Islands. Known as the "Seal Islands," the Pribilof Islands also comprise the largest Aleut community in the world. St. Paul Island is the easier of the two islands to visit and has a well-developed tour service, offered by the local Native Corporation. St. George Island, however, has more spectacular bird cliffs, offers a greater variety of seabirds, and provides more off-road viewing experiences (USFWS, 2008).

20.2.3 Commercial Shipping and Transport

The St. George Basin region does not have any major commercial ports. However, the "Great Circle" shipping route between the United States and Asia passes through the region as it extends from the Pacific Northwest through the Unimak Pass to the Bering Sea. Annual traffic on the Great Circle is estimated to include 1,600 container ships and 30 to 40 tankers, along with a variety of small commercial tugs, barges, and freighters. In total, between 3,000 and 3,500 vessels are estimated to pass through the Aleutian Arc region in any given year. A CDE in or near the St. George Basin planning area could disrupt this route, limiting or halting shipping traffic (NOAA, 2007).

20.2.4 Oil and Natural Gas Production

No offshore oil or natural gas production currently takes place in the St. George Basin planning area. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 0.7 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the St. George Basin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving St. George Basin planning area oil or gas could impact those planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

20.3 Public Use in St. George Basin Planning Area and the Nearby Coastal Area

20.3.1 Subsistence

Subsistence fishing is an essential public use of the Pribilof Islands and the area of the Aleutian Arc abutting the waters of the St. George Basin planning area. Communities in this remote region rely on these activities for their economic, social, cultural, and spiritual value, and to meet basic nutritional needs. In total, subsistence fisherman reported an average annual salmon catch during the period from 2002 to 2006 of approximately 5,000 salmon in Unalaska, most of which were sockeye (Alaska Department of Fish and Game, 2009). **Table 20-1** presents the most recent available subsistence harvest data for harbor seals and sea lions in and near the St. George basin planning area while **Table 20-2** presents the most recently available subsistence harvest data for northern fur seals. A CDE that damaged fish, wildlife, and/or habitat in the region could have a major impact on residents who engage in subsistence to meet their dietary needs or who subsist to continue their cultural traditions.

Table 20-1: Aleutian Arc Area Communities and Subsistence Seal and Sea Lion Harvest, 2008

Community	Harbor Seals			Steller Sea Lions		
	Reported Harvest, #	Estimated Harvest, #	Upper Harvest Estimate, lbs.	Reported Harvest, #	Estimated Harvest, #	Upper Harvest Estimate, lbs.
Akutan	32	34	1,901	8	8	1,600
Nikolski	14	14	784	0	0	0
St. George[1]	0	0	0	4	4	800
St. Paul*	0	0	0	22	22	4,400
Unalaska	0	0	0	2	6	1,028
Total	**46**	**48**	**2,685**	**36**	**40**	**7,828**

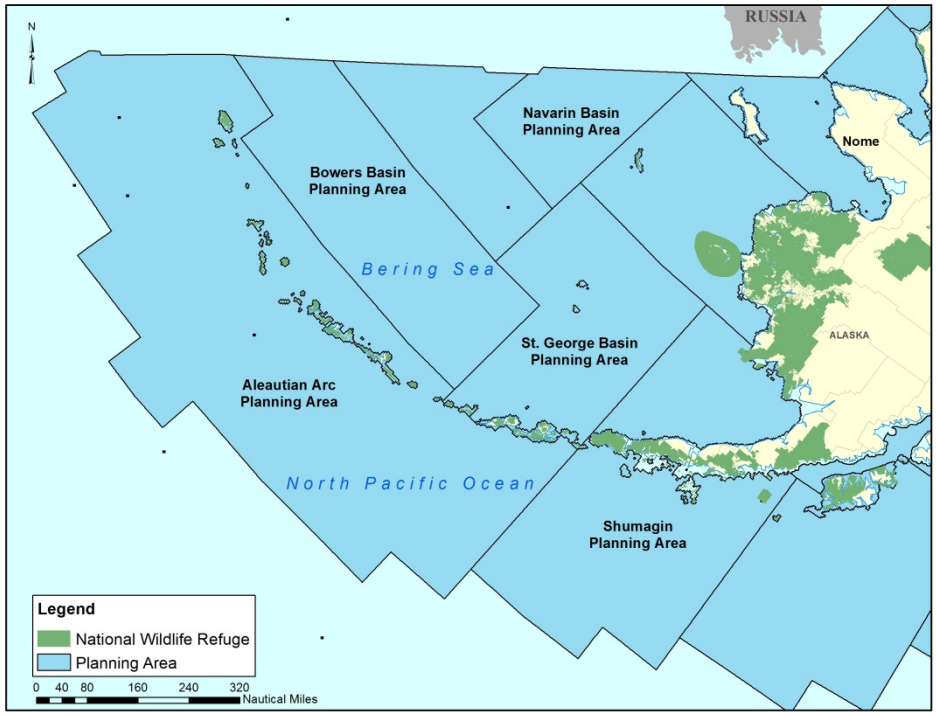
Note:
1. Information only available for St. George and St. Paul in 2007.
Source: Alaska Department of Fish and Game, 2012.

Table 20-2: Pribilof Island Subsistence Harvests for Northern Fur Seals

Year	Annual Harvest Allowances		Actual Number of Animals Harvested	
	St. Paul	St. George	St. Paul	St. George
2000	1,645 – 2,000 animals	300 – 500 animals	754	121
2001			597	184
2002			648	203
2003			522	132
Source: NOAA, 2005.				

21. Aleutian Arc

Figure 21-1: Map of the Aleutian Arc Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

21.1 Physical and Biological Resources in the Aleutian Arc Planning Area and the Nearby Coastal Area

The Aleutian Archipelago comprises hundreds of small volcanic islands, as shown in **Figure 21-1**, and is separated by oceanic passes that connect the waters of the North Pacific with the Bering Sea. The Archipelago forms a porous boundary between the two ocean basins, with the islands being bordered by warmer North Pacific water to the south and colder Bering Sea water to the north. The region is dominated by three major currents: the Aleutian North Slope Current in the Bering Sea, and the Alaska Coastal Current and Alaskan Stream in the North Pacific. These oscillating currents create extreme tidal flows with net northward movements of water from the Pacific to the Bering Sea, transporting essential nutrients and biota throughout the region (NOAA, 2007).

The Aleutian Islands are characterized by a wet and stormy maritime climate, with persistent wind, fog, and rain. The average temperature during the summer ranges from 45 to 57 degrees Fahrenheit, while winter temperatures range from 27 to 37 degrees Fahrenheit. The harsh and rapidly changing weather has substantial impacts on the marine ecosystems in the Aleutian Arc region. Over the past 50 years, the region has experienced a long-term cooling trend, coupled with increased variability in surface air temperature (NOAA, 2007).

As remote and hostile an environment as it may seem, the Aleutian Arc supports a dynamic marine environment, with a huge variety of habitats across the onshore, nearshore, and offshore systems. The Aleutian Arc area supports coldwater corals and sponge communities on the steep, rocky slopes of the islands, and provides an important habitat for diverse fish and invertebrate species. Key fish species in the area include Atka mackerel, Pacific perch, Pollock, and Pacific cod. Most of the seabirds inhabiting the Aleutians have breeding colonies in the western Bering Sea, but feed in the Archipelago (NOAA, 2007). Mammals in the region include stellar sea lions, seals, sea otters, and whales. A CDE could adversely affect these biological resources (USFWS, 2012b).

21.2 Economic Activity in the Aleutian Arc Planning Area and the Nearby Coastal Area

21.2.1 Commercial Fishing

Commercial fishing is an essential economic activity in and near the Aleutian Arc planning area, with commercial fisheries in the region providing more than half of the seafood consumed in the United States (USFWS, 2012b). Primary commercial species include pollock, cod, flatfish, halibut, crab, and salmon. In 2005, Aleutian Islands fisheries harvested 216 million pounds, with an estimated ex-vessel[42] value of $60 million, which were processed in ten ports. Because of the relatively small ports in the region, however, much of the ex-vessel value associated with fish caught in the region is accounted for and brought to ports near other planning areas. The $60 million figure is therefore an underestimate of fishing activity in the region. The majority of the offshore processing volume in the area was devoted to Atka mackerel, although recently the most economically important commercial species in the Aleutian Arc have been king crab, Pacific halibut, Pacific cod, and Atka mackerel (NOAA, 2007). Since January 1, 2011, NOAA has placed restrictions on commercial fishing on the western end of the Aleutian Island region, in an effort to protect the food supply for endangered stellar sea lions. Closures primarily affected the Atka mackerel and Pacific cod fisheries (NOAA, 2010).

21.2.2 Tourism and Recreation

Tourism is extremely limited in the Aleutian Arc region. Insofar as there are tourist activities, they include caribou hunting, bird-watching, and ship-based eco-tourism. These activities are described in more detail below. Some of the islands on the Aleutian Arc provide car rentals or lodging in an effort to attract cruise passengers; however, the economic impacts of this activity are not significant (NOAA, 2007). **Table 21-1** highlights the economic activity from the tourism sector in the Aleutians West Borough. These data describe both the "ocean" and "coastal" economies of the borough. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in boroughs that are adjacent, in whole or in part, to the shoreline. As indicated in the table, tourism accounted for approximately $600,000 in GDP in 2009 and employed approximately 15 individuals

[42] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

(NOEP, 2012a). For perspective on these figures, the Census Bureau estimates that the borough's population was approximately 5,600 in 2010 (U.S. Census 2012).

Table 21-1: Aleutians West Borough Tourism and Recreation Sector, 2009

Year	Establishments	Employment	Wages (million $)	GDP (million $)
Ocean Economy Data				
2009	8	14	$0.3	$0.6
Coastal Economy Data (Shore-adjacent Boroughs)				
2009	9	33	$0.7	$1.4

Note: NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
Source: NOEP, 2012a; NOEP, 2012b.

21.2.3 Commercial Shipping and Transport

The Aleutian Arc region does not have any major commercial ports. However, the "Great Circle" shipping route between the United States and Asia passes through the region as it extends from the Pacific Northwest through the Unimak Pass to the Bering Sea. Annual traffic on the Great Circle is estimated to include 1,600 container ships and 30 to 40 tankers, along with a variety of small commercial tugs, barges, and freighters. In total, between 3,000 and 3,500 vessels are estimated to pass through the Aleutian Arc region in any given year. A CDE in or near the Aleutian Arc planning area could disrupt this route, limiting or halting shipping traffic (NOAA, 2007).

21.2.4 Oil and Gas Production

No offshore oil or natural gas production currently takes place in the Aleutian Arc region. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be negligible (BOEM, 2012).

21.3 Public Use in the Aleutian Arc Planning Area and the Nearby Coastal Area

21.3.1 Coastal Recreation

Recreational activity in the Aleutian arc is limited due to its remoteness. Sportfishing had historically been a popular pastime among the military population on various islands, but has declined significantly in recent years due to the closure of military bases in the area (NOAA, 2007). Ferries run from island to island for visitors, and some charter services for recreational fishing are available. As mentioned above, caribou hunting is a draw for some visitors. Most fishing and hunting on the Aleutian Arc, however, is for subsistence, rather than recreation.

The region's two NWRs, Izembek NWR and Alaska Maritime NWR, are destinations for serious bird-watchers, especially those looking to sight Asiatic birds whose migration along Asia's east coast brings them to the NWR. Commercial sightseeing boats for bird- and wildlife-watchers run out of Seward, Sitka, and Homer (USFWS, 2012a).

21.3.2 Subsistence

Subsistence hunting and fishing is an essential public use of the Aleutian Arc. Communities in the remote region rely on these activities for their economic, social, cultural, and spiritual value, and to meet basic nutritional needs. The region's commercial and subsistence fisheries also maintain strong connections (NOAA, 2007). **Table 21-2** below details the average annual salmon subsistence harvest by community in the region from 2002 to 2006, except for the Akutan, Atka, and Nikolski community data which is from 2003. In total, subsistence fisherman reported an average annual catch during the period from 2002 to 2006 of approximately 10,000 salmon, nearly three quarters of which were sockeye (Alaska Department of Fish and Game, 2009).

Table 21-2: Subsistence Fishing in Aleutian Arc Area Communities, average annual harvest 2002-2006

Community	Permits Issued	Number of Fish Caught: Aleutian Arc					
		Chinook	Sockeye	Coho	Pink	Chum	Total Fish
Unalaska	216	11	4,318	616	44	480	5,469
Adak	4	0	217	0	0	0	217
Akutan, Atka, and Nikolski[1]	NA	23	2,744	730	574	0	4,071
Total	220	34	7,279	1,346	618	480	9,757

Note:
1. Data for Akutan, Atka, and Nikolski is from 2003 as more recent data is unavailable. Permits are also not required in these areas.

Source: Alaska Department of Fish and Game, 2009.

Table 21-3 presents the most recent available subsistence harvest data for seals and sea lions. A CDE that damaged fish, wildlife, and/or plants in the Aleutian Arc region could have a major impact on residents in the region who engage in subsistence fishing and hunting to meet their dietary needs or continue their cultural traditions.

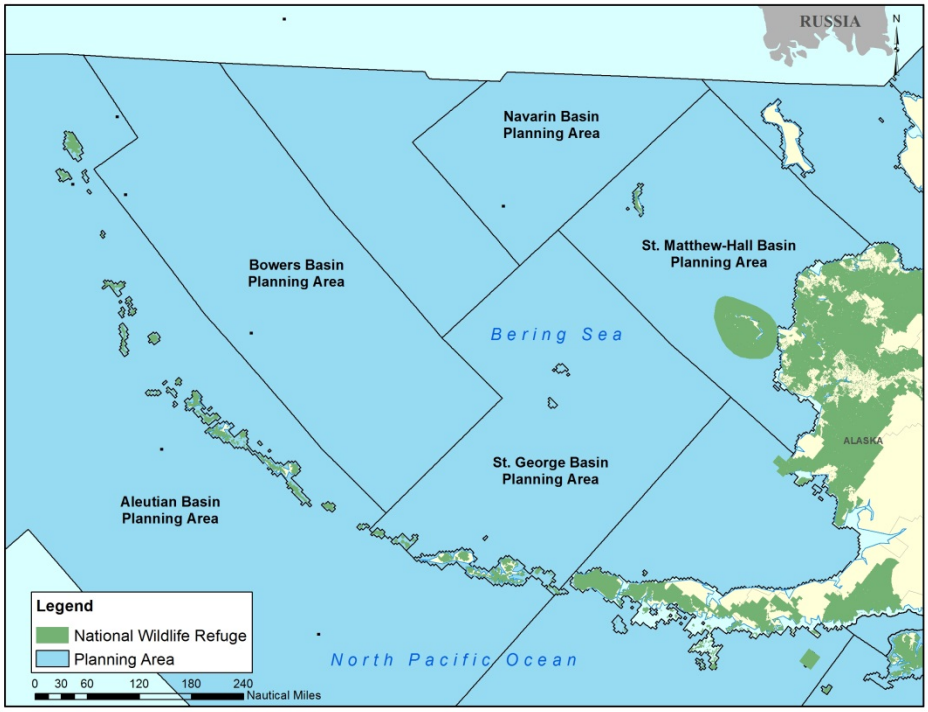
Table 21-3: Aleutian Arc Area Communities and Subsistence Seal and Sea Lion Harvest, 2008

Community	Harbor Seals			Steller Sea Lions		
	Reported Harvest, #	Estimated Harvest, #	Upper Harvest Estimate, lbs.	Reported Harvest, #	Estimated Harvest, #	Upper Harvest Estimate, lbs.
Adak	4	4	224	8	8	1,600
Akutan	32	34	1,901	8	8	1,600
Atka	14	35	1,960	28	70	14,000
Attu	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Nikolski	14	14	784	0	0	0
Shemya Island	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Unalaska	0	0	0	2	6	1,028
Total	**64**	**87**	**4,869**	**46**	**92**	**18,228**

Source: Alaska Department of Fish and Game, 2012b.

22. Bowers Basin

Figure 22-1: Map of the Bowers Basin Planning Area

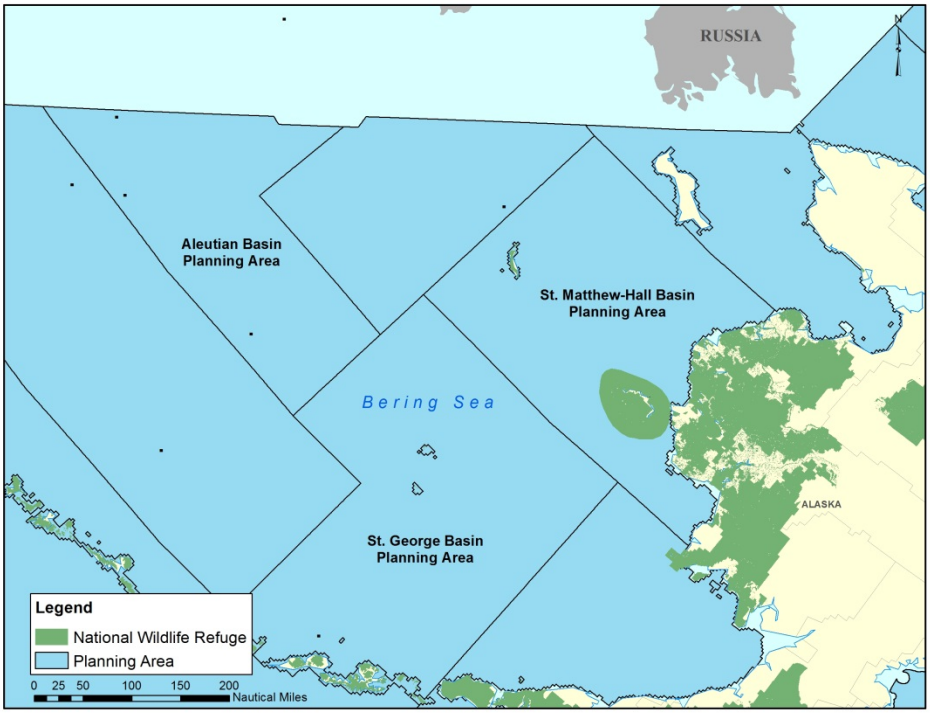


Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

This report does not present information on physical resources, economic activity, and public use of natural resources in the Bowers Basin planning area, shown above in **Figure 22-1**. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be negligible.

23. Aleutian Basin

Figure 23-1: Map of the Aleutian Basin Planning Area

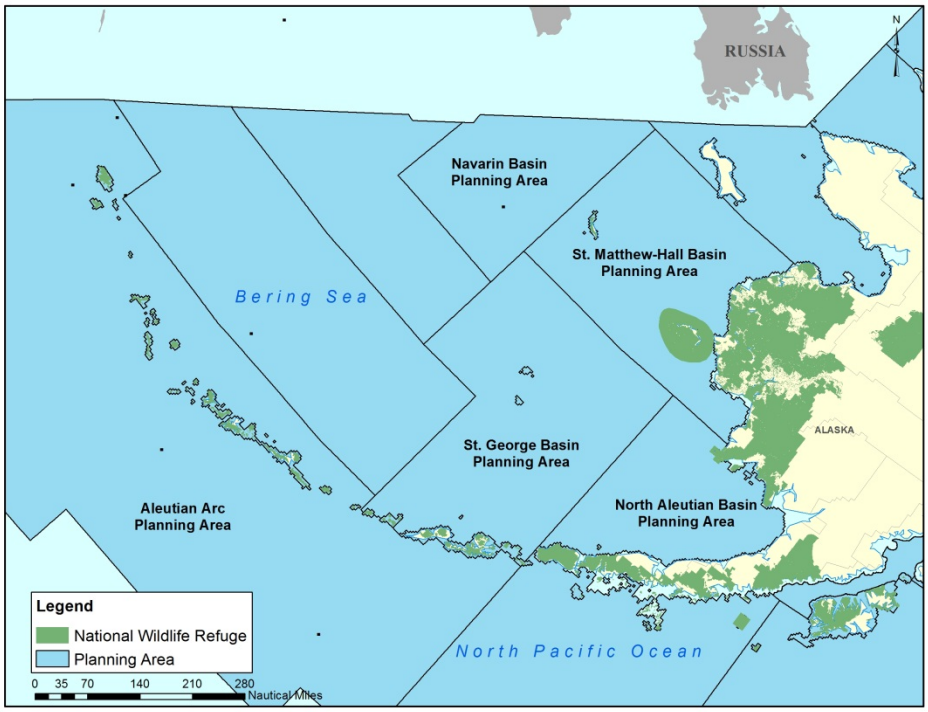


Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

This report does not present information on physical resources, economic activity, and public use of natural resources in the Aleutian Basin planning area, shown above in **Figure 23-1**. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be negligible.

24. Navarin Basin

Figure 24-1: Map of the Navarin Basin Planning Area

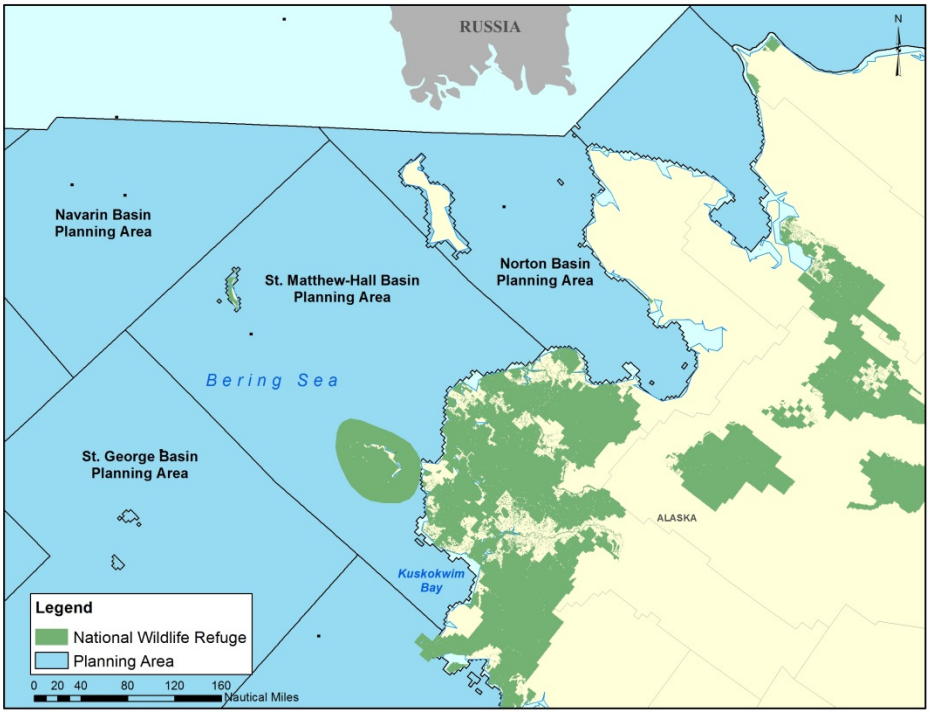


Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

The Navarin Basin planning area, shown above in **Figure 24-1**, is located to the west of the St. George Basin and St. Matthew-Hall Basin planning areas. Because the Navarin Basin planning area is surrounded by open ocean, commercial activity and public use of marine resources in the planning area are both negligible. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be .35 billion barrels of oil-equivalent (BOEM, 2012). However, if a CDE were to occur in this planning area, currents could transport discharged hydrocarbons eastward to the St. George Basin and St. Matthew-Hall Basin planning areas. Readers are referred to chapters 20 and 25 for information on the resources and activities potentially affected by a CDE in these areas. In addition, to the extent that oil and natural gas resources extracted from the Navarin Basin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Navarin Basin oil or gas could impact these planning areas. Please see the chapters focusing on these areas for information on resources that could be negligible.

25. St. Matthew-Hall Basin

Figure 25-1: Map of the St. Matthew-Hall Basin Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

25.1 *Physical and Biological Resources in the St. Matthew-Hall Basin Planning Area and the Nearby Coastal Area*

Despite its large geographic area, populations are relatively sparse in the St. Matthew-Hall Basin region. Inland, the area is characterized by vast expanses of low-lying land, crisscrossed by a multitude of rivers, while the coast is heavily influenced by the strong current of the Bering Sea (NOAA, 2011). The primary rivers draining into Kuskokwim Bay are the Kanektok, Arolik, and Goodnews rivers. Outside of the Kuskokwim river basin the region consists of rugged mountains, glacial valleys, lakes, sand and gravel beaches, and coastal cliffs. Tundra covers most of the region and non-vegetated areas such as glaciers, rocky alpine summits, and gravel bars cover most of the remaining area (La Vine, 2007).

The St. Matthew-Hall Basin planning area, shown above in **Figure 25-1**, is located near both Wade Hampton and Bethel Boroughs and is home to a variety of fish, birds, and marine mammals. Among the most common species of fish are salmon, dolly varden, pacific herring, and whitefishes. Generally, these species live in nearshore coastal-mixing zones and mixed-ice zones. Marine mammals include polar bears, ringed seals, spotted seals, harbor seals, bearded seals, ribbon seals, beluga whales, walrus, and stellar sea lions. Bowhead whales, northern right whales, and humpback whales also migrate through the area or, in the case of the humpback, reside in the area during the summer (Western Alaska SCP, 2001).

25.2 *Economic Activity in the St. Matthew-Hall Basin and the Nearby Coastal Area*

25.2.1 Commercial Fishing

Commercial fishing is an important part of the local economy in the St. Matthew-Hall Basin region. Combined with Bristol Bay, Kuskokwim Bay is considered part of the largest sockeye salmon fishery in the world. Commercial catches of salmon make up the majority of fishing activity; however, halibut and groundfish are also important. The continued availability of salmon, including chum, chinook, sockeye, coho, and pink, is essential to the health of commercial fishing in the region (NOAA, 2011). **Table 25-1** presents harvest data for blue crab in the St. Matthew-Hall region for 2010, while **Table 25-2** presents the total salmon catch in the St. Matthew-Hall region in 2012.[43] Commercial fishing in the region brought in approximately $2.0 million in ex-vessel[44] value while commercial crab harvests brought nearly $5.2 million in ex-vessel value.

Table 25-1: Commercial Crab Harvests in St. Matthew-Hall Region, 2010

Species	Average Price per Pound	Pounds Harvested (millions of lbs.)	Ex-Vessel Value ($million)
Blue Crab	$4.11	1.3	$5.16
Source: Alaska Department of Fish and Game, 2012a.			

Table 25-2: Total Commercial Salmon Harvests in the St. Matthew-Hall Region, 2012

	Chinook	Sockeye	Coho	Pink	Chum	Total Fish
Number of Fish	8,221	91,180	143,120	0	150,798	393,319
Value ($million)	$0.1	$0.5	$0.6	$0	$0.8	$2.0
Source: Alaska Department of Fish and Game, 2012a.						

25.2.2 Oil and Natural Gas Production

No offshore oil or natural gas production currently takes place in the St. Matthew-Hall Basin. As of 2011, BOEM estimates the undiscovered technically recoverable oil and gas resources in this planning area to be negligible (BOEM, 2012).

25.3 Public Use in the St. Matthew-Hall Basin and the Nearby Coastal Area

25.3.1 Coastal Recreation

The St. Matthew-Hall Basin region is one of the great birding areas of North America and offers visitors the opportunity to see numerous rare birds. The region's two NWRs, Togiak NWR and Yukon Delta NWR, are popular destinations for bird-watchers. Approximately 200 species of

[43] The 2012 season ended in August of 2012.

[44] The ex-vessel value is the value of fish and shellfish prior to processing. It reflects the price received by fisherman at the dock.

birds have been sighted on Togiak NWR, including threatened steller's eiders and spectacled eiders. Several arctic goose species frequent the refuge as well, along with a rich variety of other seabirds, waterfowl, shorebirds, songbirds and raptors. The Yukon Delta NWR is home to one of the largest aggregations of water birds in the world. Every spring millions of ducks, geese, and other water birds return to the refuge to nest. In addition, a portion of the Yukon Delta NWR is one of the most important shorebird nesting areas in the United States in terms of both density and species diversity (USFWS, 2012a).

Table 25-3 highlights the economic activity from the tourism sector in Wade Hampton and Bethel Boroughs located near the St. Matthew-Hall basin planning area. These data describe both the "ocean" and "coastal" economies of the borough. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in boroughs that are adjacent, in whole or in part, to the shoreline. As indicated in the table below, the ocean economy data show that tourism accounted for approximately $200,000 in GDP in 2009. Coastal economy data show that tourism accounted for approximately $3.3 million in GDP in 2009 and approximately 130 jobs (NOEP, 2012a).

Table 25-3: Bethel and Wade Hampton Borough Tourism and Recreation Sector, 2009

Borough	Establishments	Employment	Wages (million $)	GDP (million $)
Ocean Economy Data				
Bethel	14	N/A*	N/A*	$0.2
Wade Hampton	N/A	N/A	N/A	N/A
Total	14	N/A*	N/A*	$0.2
Coastal Economy Data (Shore-adjacent Boroughs)				
Bethel	28	102	$1.5	$3.1
Wade Hampton	3	24	$0.1	$0.2
Total	31	126	$1.6	$3.3

Note: NOEP defines establishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments. N/A is listed where data is not available. *N/A is used to identify areas where data is available; however, the data is incomplete and therefore not presented.
Source: NOEP, 2012a; NOEP, 2012b.

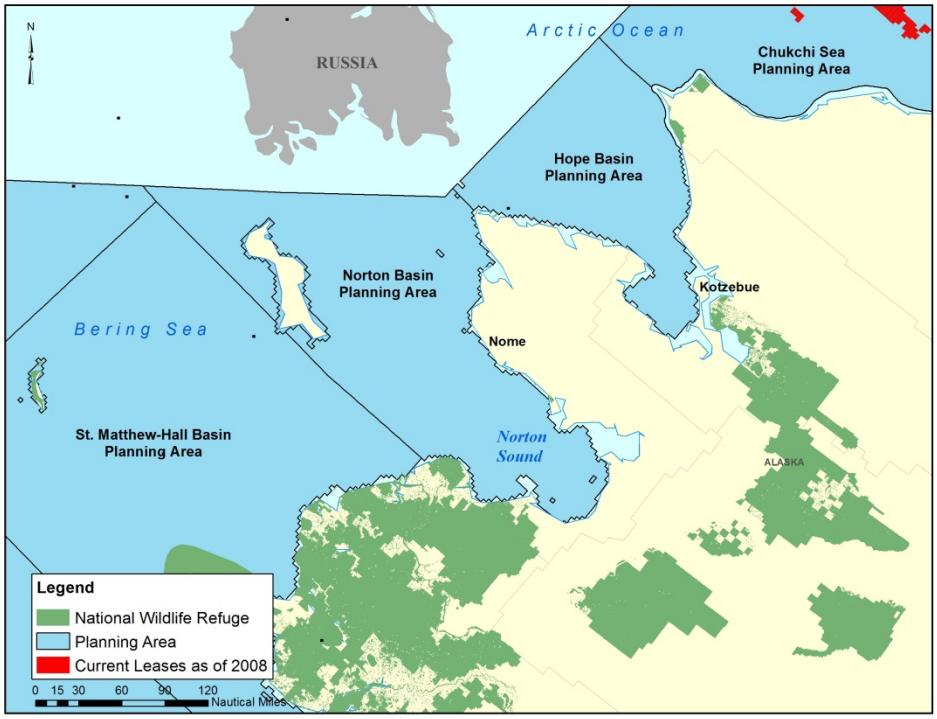
25.3.2 Subsistence

Western Alaska, which includes the boroughs of Wade Hampton, Bethel, and Dillingham, is home to a predominately Yup'ik Eskimo population. Native cultural traditions are an important part of everyday life in this area and many residents still speak their Native Alaskan languages. As of 2000, approximately 90% of all residents were Alaska Native or part Native (NOAA, 2011). Partly due to these strong Native traditions, subsistence fishing is an essential public use of the St. Matthew-Hall Basin area. Communities in this region rely on these activities for their economic, social, cultural, and spiritual value, and to meet basic nutritional needs (NOAA, 2011). In total, subsistence fisherman reported an average annual catch in 2007 of approximately 188,000 salmon throughout the Kuskokwim Bay and Kuskokwim river area. Chinook harvest accounted for approximately 72,000 fish while chum accounted for

approximately 53,000 fish. Sockeye, pink, and coho salmon account for the remaining catch (Alaska Department of Fish and Game, 2009).

26. Norton Basin

Figure 26-1: Map of the Norton Basin Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

26.1 Physical and Biological Resources in the Norton Basin Planning Area and the Nearby Coastal Area

Norton Sound, pictured above in **Figure 26-1**, receives most of its fresh water and accompanying nutrients from the Yukon and Kuskokwim Rivers, and other small rivers from the Seward Peninsula, to the north of the Basin. The region differs from the Bering Sea, which is mostly defined by strong currents, in that most of its water mixes into the area by tides and winds. The surrounding geography, including the St. Lawrence Island, varies greatly from low hills to steep highlands and coastal areas dotted with lakes and lagoons. The Seward Peninsula, including the city of Nome, is un-glaciated but is underlaid with permafrost. The climate of the Norton Basin area fluctuates between maritime, in the summer when the water is free of ice, to continental, when the water ices over in the winter (Kawerak, 2009).

The Norton Basin area is home to a wide variety of migratory birds. Ducks, geese, swans, and cranes live in the freshwater habitats of the Bering Strait, while seabirds are concentrated along the coastline, including eiders, murres, and auklets. Most of the world's population of stellar eiders migrates across the Bering Sea through the region (Kawerak, 2009).

26.2 Economic Activity in the Norton Basin Planning Area and the Nearby Coastal Area

26.2.1 Commercial Fishing

Commercial fishing is an important industry in the Norton Basin. Key species include salmon, king crab, and herring, although minor fisheries have emerged for halibut and whitefish in the past (Norton Sound Steering Committee, 2003). Red king crab is the only shellfish harvested in the area (Kawerak, 2009). **Table 26-1** presents harvest data for two of these three major commercial species.

Table 26-1: Commercial Catch by Fisheries in the Norton Sound District, 2006-2011

Year	Commercial Catch	
	Salmon (number)	Red King Crab (pounds)
2006	N/A	419,191
2007	N/A	289,264
2008	220,801	364,235
2009	N/A	369,462
2010	N/A	387,304
2011	177,167	373,990
Source: Alaska Department of Fish and Game (2012) and Kawerak (2009).		

Since 1962, commercial salmon fisheries in Norton Sound have provided annual landed values between $21,500 in 1965 and $1.0 million in 1983, with an average of approximately $250,000 between 1995 and 2000. Red King crab contributed between $41,000 in 1998 and $1.9 million in 1979, while sac roe herring contributed between $0.2 in 1998 and $4.5 million 1996. Of the total commercial landing value, salmon provided roughly 30 percent on average during the 1990s, but then trended downward, as suggested in **Table 26-2** (Norton Sound Steering Committee, 2003).

Table 26-2: Value of Fisheries in the Norton Sound District, 1993-2000

Year	Gross Value of Catch to Fishers (million$)		
	Salmon	Red King Crab	Herring
1993	$0.32	$0.43	$1.50
1994	$0.86	$0.65	$0.30
1995	$0.36	$0.93	$4.20
1996	$0.34	$0.52	$4.50
1997	$0.36	$0.18	$0.60
1998	$0.36	$0.04	$0.20
1999	$0.08	$0.07	$0.60
2000	$0.15	$0.72	$0.80
Source: Norton Sound Steering Committee, 2003.			

In 2008, commercial anglers harvested 120,000 coho salmon, 75,000 pink salmon, and 25,000 chum salmon. Chinook salmon runs were still poor. Most of these were harvested in the Shaktoolik and Unalakleet sub-districts, while processing took place primarily in Nome, Savoonga, and Unalakleet. Halibut and crab were also processed in Nome, while Savoonga serves as a halibut buying station (Kawerak, 2009).

26.2.2 Tourism and Recreation

The tourism industry in the Norton Basin region is concentrated in Nome, on the southern coast of the Seward Peninsula. Nome levies a six percent bed tax, which generated approximately $97,000 for the city's general fund in 2008. Many visitors to Nome are packaged tourists traveling with tour groups, but some are also independent travelers (Kawerak, 2009). **Table 26-3** summarizes types of travel to Nome in 2003.

Table 26-3: Tourism Markets in Nome, 2003

Market Segment	Est. Volume	Avg. Length of Stay (days)	Avg. Expenditure Per Diem	Total Expenditures
Small Group / Independent				
Birders	750	4	$200	$600,000
Other summer	2000	3	$200	$1,200,000
Hunt	200	3	$200	$120,000
Fish	200	3	$200	$120,000
Winter Adventure	300	3	$200	$180,000
Adventure Cruise	900	1	$100	$90,000
AK Air Package				
One Day	800	1	$50	$40,000
Overnight	1200	1	$200	$240,000
Special Events				
Iditarod	1500	2	$200	$600,000
Other				
Business Travel	1200	2	$200	$480,000
Visiting Friends, Relatives	750	4	$35	$105,000
Total	**9,800**	**2.5**	**$162**	**$3,775,000**

Source: Kawerak, 2009.

As **Table 26-3** suggests, most tourism in Nome is based on outdoor recreation. Although the cruise industry has begun to go as far north as Norton Sound, the main tourist activities in the area include hiking, fishing, and wildlife viewing. Ecotourism is profitable for the Norton Basin region because visitors are destination-oriented, and often willing to pay a premium for a high-quality, unique outdoor experience in northern Alaska (Nome Coastal District, 2006). A CDE that damaged coastal natural resources could adversely impact the region's tourism industry.

26.2.3 Commercial Shipping and Transport

The city of Nome is the regional hub for transportation, and the Port is the only harbor for boat moorage and services in the region (Nome Coastal District, 2006). A CDE that disrupted or halted shipping to and from the port could pose extreme difficulties for both Nome and the nearby villages and communities that rely on the port.

26.2.4 Oil and Natural Gas Production

The Norton Basin was proposed for a lease sale in the early 1980s, but the sale was cancelled in 1983 (Nome Coastal District, 2006). No offshore oil or natural gas production currently takes place in Norton Basin. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 0.6 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Norton Basin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Norton Basin oil or gas could impact those planning areas as well. Please see the chapters focusing on these areas for information on resources that could be affected.

26.3 Public Use in the Norton Basin Planning Area and the Nearby Coastal Area

26.3.1 Coastal Recreation

Sport fishing has recently been growing in popularity in the Norton Basin region as a result of reduced subsistence opportunities and overcrowding of other fishing areas in Alaska. Most recreational anglers are non-local, and come to the region for the purpose of fishing or participating in other outdoor recreation; Norton Basin residents fish mainly for subsistence, rather than recreation. The majority of guided and unguided sport fishing trips for salmon occur in the Norton Sound area, with concentrations near Unalakleet and those waters accessible from the Nome area road system. Across all species of fish, total recreational fishing has ranged from approximately 11,000 angler days in the late 1970s to 33,000 angler days in 1991, to 22,000 days in 1999. Primary salmon species for recreational anglers are coho and pink (Norton Sound Steering Committee, 2003).

Norton Basin also provides opportunities for other recreational activities, such as hunting and bird- and wildlife viewing. Because the region is home to a number of rare bird species, particularly birds that do not appear elsewhere in the United States, the region is popular with serious bird-watchers (Kawerak, 2009). **Table 26-4** highlights the economic activity from the tourism sector in Nome. These data describe both the "ocean" and "coastal" economies of the borough. "Ocean" economy data are limited to industries and activities in the "tourism and recreation" sector that are defined as being ocean-dependent. "Coastal" economy data comprise all industries and activities in the "leisure and hospitality" sector in boroughs that are adjacent, in whole or in part, to the shoreline. As indicated in the table, tourism accounted for approximately $800,000 in GDP in 2009 and employed less than 10 individuals. For perspective on these figures, the Census Bureau estimates that the borough's population was approximately 9,500 in

2010 (U.S. Census, 2012). A CDE that damaged coastal natural resources in the Norton Basin area could severely limit coastal recreation and its associated economic activity.

Table 26-4: Nome Tourism and Recreation Sector, 2009

Year	Establishments	Employment	Wages (million $)	GDP (million $)
Ocean Economy Data				
2009	14	7	$0.4	$0.8
Coastal Economy Data (Shore-adjacent Boroughs)				
2009	29	240	$3.8	$7.6

Note: NOEP defines **e**stablishments as places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.
Source: NOEP, 2012a; NOEP, 2012b.

26.3.2 Subsistence

Most residents of the Norton Basin area rely heavily on subsistence fishing and hunting, both in the region's main rivers and in the coastal marine waters. The population of the region is approximately 7,000 people; most residents live in the City of Nome, while the rest are spread out across small communities along the coast. The primary subsistence fish in the region is salmon, followed by halibut, saffron cod, and red king crabs, which are generally harvested in pots or hand lines through winter ice. Subsistence use of flounder, sole, plaice, and herring have also been documented in the region (Norton Sound Steering Committee, 2003).

Table 26-5 below details the average annual subsistence harvest for Norton Sound and Port Clarence in 2007. In total, subsistence fisherman reported an average annual catch in 2007 of approximately 74,000 salmon. Chum, pink, and coho salmon made up the majority of catches (Alaska Department of Fish and Game, 2009).

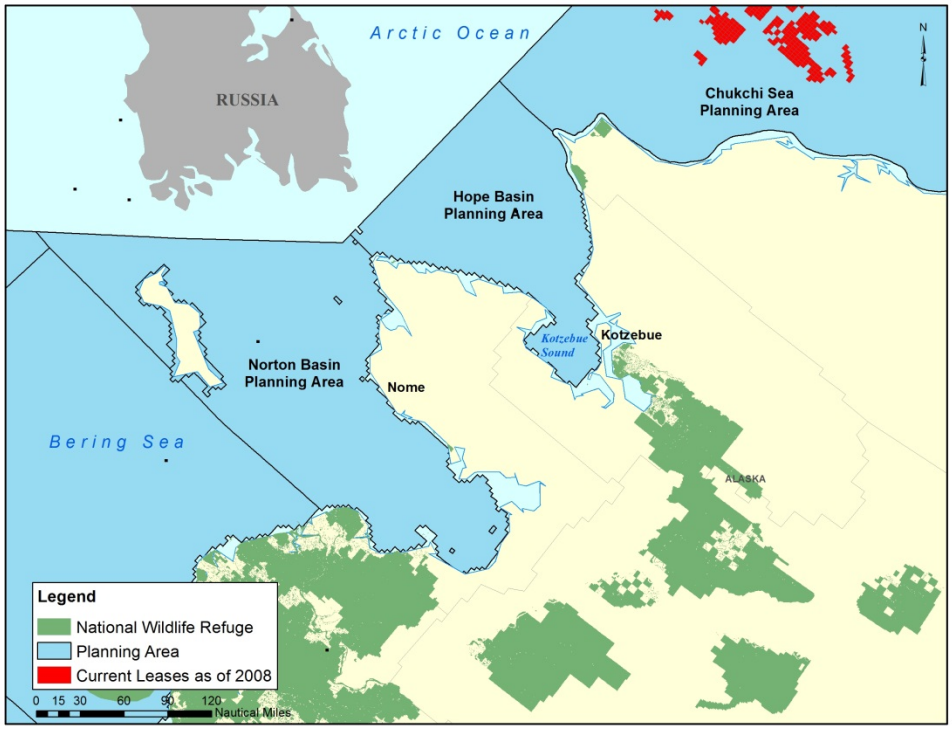
Table 26-5: Subsistence Fishing in Norton Basin, estimated annual harvest 2007

Community	Permits	Number of Fish Caught: Aleutian Arc					
		Chinook	Sockeye	Coho	Pink	Chum	Total Fish
Norton Sound	1,041	3,744	923	13,564	18,170	21,714	58,116
Port Clarence	362	85	9,484	705	4,454	1,468	16,196
Total	1,403	3,829	10,407	14,269	22,624	23,182	74,312

Source: Alaska Department of Fish and Game, 2009.

27. Hope Basin

Figure 27-1: Map of the Hope Basin Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

27.1 *Physical and Biological Resources in the Hope Basin Planning Area and the Nearby Coastal Area*

The Hope Basin planning area, pictured above in **Figure 27-1**, consists of the southeastern waters of the Chukchi Sea, primarily Kotzebue Sound. The Sound is relatively shallow, and is therefore protected from most arctic deep-water waves. Currents flow at approximately 0.5 knots, distributing sand and gravel throughout the Sound and keeping a channel open at the Kotzebue dock. The shallowness of the Sound means that vessels bound for the open ocean must anchor 15 miles offshore and then transfer goods to and from river barges. The Sound also experiences ice gouging in the winter, which can cause damage to on- and off-shore structures (Glenn Gray & Associates, 2012).

Ecological productivity in the southeast Chukchi and the Kotzebue Sound is greatest in the summer months, and dominated by three major currents that flow north through the Bering Strait. These currents stimulate population growth among coastal fish, which form the basis for the Sound's food web (Piatt et al., 1989). The Sound is home to more than 50 species of fish and several species of marine mammals, including seals, walrus, beluga and bowhead whales, and, on rare occasion, polar bears (Glenn Gray & Associates, 2012). At the eastern edge of the sound is the Kobuk River watershed, which provides spawning habitat, connectivity, and feeding grounds for populations of both resident and migratory fish (Durand et al., 2009).

Onshore, the surrounding area is mostly covered in coastal tundra, with ground cover varying between continuous cotton grass tussocks and sparse growth of sedges and dwarf shrubs, with few if any trees. Many types of land mammals live near the shore in the region, including big game mammals like moose, caribou, and bear, and furbearers such as wolves, lynx, foxes, minks, beavers, and otters. Birds are generally only present in the region between May and September, coming primarily to breed and nest before migrating, some as far as Antarctica, South America, and Asia. Others migrate between the Sound and Siberia, given the effects of the prevailing wind patterns in the Bering Strait area. Occasionally rare Asiatic species of birds will appear in and around the Kotzebue Sound (Glenn Gray & Associates, 2012).

27.2 Economic Activity in the Hope Basin Planning Area and the Nearby Coastal Area

27.2.1 Commercial Fishing

Commercial fisheries in the Hope Basin planning area are fairly limited, and consist mainly of chum salmon, which is harvested in the Kobuk and Noatak Rivers. Although the industry appears to have been growing in recent years, the level of fishing activity over the past five years has been approximately one quarter of the activity of 20 years ago. Between 2004 and 2008, less than 50 permit holders were fishing in the Kotzebue Sound area. In 2009, permit holders increased to 62, and in 2010 to 67. The 2010 harvest was the best since 1995, with 270,343 chum salmon landed (Menard, 2011). There are no large fisheries in the Arctic Management Area, which the Hope Basin planning area falls within, and virtually no commercial shellfish harvesting takes place north of Norton Sound (Arctic Fishery Management Plan, 2009).

27.2.2 Tourism and Recreation

Data on coastal tourism and recreation in the Hope Basin planning area is relatively limited, and what does exist is primarily for Kotzebue. Alaska Visitor Statistics Program (AVSP) data from 1993 indicate that 19,000 visitors traveled to Kotzebue during the summer of that year, primarily for the purpose of vacation, although some were there for business as well. More than half of these visitors came on packaged tours, while approximately one third were independent visitors. A few hundred visitors purchased day trips to the village of Kiana, primarily for the purpose of flightseeing. Eco-tourism and adventure traveling is common among visitors to the Kotzebue Sound region. Activities include river rafting, kayaking, camping, and bird- and other wildlife-viewing (Northwest Arctic Borough Economic Development Commission, n.d.).

Tourism in the Kotzebue Sound region is limited, and access is difficult due to the climate and relative lack of infrastructure. In 2010, the National Park Service opened the Northwest Arctic Heritage Center, and several small inns in Kotzebue serve travelers (Glenn Gray & Associates, 2012). Given the importance of outdoor activities to travelers to the area, a CDE in the Hope Basin planning area could harm the area's tourism industry.

27.2.3 Commercial Shipping and Transport

Due to the limited land infrastructure in the region, water is an important means of transporting fuel and supplies. Because of its location at the meeting of three major river mouths, Kotzebue is an important transfer point between ocean and inland shipping. Kotzebue residents also

depend on water transportation for subsistence purposes, and to travel to and from other communities during ice-free months (Glenn Gray & Associates, 2012).

Due to sediment deposits, very shallow rivers are present near Kotzebue. As a result, ships must anchor 12 to 15 miles offshore and then use barges to transport fuel and goods to shore. To meet this need, three freight lightering businesses operate in Kotzebue: Northland Services, Alaska Logistics, and Bowhead Transportation. Despite the difficulty created by the shallow water, Kotzebue is the primary hub of trading and supply for the region. At least five other communities rely on fuel shipments from the port at Kotzebue (Glenn Gray & Associates, 2012).

27.2.4 Oil and Natural Gas production

No offshore oil or natural gas production currently takes place in the Hope Basin planning area. As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources at 0.8 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Hope Basin planning area are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Hope Basin oil or gas could impact those planning areas. Please see the chapters focusing on these areas for information on resources that could be affected.

27.3 *Public Use in the Hope Basin Planning Area and the Nearby Coastal Area*

27.3.1 Coastal Recreation

Due to its remoteness, little recreation takes place in the Hope Basin planning area. Two National Parks operate in the region: Cape Krusenstern National Monument, which consists of 70 miles of coastline on the Chukchi Sea, and the Bering Land Bridge National Preserve, on the northern side of the Seward Peninsula. Approximately 8,000 people visited Cape Krusenstern in 2011, and slightly less than 2,000 visited the Bering Land Bridge Preserve (NPS, 2012). The region is also home to Selawik NWR at its eastern edge. As mentioned above, eco-tourism is an essential part of the tourism industry in the Kotzebue Sound region.

27.3.2 Subsistence

Subsistence fishing is a critical public use for communities in the Hope Basin region. Many residents participate in the formal wage economy, but subsistence fishing and hunting continues to be important to the way of life in the communities around the Kotzebue Sound. In 1991, more than 99 percent of sampled households used resources obtained through subsistence fishing and hunting, with 95 percent of households successfully harvesting resources and 94 percent receiving subsistence resources from others through barter (Glenn Gray & Associates, 2012).

The most recent subsistence survey of salmon harvests, in 2004, estimated that a total of 20,604 chum salmon were harvested from the Kobuk River and 3,997 from the Noatak. Chum salmon are the most commonly caught fish for subsistence purposes in the region, accounting for more than 90 percent of the total. The 2004 survey excluded the city of Kotzebue, but prior surveys

suggest that Kotzebue residents harvest approximately the same amount of salmon as the other villages combined (Menard, 2011). Subsistence also plays an important cultural role for residents of Kotzebue, approximately 80 percent of whom were Alaska Native in 2010 (Glenn Gray & Associates, 2012). **Table 27-1** below details the average annual subsistence harvest for salmon from 2000 through 2004. In total, subsistence fisherman reported an average annual catch in 2000, the last year with complete data, of approximately 69,000 salmon. Subsistence catch data in 2004, without data from Kotzebue, amounted to approximately 26,000 fish (Alaska Department of Fish and Game, 2009).

Table 27-1: Subsistence Fishing for Salmon in the Kotzebue Area, Hope Basin, annual harvests

Year	# of households	Number of Fish Caught: Kotzebue Area					
		Chinook	Sockeye	Coho	Chum	Pink	Total Fish
2000	1,227	211	75	2,557	65,975	75	68,893
2001[1]	1,149	11	14	768	49,014	36	49,844
2002[2]	216	3	9	56	16,880	8	16,955
2003[3]	488	40	53	1,042	19,201	583	20,918
2004[3]	440	54	18	1,502	23,348	1,259	26,181

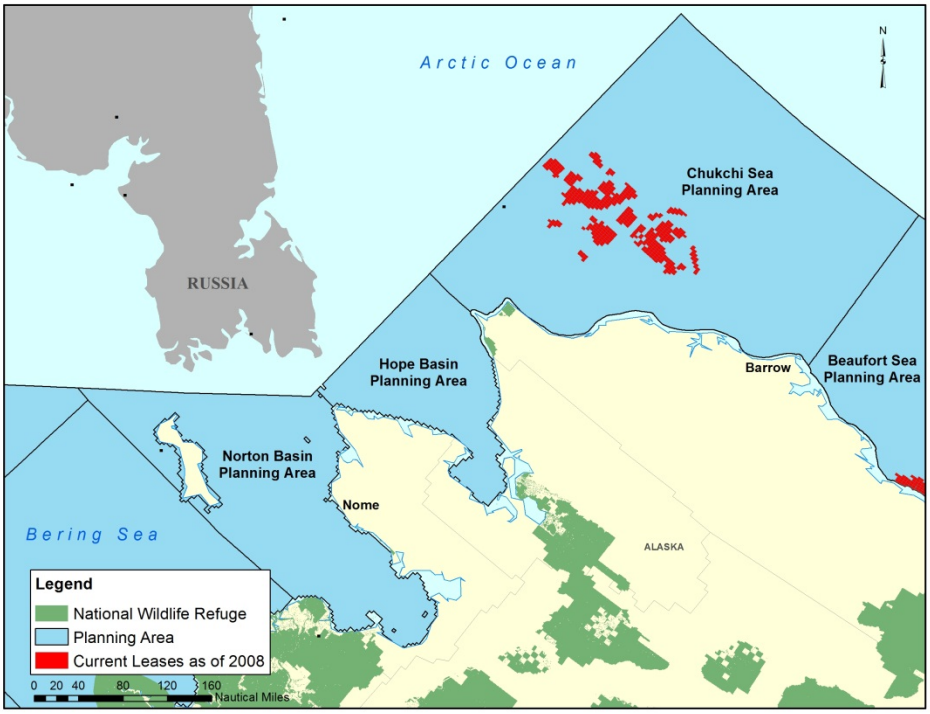
Notes: The Kotzebue Area includes Ambler, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, and Shugnak.

1. Does not include Ambler.
2. Includes only Noatak and Noorvik.
3. Does not include Kotzebue.

Source: Alaska Department of Fish and Game, 2009.

28. The Chukchi Sea

Figure 28-1: Map of the Chukchi Sea Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

28.1 Physical and Biological Resources in the Chukchi Sea Planning Area and the Nearby Coastal Area

The Arctic oceans of Alaska's North Slope are unique among U.S. coastal waters. Ice formation typically begins in October and does not begin to break up until April or May. The ecological food web in the Arctic consists of primary producers and other microorganisms, benthic invertebrates, fish, marine mammals, and birds. Primary producers rely on sunlight, making seasonal differences critically important to the functioning of Arctic ecosystems (Cobb et al., 2008). Traditional feeding hot spots for gray whales and walrus include the south-central Chukchi Sea and a few areas identified in the northeastern Chukchi Sea. The northeastern and southeastern Chukchi Sea is also home to a rich epifaunal community, including numerous mollusks, crabs, and echinoderms (Blanchard, 2010).

The Chukchi Sea planning area, as shown above in **Figure 28-1**, is home to a variety of fish, birds, and marine mammals due to the relatively robust benthic community (Blanchard, 2010). Among the most important species of fish to local residents are the coregonids, charr, lake trout, and, to a lesser extent, Pacific herring. Generally, these key species live in nearshore coastal-mixing zones and mixed-ice zones. The most commonly caught marine fish is the Arctic cod, a keystone species in the Arctic food web. Marine mammals, particularly beluga whales and ringed seals, are extremely important for subsistence hunting and are considered ecologically influential predators. Additionally, the migration patterns of both these marine mammals and

various Arctic bird species are important for nutrient import and export (Cobb et al., 2008). Bowhead whales also migrate through the Barrow area, from the Bering Sea, through the Chukchi and into the Beaufort Sea, in the spring (generally April to June) and fall (September and October). However, there have also been reports of whales feeding near Barrow during the summer (NMML, 2011).

28.2 Economic Activity in the Chukchi Sea Planning Area and the Nearby Coastal Area

28.2.1 Commercial Fishing

As of 2009, the United States government has banned commercial fishing in U.S. waters north of the Bering Strait, citing concerns over climate change (Winter, 2011). Commercial fishing had been extremely limited in the Chukchi Sea prior to the ban; however, the North Pacific Fisheries Management Council feared that a warming Arctic might become a target for commercial fishers if certain fish species, particularly cod and snow crabs, moved northward into warming waters. Extensive commercial fishing is expected to continue further south. An estimated 60 percent of U.S. commercial fishing landings come from the Bering Sea.

28.2.2 Commercial Shipping and Transport

The patterns and amount of vessel traffic in the Arctic are highly affected by seasonal variability and ice cover. As of 2004, only government ice-breakers and research vessels broke ice in the Arctic; they also only traveled into ice covered waters in the spring, summer, and fall. Summer is when all of the community re-supply takes place and most bulk commodities are shipped out and supplies brought in for commercial operations. Summer is also when passenger vessels travel to the region. If reductions in sea-ice thickness and extent continue, as predicted in the near term, the summer and fall shipping seasons will most likely lengthen. Winter in the central Arctic, however, will remain inhospitable to marine navigation; therefore, future Arctic vessel activity will continue to be highly seasonal in the region. Arctic marine operations off Alaska in the Chukchi and Beaufort seas to support oil and gas exploration are expected to increase for the next decade (AMSA, 2009).

28.2.3 Oil and Natural Gas Production

A portion of the oil and natural gas produced in northern Alaska are extracted from offshore facilities. To produce oil and natural gas in this climate, the industry relies on a unique set of technologies to combat the challenges of extreme temperatures, remote locations, and shifting ice flows (Minerals Management Service, 2002). In 2012, Shell initiated drilling activity in the Chukchi Sea planning area. Shell's start date for production, however, is currently uncertain (Reuters, 2012). Lease sale 237 in the Chukchi Sea is also included in BOEM's Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017 and is scheduled for 2016 (BOEM, 2012b and BOEM, 2012c). In 2011, BOEM estimated a mean availability of undiscovered technically recoverable oil and gas resources in and near the Chukchi Sea planning area to be approximately 29.0 billion barrels of oil-equivalent (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Chukchi Sea are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Chukchi Sea oil or gas could impact those planning areas as well. Please see the chapters focusing on these areas for information on resources that could be affected.

28.3 Public Use in the Chukchi Sea Planning Area and the Nearby Coastal Area

28.3.1 Subsistence Use in the Chukchi Sea

Despite its size, the Alaskan Arctic is very sparsely populated (USGS, 2011). Approximately 24,000 people live in its nearly 150,000 square miles, mainly in indigenous Iñupiat communities. About half the population lives in one of the three population centers of Barrow, on the Beaufort Sea; Kotzebue, on the Chukchi Sea; and Nome, on the Bering Strait.[45] The remaining residents live in small villages of less than 1,000, scattered along the North Slope (Howe et al, 2011). The harsh Arctic climate and the difficulty of physically accessing the North Slope limit recreational public use in the Arctic. Most of the public use in the Arctic is among small subsistence communities along the coasts.

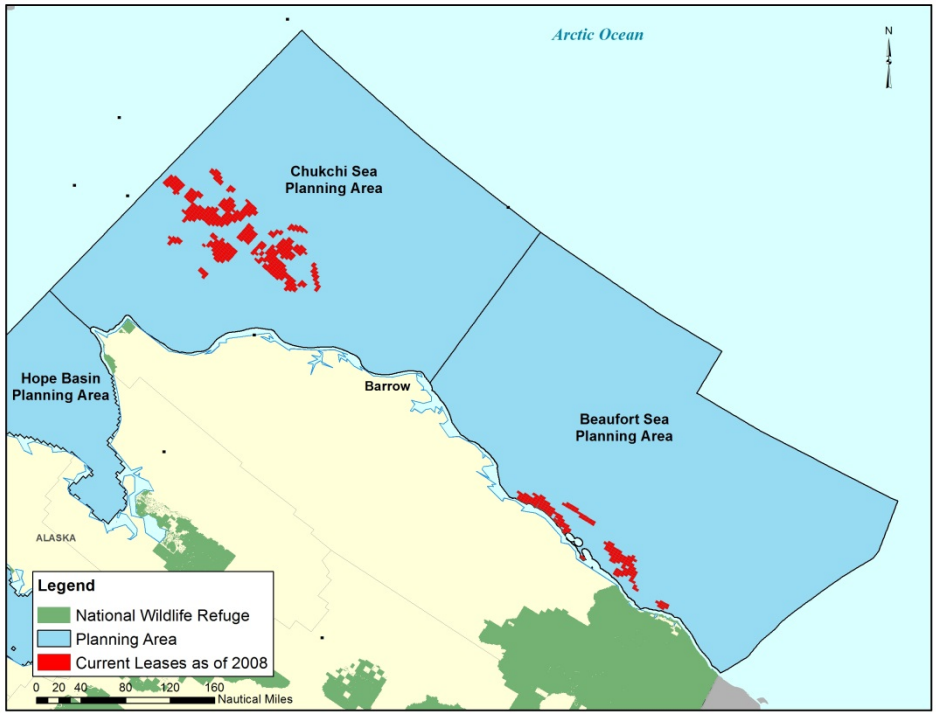
Native communities along the coasts of the Chukchi Sea rely on subsistence use, given their remote location. Marine mammals such as baleen and toothed whales, ice seals, walruses, and polar bears are harvested by subsistence hunters, and make up a substantial proportion of many communities' annual diets. Based on a survey commissioned for the Alaska Department of Administration (ADA), 26 percent of respondents in the Arctic region rely on subsistence for at least half of their food supply. For another 27 percent, subsistence accounts for 25 to 50 percent of their food supply (McDowell Group, 2009).

Among the Iñupiat, subsistence activities hold a very high cultural value, and form a key component of cultural identity in addition to being an important link to the market economy. In northern Alaska, community relationships depend on the sharing and trading of natural resources. A CDE in the Arctic, at any time of year, could seriously damage this way of life (USGS, 2011).

[45] Out of the three population centers listed above, Barrow is the community closest to the Chukchi Sea planning area. Kotzebue is located on the Chukchi Sea, however, it is closer to the Hope Basin planning area.

29. Beaufort Sea

Figure 29-1: Map of the Beaufort Sea Planning Area



Data Source: Esri, North American Albers Conic Equal Area, Alaska Cadastral Data, BOEM.

29.1 Physical and Biological Resources in the Beaufort Sea Planning Area and the Nearby Coastal Area

The Arctic oceans of Alaska's North Slope are unique among U.S. coastal waters. Ice formation typically begins in October and does not begin to break up until April or May. The ecological food web in the Arctic consists of primary producers and other microorganisms, benthic invertebrates, fish, marine mammals, and birds. Primary producers rely on sunlight, making seasonal differences critically important to the functioning of Arctic ecosystems (Cobb et al., 2008).

The Beaufort Sea planning area, as shown above in **Figure 29-1**, is home to a variety of fish, birds, and marine mammals. Among the most important species of fish to local residents are the coregonids, charr, lake trout, and, to a lesser extent, Pacific herring. Generally, these key species live in nearshore coastal-mixing zones and mixed-ice zones. The most commonly caught marine fish is the Arctic cod, a keystone species in the Arctic food web. Marine mammals, particularly beluga whales and ringed seals, are extremely important for subsistence hunting and are considered ecologically influential predators. Additionally, the migration patterns of both these marine mammals and various Arctic bird species are important for nutrient import and export (Cobb et al., 2008). Bowhead whales also migrate through the Barrow area, from the Bering Sea, through the Chukchi and into the Beaufort Sea, in the spring (generally April to June) and

fall (September and October). However, there have also been reports of whales feeding near Barrow during the summer (NMML, 2011).

29.2 *Economic Activity in the Beaufort Sea Planning Area and the Nearby Coastal Area*

29.2.1 Commercial Fishing

As of 2009, the United States government has banned commercial fishing in U.S. waters north of the Bering Strait, citing concerns over climate change (Winter, 2011). Commercial fishing had been extremely limited in the Beaufort Sea prior to the ban. However, the North Pacific Fisheries Management Council feared that a warming Arctic might become a target for commercial fishers if certain fish species, particularly cod and snow crabs, moved northward into warming waters. Extensive commercial fishing is expected to continue further south. An estimated 60 percent of U.S. commercial fishing landings come from the Bering Sea.

29.2.2 Commercial Shipping and Transport

The patterns and amount of vessel traffic in the Arctic is highly affected by seasonal variability and ice cover. As of 2004, only government ice-breakers and research vessels broke ice in the Arctic; they also only traveled into ice covered waters in the spring, summer and fall. Summer is when all of the community re-supply takes place and most bulk commodities are shipped out and supplies brought in for commercial operations. Summer is also when passenger vessels travel to the region. If reductions in sea-ice thickness and extent continue, as predicted in the near term, the summer and fall shipping seasons will most likely lengthen. Winter in the central Arctic, however, will remain inhospitable to marine navigation; therefore, future Arctic vessel activity will continue to be highly seasonal in the region. Arctic marine operations off Alaska in the Chukchi and Beaufort seas to support oil and gas exploration are expected to increase for the next decade (AMSA, 2009).

29.2.3 Oil and Natural Gas Production

A portion of the oil and natural gas produced in northern Alaska is extracted from offshore facilities. To produce oil and natural gas in this climate, the industry relies on a unique set of technologies to combat the challenges of extreme temperatures, remote locations, and shifting ice flows (Minerals Management Service, 2002). As shown in **Table 29-1,** the NorthStar facility in the Beaufort Sea produced approximately 6.1 million barrels of oil in 2010 and 168 million mcf (thousand cubic feet) of natural gas. Approximately 17.8 percent of this production is attributed to federal waters. Lease sale 242 in the Beaufort Sea is also included in BOEM's Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017 and is scheduled for 2017 (BOEM, 2012b and BOEM, 2012c). As of 2011, BOEM estimates a mean availability of undiscovered technically recoverable oil and gas resources of 13.1 billion barrels of oil-equivalent in the Beaufort Sea planning area (BOEM, 2012).

To the extent that oil and natural gas resources extracted from the Beaufort Sea are shipped to port in other parts of Alaska (e.g. Valdez) or through other planning areas near the west coast of the contiguous U.S. (e.g. Washington/Oregon), a CDE involving Beaufort Sea oil or gas could

impact those planning areas as well. Please see the chapters focusing on these areas for information on resources that could be affected.

Table 29-1: Beaufort Sea Oil and Natural Gas Field Production, 2010

Production Month	Oil Production (barrels)	Federal Share of Oil Production (barrels) [1]	Gas Production (mcf)	Federal Share of Gas Production (mcf) [1]
Jan-10	691,558	123,374	17,563,672	3,133,359
Feb-10	621,387	110,855	15,868,443	2,830,930
Mar-10	629,469	112,297	17,328,881	3,091,472
Apr-10	466,784	83,274	12,840,325	2,290,714
May-10	514,995	91,875	13,483,153	2,405,394
Jun-10	523,027	93,308	13,753,267	2,453,583
Jul-10	406,330	72,489	11,401,320	2,033,995
Aug-10	190,328	33,955	5,393,586	962,216
Sep-10	514,405	91,770	15,031,195	2,681,565
Oct-10	527,181	94,049	16,218,148	2,893,318
Nov-10	462,950	82,590	12,988,264	2,317,106
Dec-10	536,712	95,749	16,679,737	2,975,665
Yearly Total	**6,085,126**	**1,085,586**	**168,549,991**	**30,069,318**

Note:

1. Federal offshore production on the Alaska comes from the NorthStar facility, which produces from a unitized set of State and Federal Leases. Consequently, there is a State/Federal sharing allocation for crude oil and natural gas from Northstar. The current federal sharing allocation is 17.84 percent.

Source: BOEM, 2011b.

29.3 Public Use in the Beaufort Sea Planning Area and the Nearby Coastal Area

29.3.1 Subsistence Use in the Beaufort Sea

Despite its size, the Alaskan Arctic is very sparsely populated (USGS, 2011). Approximately 24,000 people live in its nearly 150,000 square miles, mainly in indigenous Iñupiat communities, in small villages of less than 1,000 people, scattered along the North Slope (Howe et al, 2011). The harsh Arctic climate and the difficulty of physically accessing the North Slope limit recreational public use in the Arctic. Most of the public use in the Arctic is among small subsistence communities along the coasts.

Native communities along the coasts of the Beaufort Sea rely on subsistence use, given their remote location. Marine mammals such as baleen and toothed whales, ice seals, walruses, and polar bears are harvested by subsistence hunters, and make up a substantial proportion of many communities' annual diets. Based on a survey commissioned for the Alaska Department of Administration (ADA), 26 percent of respondents in the Arctic region rely on subsistence for at least half of their food supply. For another 27 percent, subsistence accounts for 25 to 50 percent of their food supply (McDowell Group, 2009).

Among the Iñupiat, subsistence activities hold a very high cultural value, and form a key component of cultural identity in addition to being an important link to the market economy. In

northern Alaska, community relationships depend on the sharing and trading of natural resources. A CDE in the Arctic, at any time of year, could seriously damage this way of life (USGS, 2011).

30. References

"Input sought on Cook Inlet oil and gas leases," 2012. Associated Press. JuneauEmpire.com. March 25, 2012. Available online at: juneauempire.com/state/2012-03-25/input-sought-cook-inlet-oil-and-gas-leases#.T43lirOm-y6.

Alaska Department of Fish and Game. 2006. Our Wealth Maintained: A Strategy for Conserving Alaska's Diverse Wildlife and Fish Resources. Juneau. Available online at: http://www.adfg.alaska.gov/static/species/wildlife_action_plan/cwcs_full_document.pdf.

Alaska Department of Fish and Game. 2009. Technical Paper No. 346: Alaska Subsistence Salmon Fisheries 2007 Annual Report.

Alaska Department of Fish and Game. 2012a. Commercial Fisheries Information by Area. Available online at: http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.main.

Alaska Department of Fish and Game. 2012b. Subsistence Fishing Home. Available online at: http://www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main.

Alaska Department of Natural Resources. 2007. Economic Impacts and Contributions of Sport fishing in Alaska: 2007 Report. Available online at: http://www.southwickassociates.com/wp-content/uploads/2011/10/2007AK_reportFORWEB.pdf.

Alaska Department of Natural Resources. 2012. Division of Oil & Gas. Available online at: http://dog.dnr.alaska.gov/index.htm.

Alaska Ocean Observing System. 2005. Cook Inlet Physical Oceanography Workshop Proceedings. 21-22 February: Homer, Alaska. Available online at: http://doc.aoos.org/2005/cook_inlet_physical_oceanography_workshop_proceedings-combined%20sections-final-2006.pdf.

Alleman, Richard W., Joan A Browder, Susan M. Markley, Peter B. Ortner (eds.). 2002. A Strategic Science Plan for Biscayne Bay. Florida Bay and Adjacent Marine Systems Program Management Committee. January. Available online at: http://www.aoml.noaa.gov/ocd/sferpm/bbscienceplandraft.pdf.

Anderson, Todd. 2011. Memorandum: 2011 Chignik Salmon Season Summary. November 3, 2011. Alaska Department of Fish and Game: Division of Commercial Fisheries. Available online at: http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2011_chignik_salmon_summary.pdf.

Arctic Fishery Management Plan. 2009. Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Analysis for the Arctic Fishery Management Plan and Amendment 29 to the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. National Marine Fisheries Service. Available online at: http://www.fakr.noaa.gov/analyses/arctic/earirfrfa0809final.pdf.

Audubon of Florida. [n.d.] Audubon of Florida's Gulf Coast Ecosystem/Florida Coastal Islands Sanctuaries Program. Partnerships for Colonial Waterbird Management and Conservation Policy Initiatives. Available online at: http://www.pinellascounty.org/environment/pdfs/stJoePDFs/Audubon-of-FL-Gulf-Coast-Ecosystem-FL-Coastal-Islands-Sanctuaries-Program.pdf.

Ballew, Carol, Angela Ross, Rebecca S. Wells, Vanessa Hiratsuka. 2004. Final Report on the Alaska Traditional Diet Survey. Alaska Native Epidemiology Center: Anchorage, AK. Available online at: http://www.anthc.org/chs/epicenter/upload/traditional_diet.pdf.

Batker, David, et al. 2010. Gaining Ground: Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta. Earth Economics: Tacoma, WA.

Battelle Memorial Institute. 2008. San Francisco Bay Subtidal Habitat Goals Project: Economic Valuation of San Francisco Bay Natural Resource Services: Final Report. Submitted to: National Oceanic and Atmospheric Administration, San Francisco, CA. Available online at: http://sfbaysubtidal.org/PDFS/Ap1-2%20Econ%20Evaluation.pdf.

Bay Area Economics. 2008. Port of San Francisco: Economic Impact Study. Emeryville, CA. Available online at: http://www.sf-port.org/ftp/uploadedfiles/about_us/divisions/finance_admin/EconomicImpactReportSept2008.pdf.

Blanchard, L. Amy, Hilary Nichols and Carrie Parris. 2008. Environmental Studies Program in the Chukchi Sea: Benthic Ecology of the Burger and Klondike Survey areas. Prepared for ConocoPhillips Alaska, Inc. and Shell Exploration & Production Company, Anchorage, AK.

BOEM. 2012. Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2011. Available online at: http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Resource-Assessment/2011-RA-Assessments.aspx.

BOEM. 2012a. "Environmental Studies Program: Studies Development Plan, FY 2013-2015" (Herndon, VA). Available online at: http://www.boem.gov/uploadedFiles/2013-2015_Studies_Development_Plan.pdf.

BOEM. 2012b. Proposed Outer Continental Shelf Oil and Gas Leasing Program, 2012-2017. Available online at: http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/2012-2017/Five-Year-Program.aspx.

BOEM. 2012c. Proposed Final Outer Continental Shelf Oil and Gas Leasing Program, 2012-2017. Available online at: http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/2012-2017/Five-Year-Program.aspx.

BOEM. 2012d. Monthly Production by Planning Areas with Daily Production Rates. Available online at: http://www.data.boem.gov/homepg/pubinfo/repcat/product/pdf/4115.pdf.

Bristol Bay Native Association. 2004. Bristol Bay Regional Economic Opportunity Plan. Available online at: http://www.bbna.com/econdev/BBeconopplan.pdf.

Bureau of Economic Analysis (BEA). 2011. Advance 2010 and Revised 2007-2009 GDP-by-State Statistics. Available online at: http://www.bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm.

California Department of Conservation. 2010. "2009 Annual Report of the State Oil and Gas Supervisor" (Sacramento, CA). Available online at: www.conservation.ca.gov/DOG/pubs_stats/annual_reports/annual_reports.htm.

California Department of Fish and Game. 2011. "Table 15 - Poundage And Value Of Landings Of Commercial Fish Into California By Area – 2010." Available online at: http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=38112&inline=true.

Caudill, James, Erin Henderson. 2005. Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation.

Cerveny, Lee K. 2005. Tourism and its effects on southeast Alaska communities and resources: case studies from Haines, Craig, and Hoonah, Alaska. Res. Pap. PNW-RP-566. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Chambers, Dave, Robert Moran, and Lance Trasky. 2012. Bristol Bay's Wild Salmon Ecosystems and the Pebble Mine: Key Considerations for a Large-Scale Mine Proposal. Wild Salmon Center and Trout Unlimited. Available online at: http://www.wildsalmoncenter.org/pdf/PM-Report.pdf.

Chesapeake Bay Foundation. 2012. "More than Just the Bay." Available online at: http://www.cbf.org/about-the-bay/more-than-just-the-bay.

City of Portland, 2007, “Columbia Slough Watershed: Long-Term Monitoring Plan” (Bureau of Environmental Services). Available online at: http://www.portlandonline.com/bes/index.cfm?a=175915&c=33221.

Cobb, D., H. Fast, M.H. Papst, D. Rosenberg, R. Rutherford, and J.E. Sareault. 2008. Beaufort Sea Large Ocean Management Area: Ecosystem Overview and Assessment Report. Central and Arctic Region, Freshwater Institute: Winnipeg, Manitoba. Canadian Technical Report of Fisheries and Aquatic Sciences 2780.

Colt, Steve; Martin, Stephanie; Mieren, Jenna; Tomeo, Martha. 2002. Recreation and tourism in south-central Alaska: patterns and prospects. Gen. Tech. Rep. PNW-GTR-551. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 p.

DOI. 2010. Press Release: Secretary Salazar Announces Comprehensive Strategy for Offshore Oil and Gas Development and Exploration. Available online at: http://www.doi.gov/news/pressreleases/2010_03_31_release.cfm#.

Duffield, John W., Christopher J. Neher, David A. Patterson, Oliver S. Goldsmith. 2007. Economics of Wild Salmon Ecosystems: Bristol Bay, Alaska. USDA Forest Service Proceedings RMRS-P-49. Available online at: http://www.fs.fed.us/rm/pubs/rmrs_p049/rmrs_p049_035_044.pdf.

Durand, John, Robert Lusardi, Robyn Suddeth, Gerard Carmona, Christina Connell, Sarah Gatzke, Jacob Katz, Daniel Nover, Jeffery Mount, Peter Moyle, Joshua Viers. 2009. Conceptual ecosystem model of sub-Arctic river response to climate change: Kobuk River, Alaska. Center for Watershed Studies, John Muir Institute of the Environment. University of California, Davis. Available online at: http://hydra.ucdavis.edu/kobuk/files/kobuk/Conceptual_ecosystem_model_of_the_Kobuk_River_UC_Davis_September_2009.pdf.

ECONorthwest. 2010. Economic Analysis of the Chuitna Watershed & Cook Inlet. Available online at: http://inletkeeper.org/resources/contents/economic-analysis-of-the-chuitna-watershed-cook-inlet/view.

EPA. 2007. National Estuary Program Coastal Condition Report. Office of Wetlands, Oceans, and Watershed. Available online at: http://water.epa.gov/type/oceb/nep/index.cfm#nepccr.

Exxon Valdez Oil Spill Trustee Council. 2012. Status of Injured Resources and Services. Available online at: http://www.evostc.state.ak.us/Recovery/status.cfm.

Florida Coastal and Ocean Coalition Steering Committee. 2010. Florida Coastal and Oceans Coalition Drilling Off Florida: A Closer Look at the Risks. Available online at: http://www.conserveturtles.org/pdf/florida/DrillingOffFloridaCloserLook.pdf.

Florida Fish and Wildlife Conservation Commission. 2012. Commercial Landings Data. Available online at: http://myfwc.com/research/saltwater/fishstats/commercial-fisheries/landings-in-florida/.

Gentner, Brad and Scott Steinback. 2008. The Economic Contribution of Marine Angler Expenditures in the United States, 2006. NOAA Technical Memorandum NMFS-F/SPO-94. Available online at: http://spo.nmfs.noaa.gov/tm/SPO94.pdf.

Geological Survey of Alabama, State Oil and Gas Board. Online oil and gas production data. Available online at: http://www.gsa.state.al.us/ogb/data_sum.aspx.

Gibson, Joshua C. and Julie A. McClafferty. 2005. Final Report for Chesapeake Bay Angler Interviews: Identifying Populations at Risk for Consuming Contaminated Fish in Three Regions of Concern: Results for Baltimore Region of Concern. CMI-HDD-05-01. Prepared for the Chesapeake Bay Program.

Glenn Gray & Associates. 2012. City of Kotzebue: Public Review Draft: Comprehensive Plan. Available online at: http://www.cityofkotzebue.com/vertical/sites/%7BA001CDF5-7F45-4E0C-9DFC-D296959501D1%7D/uploads/KotzebueComprehensive_Plan_4-6-12.pdf.

Goldsmith, Scott, Jerry Brian, and Alexandra Hill. 2003. The Kodiak National Wildlife Refuge: Economic Importance. Prepared for U.S. Fish and Wildlife Service. Available online at: http://www.iser.uaa.alaska.edu/Publications/Kodiak%20NWR%20Econ%20Importance%20Final.pdf.

Gramling, Robert, JoAnne Darlington, George Wooddell, and Ray Brassieur. [n.d.] Subsistence Use and Value: The Sharing, Distribution and Exchange of Wetland Resources among Households in Coastal Communities. University of Louisiana at Lafayette. Available online at: http://www.gulfcrest.org/Science/Project Reports/gramling_final_report.pdf.

Gulf Coast Ecosystem Restoration Task Force. 2011. Gulf of Mexico Regional Ecosystem Restoration Strategy (Preliminary).

Hartill, T.G. and M.D. Keyse. 2011. Annual summary of the commercial and subsistence salmon fisheries and salmon escapements in the Alaska Peninsula, Aleutian Islands, andAtka-Amila Islansd Management Areas, 2010. Alaska Department of Fish and Game, Fishery Management Report No. 11-34, Anchorage. Available online at: http://www.adfg.alaska.gov/FedAidpdfs/FMR11-34.pdf.

Houston, James. R. 2002. The Economic Value of Beaches – A 2002 Update. U.S. Army Engineer Research and Development Center. Available online at: http://www.wcu.edu/WebFiles/PDFs/Economic_Value_of_Beaches_2002.pdf.

Howe, Lance, Lee Huskey, and Matt Berman. 2011. Migration in Arctic Alaska: Empirical Evidence of the Stepping Stone Hypothesis. University of Alaska Anchorage, Department of Economics. Anchorage, AK.

IHS Global Insight. 2010. The Economic Impact of the Gulf of Mexico Offshore Oil and Natural Gas Industry and the Role of the Independents.

Jackson, Dudley. 2012. The Economic Impact of Golf in South Carolina. South Carolina Department of Parks, Recreation and Tourism: Columbia, SC.

Johnson, Darlene R., Douglas E. Harper, G. Todd Kellison, and James A. Bohnsack. 2007. Description and Discussion of Southeast Florida Fishery Landings, 1990-2000. NOAA Technical Memorandum NMFS-SEFSC-550.

Kawerak, Inc. 2009. The Bering Strait Comprehensive: Economic Development Strategy 2009-2013. Available online at: http://www.kawerak.org/servicedivisions/csd/cpd/forms/CEDS2009.pdf.

Kildow, Judith and Charles S. Cogan. 2005. California's Ocean Economy: Report to the Resources Agency, State of California. Prepared by The National Ocean Economics Program. Available online at: http://resources.ca.gov/press_documents/CA_Ocean_Econ_Report.pdf.

King, Philip. 2003. The Potential Loss in Gross National Product and Gross State Product from a Failure to Maintain California's Beaches. Prepared for the California Department of Boating and Waterways. Available online at: http://userwww.sfsu.edu/~pgking/Econ%20Impact%20of%20Out%20of%20State%20and%20For%20tourism%20v7.pdf.

La Vine, Robbin, Mark J. Lisac and Philippa Coiley-Kenner. 2007. Traditional Ecological Knowledge of 20th-Century Ecosystems and Fish Populations in the Kuskokwim Bay Region. Fisheries Resource Monitoring Program. October.

Leeworthy, Vernon R. and Peter C. Wiley. 2000. Proposed Tortugas 2000 Ecological Reserve: Final Socioeconomic Impact Analysis of Alternatives. Special Projects Office, National Ocean Service: National Oceanic and Atmospheric Administration. Available online at: http://coastalsocioeconomics.noaa.gov/core/reserves/tortugas.pdf.

Leeworthy, Vernon R. and Peter C. Wiley. 2001. Current Participation Patterns in Marine Recreation. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service Special Projects: Silver Spring, MD. Available online at: http://coastalsocioeconomics.noaa.gov/core/nsre/nsre_2.pdf.

Lipton, Douglas W. and Katherine Wellman. 1995. Economic Valuation of Natural Resources: A Handbook for Coastal Resource Policymakers. NOAA Coastal Ocean Program: Decision Analysis Series No. 5. Case Study 3: Florida Keys National Marine Sanctuary. Available online at: http://www.mdsg.umd.edu/programs/extension/valuation/PDF/11-CS-03.pdf.

Los Angeles Tourism Statistics. 2011. "Los Angeles Tourism by Numbers: 2011 Quick Facts." Available online at: http://discoverlosangeles.com/business-services/research-and-reports/TOURISM%20STATS%202011%20(Prelim).pdf.

Louisiana Department of Natural Resources. "Louisiana Energy Facts and Figures," Available online at: http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=206&pnid=0&nid=122.

Marine Conservation Alliance. 2011. The Seafood Industry in Alaska's Economy: 2011 Executive Summary Update. Available online at: http://www.marineconservationalliance.org/wp-content/uploads/2011/02/SIAE_Feb2011a.pdf.

McDermott, Robert. 2010. Port of Bristol Bay: Nanek, Alaska. Presented at the Economic Development Administration (EDA) Seattle Regional Conference, Millennium Biltmore Hotel, Los Angeles, California, December 7 – 9. Available online at: http://www.edaseattle.org/wp-content/uploads/Smith-McDermott.pdf.

McDowell Group. 2009. The Economic Impacts of the Visitor Industry in Juneau 2007-08. Prepared for Juneau Convention & Visitors Bureau. April.

Menard, J. 2011. 2011 Kotzebue Sound salmon fisheries management plan. Alaska Department of Fish and game, Division of Commercial Fisheries, Regional Information Report No. 3A11-02. Anchorage. Available online at: http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2011.02.pdf.

Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being: Synthesis. Island Press: Washington, DC.

Minerals Management Service. 2006. Hope Basin Planning Area (Alaska) – Province Summary: 2006 Oil and Gas Assessment. Available online at:

http://www.alaska.boemre.gov/re/reports/2006Asmt/HBGA/Hope%20Basin%20Province%20Summary-2006%20Assessment.pdf.

Minerals Management Service. 2007. Outer Continental Shelf Oil & Gas Leasing Program: 2007-2012. Final Environmental Impact Statement: April 2007. Chapter 3: Affected Environment. Available online at: http://www.boemre.gov/5-year/2007-2012FEIS/Chapter3AffectedEnvironment.pdf.

Monterey Bay National Marine Sanctuary. 2012. Sanctuary Overview. Available online at: http://montereybay.noaa.gov/intro/welcome.html.

Mundy, Phillip R., et al. 2010. "Status and trends of the Alaska Current Region, 2003-2008," in S.M. McKinnell and M.J. Dagg (eds.), Marine Ecosystems of the North Pacific Ocean, 2003-2008. PICES Special Publication 4. Available online at: http://www.pices.int/publications/special_publications/NPESR/2010/PICES_PUB4_Chp4_Alaska.pdf.

Murley, James, Lenore Alpert, William B. Stronge, Roxanne Dow. 2005. Tourism in Paradise: The Economic Impact of Florida Beaches. Proceedings of the 14th Biennial Coastal Zone Conference, New Orleans: July 17 to 21. Available online at: http://www.csc.noaa.gov/cz/CZ05_Proceedings/pdf%20files/Alpert.pdf.

National Energy Technology Laboratory. 2007. Alaska North Slope Oil and Gas: A Promising Future or an Area in Decline? Summary Report. U.S. Department of Energy. Available online at: http://www.netl.doe.gov/technologies/oil-gas/publications/EPreports/ANSSummaryReportFinalAugust2007.pdf.

National Environmental Justice Advisory Council. 2002. "Fish Consumption and Environmental Justice" (December 3-6, 2001). Available online at: http://www.epa.gov/compliance/ej/resources/publications/nejac/fish-consump-report_1102.pdf.

National Marine Fisheries Service. 2012. Annual Commercial Landings by Group. Available online at: http://www.st.nmfs.noaa.gov/st1/commercial/landings/gc_runc.html.

National Marine Sanctuaries. 2012. Socioeconomic Monitoring Program for the Florida Keys National Marine Sanctuary. Available online at: http://sanctuaries.noaa.gov/science/socioeconomic/floridakeys/recreation/welcome.html.

National Oceanic and Atmospheric Administration. 2005. Identifying Communities Associated with the Fishing Industry in Texas: Final Report. Prepared for U. S. Department of Commerce, NOAA Fisheries, Southeast Region: St. Petersburg, Florida. Available online at: http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/Texas_collapsed-Feb06.pdf.

National Oceanic and Atmospheric Administration. 2005. Setting the Annual Subsistence Harvest of Northern Fur Seals on the Pribilof Islands, Final Environmental Impact Statement. Available online at: http://www.fakr.noaa.gov/protectedresources/seals/fur/eis/final0505.pdf.

National Oceanic and Atmospheric Administration. 2006. Identifying Communities Associated with the Fishing Industry in Alabama and Mississippi: Final Report, Public Release Version. Prepared for U. S. Department of Commerce, NOAA Fisheries, Southeast Region: St. Petersburg, Florida. Available online at: http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/AlaMiss_PublicReleaseVersion_pdf_Feb06.pdf.

National Oceanic and Atmospheric Administration. 2007. Aleutian Islands Fishery Ecosystem Plan: December 2007. Available online at: http://www.fakr.noaa.gov/npfmc/PDFdocuments/conservation_issues/AIFEP/AIFEP12_07.pdf.

National Oceanic and Atmospheric Administration. 2008. "Community Profiles for the Northeast US Fisheries." Available online at: http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html.

National Oceanic and Atmospheric Administration. 2009a. Fisheries Economies of the United States. Office of Science and Technology. Available online at: http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

National Oceanic and Atmospheric Administration. 2009b. Fishing Communities of the United States 2006: Economics and Sociocultural Status and Trends Series. Technical Memorandum NMFS-F/SPO-98/. Available online at: http://www.st.nmfs.noaa.gov/st5/publication/communities/CommunitiesReport_ALL.pdf.

National Oceanic and Atmospheric Administration. 2010. NOAA Restricts Commercial Mackerel, Cod Fishing in Western Aleutians to Protect Western Steller Sea Lions. Available online at: http://www.noaanews.noaa.gov/stories2010/20101208_sealion.html.

National Oceanic and Atmospheric Administration. 2011. "Deepwater Horizon/BP Oil Spill: Size and Percent Coverage of Fishing Area Closures Due to BP Oil Spill." Fisheries Service, Southeast Regional Office. Available online at: http://sero.nmfs.noaa.gov/ClosureSizeandPercentCoverage.htm.

National Oceanic and Atmospheric Administration. 2011. Community Profiles for North Pacific Fisheries – Alaska: Alaska Peninsula/Aleutian Islands Sub-Regional Introduction. Available online at: http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/CPU.php.

National Oceanic and Atmospheric Administration. 2012. Recreational Fisheries Statistics Queries. Available online at: https://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/queries/index.

National Ocean Economics Program. 2008. Phase II: Appendices Florida's Ocean and Coastal Economies Report. Available online at: http://www.oceaneconomics.org/Download/.

National Ocean Economics Program. 2012a. Market Data: Ocean Economy Data. Available online at: http://www.oceaneconomics.org/Market/ocean/oceanEcon.asp?IC=N.

National Ocean Economics Program. 2012b. Market Data: Coastal Economy Data. Available online at: http://www.oceaneconomics.org/Market/coastal/coastalEcon.asp.

National Ocean Economics Program. 2012c. Commercial Fish Species Search. Available online at: http://www.oceaneconomics.org/LMR/fishSearch.asp.

National Park Service Public Use Statistics Office. 2012. NPS Stats. Available online at: http://www.nature.nps.gov/stats/viewReport.cfm.

Nome Coastal District. 2006. Nome Coastal Management Plan: 2006 Plan Amendment. Available online at: http://www.alaskacoast.state.ak.us/District/FinalFinalPlans/Nome/Nome_Final_Draft_Plan_Amendment_081306.pdf.

Norman, K., J., Sepez, H. Lazrus, N. Milne, C. Package, S. Russell, K. Grant, R.P. Lewis, J. Primo, E. Springer, M. Styles, B. Tilt, and I. Vaccaro. 2007. Community profiles for West Coast and North Pacific fisheries–Washington, Oregon, California, and other U.S. states. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-85. Available online at: http://www.nwfsc.noaa.gov/assets/25/6718_01082008_153910_CommunityProfilesTM85WebFinalSA.pdf.

Northern Economics, Inc. 2009a. The Seafood Industry in Alaska's Economy. Prepared for Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. January. Available online at: http://www.marineconservationalliance.org/wp-content/uploads/2010/06/SIAE_Jan09-1.pdf.

Northern Economics, Inc. 2009b. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration and Production. Available online at: http://www.iser.uaa.alaska.edu/Publications/Econ_Analysis_Offshore_O&GDevpt.pdf.

Northern Economics, Inc. 2011. The Seafood Industry in Alaska's Economy. Prepared for Marine Conservation Alliance, At-Sea Processors Association and Pacific Seafood Processors Association. February. Available online at: http://www.marineconservationalliance.org/?page_id=920.

Northwest Arctic Borough Economic Development Commission and Alaska Department of Commerce and Economic Development. [n.d.] Rural Alaska Tourism Infrastructure Needs Assessment: Northwest Arctic Borough. Available online at: http://www.commerce.state.ak.us/ded/dev/toubus/pub/9_northwest_borough_section.pdf.

Norton Sound Steering Committee. 2003. Research and Restoration Plan for Norton Sound Salmon: Working Draft September 26, 2002 (as revised through February 18, 2003). Available online at: http://69.93.224.39/~aykssi/wp-content/uploads/NS-RR-Plan-rev.pdf.

Oceana. 2011. "Protecting the Oregon Coast: Identifying and Protecting Important Ecological Areas" (Washington, DC). Available online at: http://oceana.org/sites/default/files/reports/Oceana_IEAs_v6.pdf.

Parsons, George R., A.K. Kang, C.G. Leggett, and K.J. Boyle. 2009. "Valuing Beach Closures on the Padre Island National Seashore," Marine Resources Economics 24: 213:235.

Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division January 2, 2013.

Piatt, John F., John L. Wells, Andrea MacCharles, Brian S. Fadely. 1989. The distribution of seabirds and fish in relation to ocean currents in the southeastern Chukchi Sea. Alaska Fish and Wildlife Research Center: Anchorage, AK. Available online at: http://alaska.usgs.gov/science/biology/seabirds_foragefish/products/publications/Piatt_Wells_MacCharles_Fadely_89.pdf.

Pomeroy, Caroline, Cynthia J. Thomson, and Melissa M. Stevens. 2010. California's North Coast Fishing Communities, Historical Perspective and Recent Trends: Final Report to the California State Coastal Conservancy Award 06–128. California Sea Grant College Program: University of San Diego, La Jolla CA. Available online at: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/CA_NCoastFCP.pdf.

Pritchard, Elizabeth S., ed. 2009. Fisheries of the United States: 2008. U.S. Department of Commerce, National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division, Silver Spring, MD. Available online at: http://www.st.nmfs.noaa.gov/st1/fus/fus08/fus_2008.pdf.

Railroad Commission of Texas. 2012. “Texas Crude Oil Production - Offshore State Waters.” Available online at: http://www.rrc.state.tx.us/data/production/offshoreoil/index.php.

Resource Development Council for Alaska, Inc. 2010. Preliminary Investigation of Economic Impacts Related to Proposed Critical Habitat Designation for Cook Inlet Beluga Whale. Available online at: http://www.akrdc.org/issues/other/esa/belugas/rdccibwchea.pdf.

Resources Agency of California. 1997. California's Ocean Resources: An Agenda for the Future: Chapter 4. Available online at: http://resources.ca.gov/ocean/97Agenda/PDF/.

Reuters. Update 2-California kills offshore oil lease project, 2009. July 24, 2009. Available online at: http://www.reuters.com/article/2009/07/25/oil-california-offshore-idUSN2449232020090725.

Reuters. Shell Admits Arctic Drilling Defeat, For Now. September 18, 2012. Available online at: http://www.reuters.com/article/2012/09/17/us-royaldutchshell-idUSBRE88G11Q20120917.

Roach, B., W. Wade, and J. Plater. 2001. Forecasting Environmental and Social Externalities Associated with OCS Oil and Gas Development: The Offshore Environmental Cost Model, Volume 2, Determinants of the Environmental and Social Costs. MMS OCS Study 2001-018. U.S. Department of the Interior, Minerals Management Service, Environmental Studies Branch: Herndon, VA.

Skewgar, E. and S.F. Pearson (eds.). 2011. “State of the Washington Coast: Ecology, Management, and Research Priorities” (Washington Department of Fish and Wildlife, Olympia). Available online at: http://wdfw.wa.gov/publications/01198/wdfw01198.pdf.

South Atlantic Fishery Management Council. 2009. Fishery Ecosystem Plan, Vols. I and II. Available online at: http://www.safmc.net/Default.aspx?alias=www.safmc.net/ecosystem.

South Carolina Department of Natural Resources. 2009. Green Means Green: 30 Billion Reasons Why Life’s Better Outdoors: The Economic Impact of South Carolina’s Natural Resources. Available online at: http://www.dnr.sc.gov/green/greenreport.pdf.

South Carolina Sea Grant Consortium. 2007. The Changing Face of Coastal South Carolina: Valuing Resources – Adapting to Change. Strategic Plan, 2006-2010.

Southern California Research Learning Center. 2012. “Mediterranean Ecosystems in California and Northern Baja California.” Available online at: http://www.mednscience.org/mediterranean_ecosystem_California.

Southwick Associates, Inc. 2006. The 2006 Economic Benefits of Hunting, Fishing and Wildlife Watching in Texas. Prepared for the Texas Parks and Wildlife Department.

Southwick Associates. 2008. The Economic Impacts of Marine Recreational Fishing in the North Central Coast of California and the Potential Effects of Area Closures. Prepared for the American Sportfishing Association. Available online at: http://www.keepamericafishing.org/-/pdf/EconRpt_041608.pdf.

Southwick Associates. 2009. The Potential Economic and Conservation Impacts of Proposed Marine Recreational Fishing Closures in Southern California. Prepared for the American Sportfishing Association. Available online at: http://www.southwickassociates.com/wp-content/uploads/2011/10/CA_2009.pdf.

State of the Gulf of Mexico Summit. 2011. Texas Gulf Coast Restoration Priorities. Available online at: http://www.sgmsummit.org/stepping-stones/pdf/04-RestorationPriorities.pdf.

Stichert, Mark A. 2010. Annual Management Report for Shellfish Fisheries in the Kodiak, Chignik, and Alaska Peninsula Areas, 2009. Alaska Department of Fish and Game, Fishery Management Report 10-32, Anchorage. Available online at: http://www.adfg.alaska.gov/FedAidPDFs/FMR10-32.pdf.

Stubblefield D, Stewart C. DNATL Community Food Assessment. Humboldt State University: California Center for Rural Policy, May 2012.

Sugihara, Neil G., Jan W. van Wagtendonk, Kevin E. Shaffer, JoAnn Fites-Kaufman, Andrea E. Thode (eds.). 2006. “Part II: The History and Ecology of Fire in California’s Bioregions” in Fire in California’s Ecosystems. University of California Press: Berkeley, CA. Available online at: http://www.cnr.berkeley.edu/stephens-lab/Publications/Stuart%20Stephens%20North%20Bioregion%20AFE%209-06.pdf.

TCW Economics. 2010. Economic Contributions and Impacts of Salmonid Resources in Southeast Alaska: Final Report. Prepared for Trout Unlimited, Alaska Program. Available online at: http://www.tu.org/sites/www.tu.org/files/documents/EconReportFull.pdf.

U.S. Army Corps of Engineers. 2009. Navigation Data Center: Waterborne Commerce Statistics Center. Available online at: http://www.ndc.iwr.usace.army.mil//wcsc/webpub09/webpubpart-1.htm.

U.S. Census, County Business Patterns, 2010. Employer establishments and non-employer establishments. Available online at: http://www.census.gov/econ/cbp/index.html and http://www.census.gov/econ/nonemployer/.

U.S. Census, County Business Patterns, 2012. Population Finder. Available online at: http://www.census.gov/popfinder/.

U.S. Fish and Wildlife Service (USFWS). 1999. Multi-Species Recovery Plan for South Florida: The South Florida Ecosystem. Available online at: http://www.fws.gov/verobeach/MSRPPDFs/SFecosystem.pdf.

U.S. Fish and Wildlife Service (USFWS). 2008. Pribilof Islands, Wildlife Viewing. Available online at: http://alaskamaritime.fws.gov/visitors-educators/wildlifeviewing/pribilofs.htm.

U.S. Fish and Wildlife Service (USFWS). 2009. "Net Economic Values of Wildlife-Related Recreation in 2006," Addendum to the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation Report 2006-5.

U.S. Fish and Wildlife Service (USFWS). 2011. 2010/2012 Federal Subsistence Wildlife Regulations: Area 10, Aleutian Islands. Available online at: http://alaska.fws.gov/asm/pdf/wildregs/unit10.pdf.

U.S. Fish and Wildlife Service (USFWS). 2012a. National Wildlife Refuge Locator. Available online at: http://www.fws.gov/refuges/refugeLocatorMaps/.

U.S. Fish and Wildlife Service (USFWS). 2012b. Aleutian and Bering Sea Islands Landscape Conservation Cooperative: Fact Sheet. Available online at: http://alaska.fws.gov/lcc/pdf/abs_factsheet.pdf.

U.S. Geological Survey. 2011. An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska. Circular 1370. Available online at: http://pubs.usgs.gov/circ/1370/.

U.S. Lifesaving Association. Travel and Leasure: America's Most Crowded Beaches. July 18th, 2012. Available online at: http://www.travelandleisure.com/articles/americas-most-crowded-beaches.

Wildland Studies. 2012. Ecosystems of Southcentral Alaska: The Coastal Alaska Project. July 27-August 13, 2012: Anchorage, AK. Available online at: http://www.wildlandsstudies.com/resources/WS+COASTAL+ALASKA+Full+Project+Description+Summer+2012.pdf.

Window on State Government. 2009. Texas in Focus: Gulf Coast Region: Economic Development. Available online at: http://www.window.state.tx.us/specialrpt/tif/gulf/ecodevo.php.

Winter, Alison. 21 August 2009. U.S. Bans Commercial Fishing in Warming Arctic. New York Times. Accessed 6 March 2012 at: http://www.nytimes.com/gwire/2009/08/21/21greenwire-us-bans-commercial-fishing-in-warming-arctic-33236.html.

Wolf, Patricia. 2001. California's Offshore Ecosystem in California's Living Marine Resources: A Status Report. California Department of Fish and Game. Available online at: http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=34238&inline=true.

World Wildlife Fund. 2011. The Value of Commercial Fisheries Near Bristol Bay, Alaska. Available online at: http://www.worldwildlife.org/who/media/press/2012/WWFBinaryitem26202.pdf.