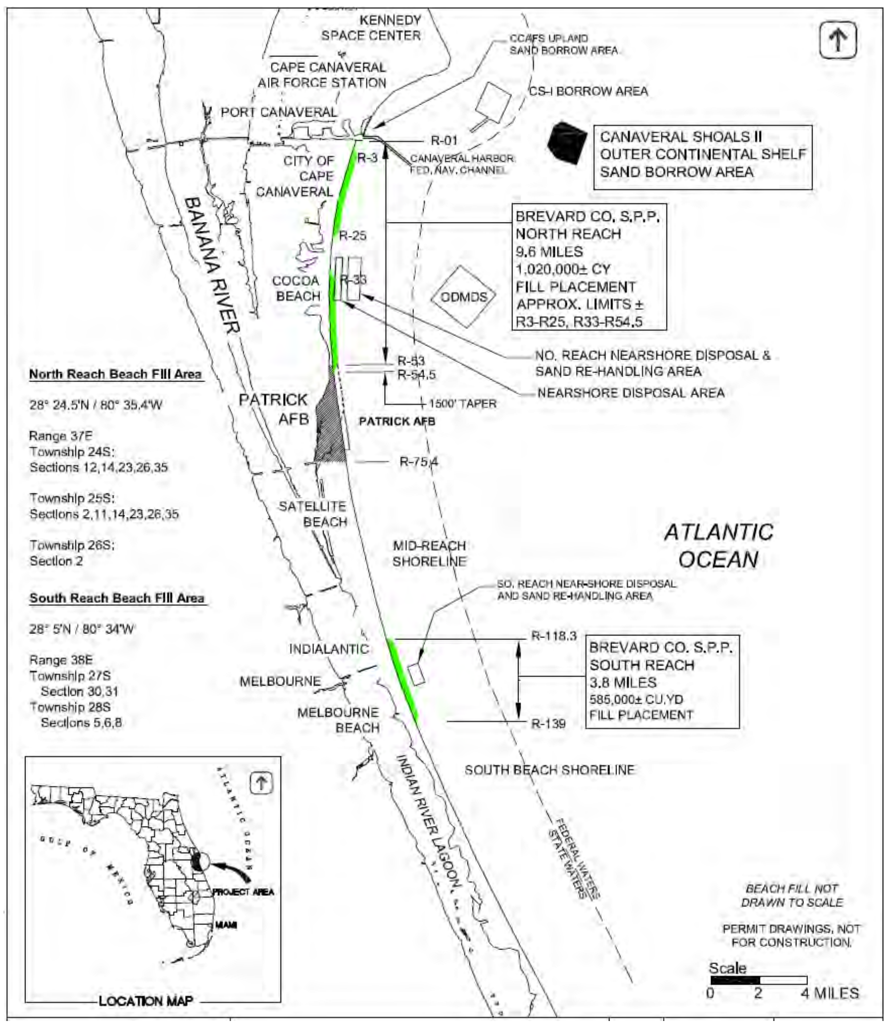
OCS EIS/EA
BOEM 2013-01151

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals II in the Brevard County Shore Protection Project (SPP) North Reach and South Reach

Environmental Assessment



U.S. Department of the Interior
Bureau of Ocean Energy Management
Division of Environmental Assessment

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals II in the Brevard County Shore Protection Project (North Reach and South Reach)

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Acronyms List

BOEM	Bureau of Ocean Energy Assessment
BO	Biological Opinion
CFR	Code of Federal Regulations
CO	Carbon monoxide
CS II	Canaveral Shoal Borrow Area II
m^3	cubic meters
cy	cubic yards
CZMA	Coastal Zone Management Act
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
DEP	Department of Environmental Protection (in Florida)
DPEC	Dredging Projects Emission Calculator
FCCE	Flood Control and Coastal Emergency
FCMA	Magnuson-Stevens Fisheries Conservation and Management Act
FDEP	Florida Department of Environmental Protection
ft	feet, foot
FWCC	Florida Fish and Wildlife Commission
JCP	Joint Coastal Permit
km	Kilometers
NAAQS	National Ambient Air Quality Standards
NTU	Nelephelometric Turbidity Units
m	meters
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NASA	National Aeronautic and Space Administration
NAVD88	North American Vertical Datum, 1988
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NO	Nitric Oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
OCS	Outer Continental Shelf
PCE	primary constituent elements (most important parts of a critical habitat)
P3BO	Peninsular Piping Plover Biological Opinion
PM	particulate matter
PM10	particulate matter 10 microns or less
RBO	regional biological opinion
SHPO	State Historic Preservation Officer

SO2	sulfur dioxide
SPBO	Statewide Programmatic Biological Opinion
SPP	Shoreline Protection Project of Brevard County, FL
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic carbon
μg	micrograms

1 INTRODUCTION

This Environmental Assessment (EA) provides an updated evaluation of the potential environmental impacts associated with the Bureau of Ocean Energy Management (BOEM) authorization for the use of 2,400,000 cubic yards (cy) (1,834,931 cubic meters (m^3)) of Outer Continental Shelf (OCS) sand from the Canaveral Shoals Borrow Area II (CS II) offshore Cape Canaveral, Florida in the Brevard County Shore Protection Project. The BOEM proposes to enter into a noncompetitive agreement with the U.S. Army Corps of Engineers (USACE), Jacksonville District and Brevard County Board of County Commissioners so that the project proponents can extract, transport, and place sand from CS II along 9.8-miles (16 kilometers (km)) of shoreline known as the North Reach segment and 3.8 miles (6 km) known as the South Reach (Figure 1) along the Brevard County shoreline.

Pursuant to the National Environmental Policy Act (NEPA), the USACE described the affected environment, evaluated potential environmental impacts resulting from the proposed action, and developed and described alternatives to the proposed action in its *Brevard County Shore Protection Feasibility and Environmental Impact Statement* (EIS) (USACE 1996; Appendix A). The USACE prepared an EA*: Environmental Assessment of a Proposed Sand Borrow Area for the Purposes of Beach Nourishment in Brevard County, Florida* (1998; Appendix B) to evaluate the potential impacts of using the CS II borrow area, not considered in the 1996 EIS. In 2005 and 2009 BOEM (then the Minerals Management Service) prepared two additional EAs (*Issuance of a Non-competitive Lease for Canaveral Shoals II* and *Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project*) (Appendices C and D). The 1998, 2005, and 2009 EAs tiered from the 1996 EIS and were used by BOEM to support leasing decisions in 2002, 2005 and 2009. This EA supplements those existing NEPA analyses. The purpose of this EA is to determine if the proposed action, in light of new information, would have any significant effect on the human environment and whether an EIS must be prepared.

The 1996 EIS, cited above, considered in detail a range of potential shore protection alternatives, including structural and non-structural options, varying beach berm widths, and multiple sources of fill material. Based upon a combination of economic, engineering, and environmental factors, the USACE selected for implementation of the non-structural alternative that would best meet its needs for the Brevard County Shore Protection Project. Therefore, the focus of this EA is to evaluate potential environmental impacts from returning the Brevard County shoreline to the condition described in the 1996 EIS preferred alternative. Accordingly, the No Action Alternative and the Proposed Action are evaluated in this EA.

BOEM, in cooperation with the USACE, identified and reviewed new information to determine if any resources should be re-evaluated or if the new information would alter effects determinations. While this EA further supports and elaborates on the analyses and information presented in existing NEPA documents, it does not change the conclusions of any of those prior NEPA analyses. Pursuant to 43 Code of Federal Regulations (CFR) 46, the analyses are still deemed valid and are incorporated by reference. No new information was identified that would lead to a determination of significantly different impacts or would necessitate a major revision of

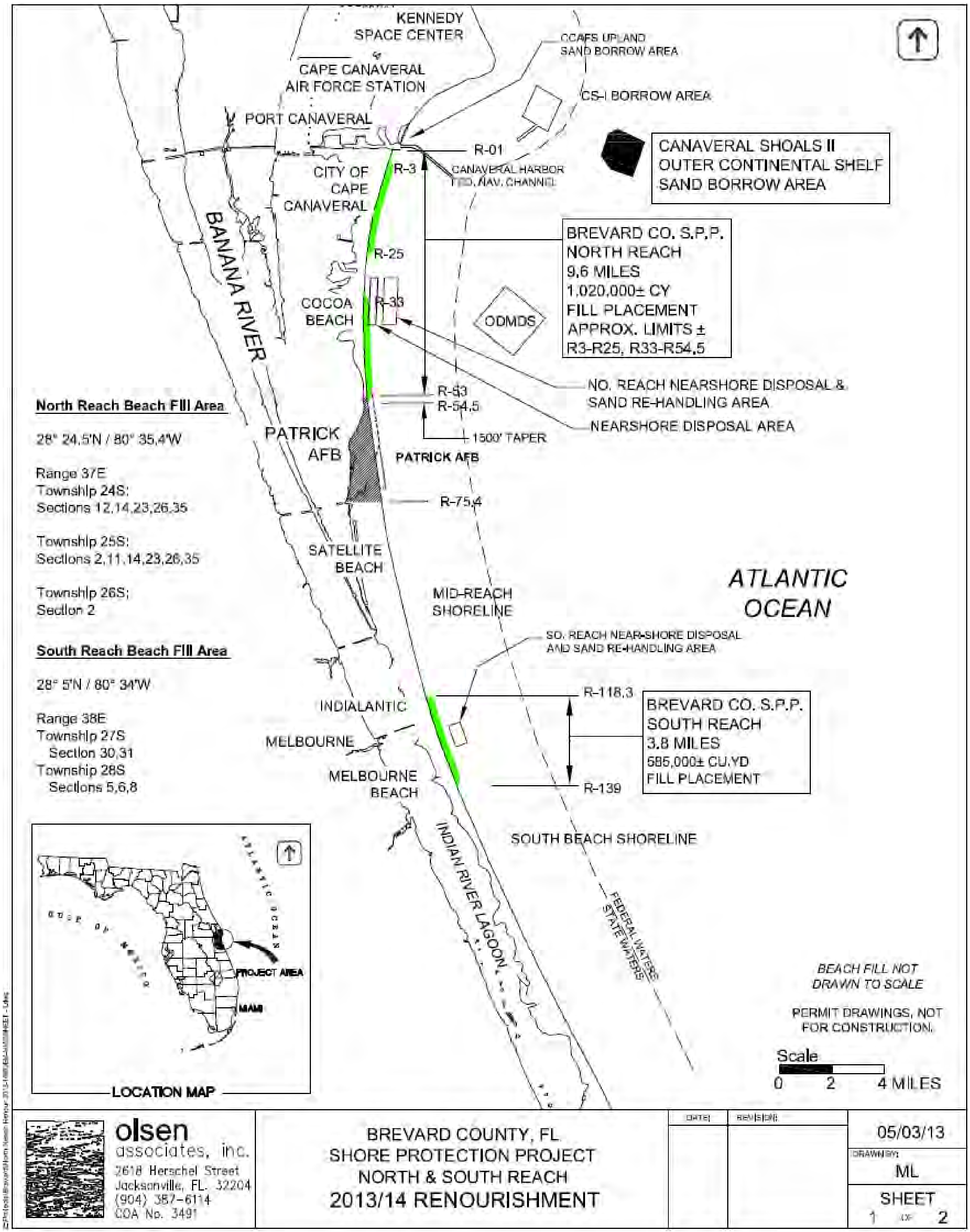

Figure 1. Brevard County, North and South Reach 2013/2014 Project Area

the impacts analyses previously prepared or related to the Brevard County Shore Protection Project and required preparation of an EIS.

BOEM has integrated the process of NEPA compliance with other environmental requirements, including the Coastal Zone Management Act (CZMA), Endangered Species Act (ESA), Magnuson-Stevens Fishery Management and Conservation Act (FCMA), and National Historic Preservation Act (NHPA). The USACE has served in the role of lead federal agency for environmental compliance activities, while BOEM has acted in a cooperating role. Additionally, the USACE has served as the lead federal agency and fulfilled BOEM and USACE's collective responsibilities under Section 106 of the NHPA. Pursuant to Subpart D of the implementing regulations for the CZMA (15 CFR 930), Brevard County provided consistency concurrences from the Florida Department of Environmental Protection (FDEP), dated April 26, 2013, indicating the proposed actions are consistent with the Florida's Coastal Zone Management Program (Appendix E).

For ESA compliance, the potential impacts on sea turtles, North Atlantic right whales, and humpback whales were previously coordinated with the National Marine Fisheries Service (NMFS) and are covered under the 1995/1997 South Atlantic Regional Biological Opinion (BO) (http://el.erdc.usace.army.mil/seaturtles/index.cfm). The USACE notified the NMFS on April 18, 2013 of their intent to utilize the South Atlantic Regional Biological Opinion and BOEM's involvement in the proposed action. On July 30, 2009, NMFS provided written concurrence that the dredging and construction operations at the South Reach may affect, but is not likely to adversely affect smalltooth sawfish (Appendix F). The USACE has determined and requested similar concurrence that dredging and construction operations for this construction cycle may affect, but is not likely to adversely affect the smalltooth sawfish (Appendix F). The U.S. Fish and Wildlife Service (USFWS) was notified by letter on April 4, 2013 that the USACE intended to utilize the State Programmatic Biological Opinion (Appendix G) for Section 7 coverage for manatees and nesting sea turtles. The USFWS was also contacted on April 17, 2013 to clarify BOEM's involvement in potentially authorizing the borrow area (Appendix G). The USACE and BOEM initiated consultation with the USFWS on May 7, 2013 for piping plovers, making a determination of "may affect, is not likely to adversely affect" and seeking to apply the Peninsular Piping Plover Biological Opinion (P3BO) to the proposed activities. The P3BO was issued on May 22, 2013 and all terms and conditions associated with it will be applied to this project (Appendix G). The USACE consulted with NMFS concerning Essential Fish Habitat in late 2004 using existing NEPA documents; a supporting detailed assessment of Essential Fish Habitat was provided in the Minerals Management Service (MMS) EA (2005). NMFS issued Conservation Recommendations on January 12, 2005 focusing on protecting sensitive nearshore rock habitat and communities (Appendix H). Post-construction monitoring surveys in the nearshore were performed annually from 2006 through 2008 to monitor potential impacts. Results indicated that the nearshore rock habitat and communities were not adversely affected by placement of sand on the South Reach. Following construction in 2010, no additional monitoring of the nearshore worm rock areas along South Reach occurred. On April 19, 2013, the USACE notified NMFS of its intent to proceed with the maintenance renourishment of North and South Reach and that they would follow the NMFS 2005 Conservation Recommendations.

To comply with Section 106 requirements, the USACE re-coordinated with the Florida State Historic Preservation Officer (SHPO) and several Florida tribes in May 2013. Previously, the SHPO confirmed eight targets as debris from Air Force or National Aeronautic and Space Administration (NASA) programs and suggested they could be eligible for listing in the National Register (Appendix I). Those targets will be avoided.

2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Brevard County Shore Protection Project is authorized by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303, to reduce damage to structures and shorefront property related to erosion and storms. Initial construction of the North and South Reach segments was completed in 2002 and 2003 and involved the placement of approximately 5 million cy (3,822,774 m^3) of sand on the beach. The North and South Reach were renourished in 2005 with approximately 2 million cy (1,529,109 m^3) of sand under authorization of the Flood Control and Coastal Emergencies Act. In 2010, approximately 640,000 cy (489,315 m^3) of sand from CS II was dredged and placed along 3.8 miles (6 km) of South Reach. Since then, storm activity has severely eroded portions of the Brevard County North Reach and South Reach. Tropical Storm Debby and Hurricane Sandy, in particular, caused increased erosion to both the North and South Reaches in 2012. The Project is being constructed using Flood Control and Coastal Emergency (FCCE) rehabilitation funding provided through Disaster Relief Appropriations Act of 2013. BOEM's proposed action is needed to authorize use of an additional 2,400,000 cy (1,834,931 m^3) of OCS sand from CS II to re-nourish the North and South Reaches and enhance storm damage protection.

3 DESCRIPTION OF THE PROPOSED ACTION

The USACE proposes to place approximately 1,605,000 cy (1,227,110 m^3) of beach-compatible sand along portions of the Brevard County, Florida Atlantic Ocean shoreline to restore sand eroded from the Brevard County Shore Protection Project. Approximately 1,020,000 cy (779,845 m^3) of sand will be placed along all or parts of the 9.8-mile (16 km) North Reach segment, between FDEP monuments R1 and R53 (City of Cape Canaveral and Cocoa Beach) with south-end transition of up to 1500-foot (457 m) length extending to R54.5 (Figure 1). Sand placement within the North Reach segment is anticipated to be principally within two sub-segments of shoreline: approximately 4 miles (6.4 km) between R3 and R25, and approximately 4 miles (6.4 km) between R33 and R54.5, with an intervening gap of approximately 1.5 miles (2.4 km), more or less. Approximately 585,500 cy (447,646 m^3) of sand will be placed along all or parts of the 3.8-mile (6 km) South Reach segment, between FDEP reference monuments R118.3 and R139 (Melbourne Beach and Indialantic) (Figure 1). Actual limits may vary based upon conditions at the time of final project design and construction.

The proposed action would dredge up to approximately 2,400,000 cy (1,834,931 m^3) of sand from one or both of two offshore borrow areas south of Cape Canaveral and east of Port Canaveral: Canaveral Shoals I located in State of Florida waters, and/or Canaveral Shoals II located in Federal waters on the Outer Continental Shelf (Figure 2). A portion of the dredged

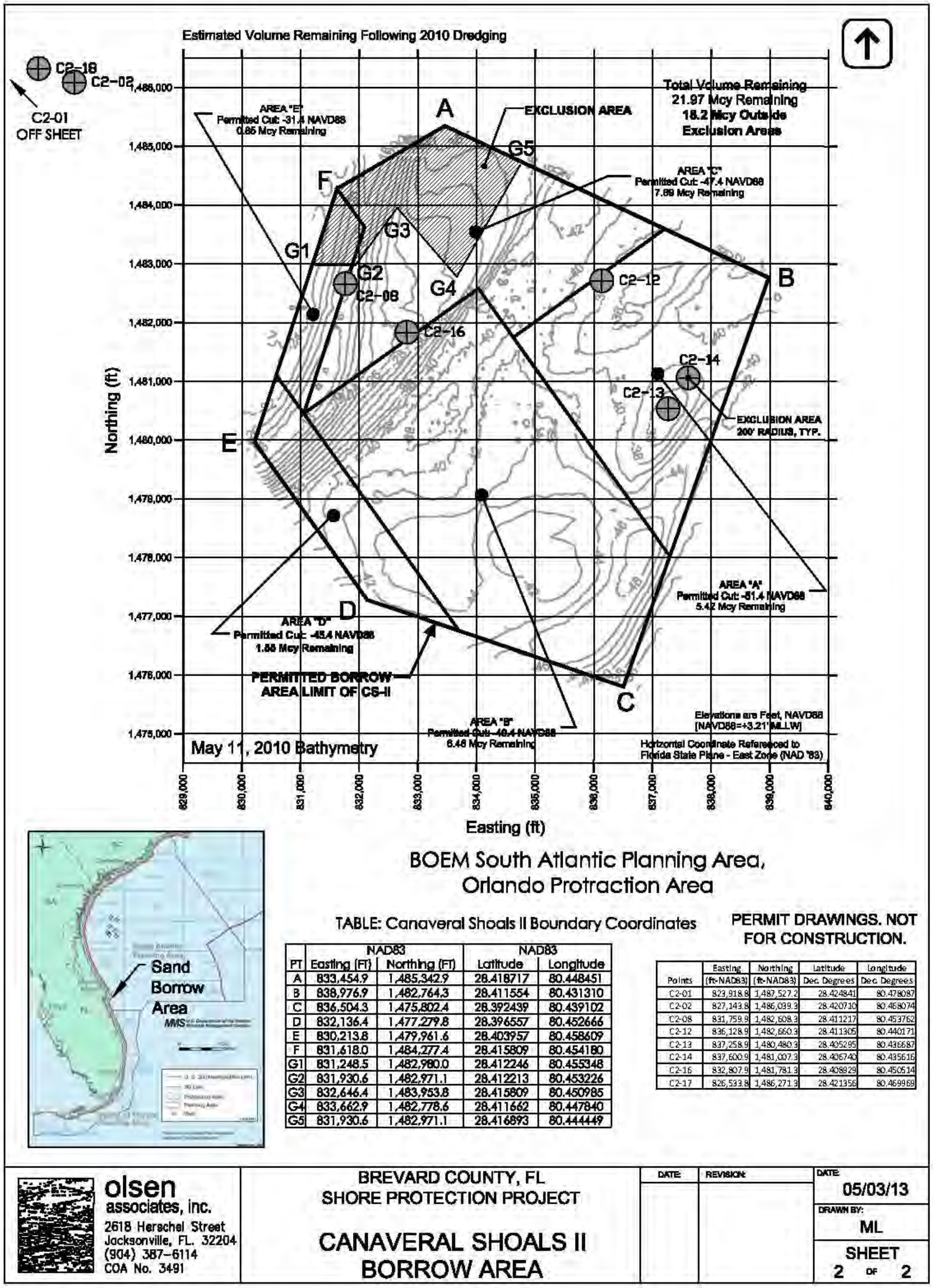

TABLE: Canaveral Shoals II Boundary Coordinates

PT	NAD83 Easting (FT)	NAD83 Northing (FT)	NAD83 Latitude	NAD83 Longitude
A	833,454.9	1,485,342.9	28.418717	80.448451
B	838,976.9	1,482,764.3	28.411554	80.431310
C	836,504.3	1,475,802.4	28.392439	80.439102
D	832,136.4	1,477,279.8	28.396557	80.452666
E	830,213.8	1,479,961.6	28.403957	80.458609
F	831,618.0	1,484,277.4	28.415809	80.454180
G1	831,248.5	1,482,980.0	28.412246	80.455348
G2	831,930.6	1,482,971.1	28.412213	80.453226
G3	832,646.4	1,483,953.8	28.415809	80.450985
G4	833,662.9	1,482,778.6	28.411662	80.447840
G5	831,930.6	1,482,971.1	28.416893	80.444449

Points	Easting (ft-NAD83)	Northing (ft-NAD83)	Latitude Dec. Degrees	Longitude Dec. Degrees
C2-01	823,918.8	1,487,527.2	28.424841	80.478087
C2-02	827,143.8	1,486,039.3	28.420710	80.468074
C2-08	831,759.9	1,482,608.3	28.411217	80.453762
C2-12	836,128.9	1,482,660.3	28.411305	80.440171
C2-13	837,258.9	1,480,480.3	28.405295	80.436687
C2-14	837,600.9	1,481,007.3	28.406740	80.435616
C2-16	832,807.9	1,481,781.3	28.408929	80.450514
C2-17	826,533.8	1,486,271.3	28.421356	80.469969

Figure 2. Canaveral Shoals II Borrow Area

sand may be placed in one or both of the two nearshore rehandling areas as part of the construction process. The difference in volume (dredged vs. placed) provides for any loss during the dredging process, including rehandling, as well as a contingency volume if additional sand needs to be placed to achieve the design template. CS II is the preferred open ocean borrow area, roughly 5 miles (8 km) from its nearest landward point (Cape Canaveral Air Force Station). It is approximately 6,000 x 6,500 feet (1829-1981 m) with existing depths ranging from -11 to -42 feet (3.4 to 12.8 m). From the core borings and sediment analysis, the substrate of the site consists of beach quality sand (medium sand with a significant shell fraction) which meets the criteria of the Florida Sand Rule. This borrow area has been dredged on six prior occasions for purposes of placing renourishment sand along the Brevard County beaches, including four times for the North and South Reach segments in 2000/01 through 2010, and twice for the Patrick Air Force Base shoreline in 2000/01 and 2005. Approximately 20 million cy (15,291,097 m^3) of sand are currently available within the existing permitted limits of CS II. The proposed action will limit dredging activity to within the footprint that has been previously dredged at CS II.

The proposed action would occur between October 1 and April 30 in order to avoid most sea turtle nesting activities. Dredge activity may commence as early as October 1 if elective use of a rehandling area is made. Sand placement and construction activity on the beach would occur only after October 31. It is anticipated that construction of the North and South Reach segments of the project may be built concurrently, at least in part.

The North and South Reach segments would be constructed with one or more hopper dredges using direct hopper dredge pump-out to the beach or, if elected by the dredge contractor, temporary storage in the nearshore rehandling areas and subsequent transfer by a cutterhead-pipeline dredge to the beach. Permitting authority for the re-handling area lies with FDEP since the area is within State waters and these permissions are included in the State Permit.Hopper dredging is expected to occur over approximately 180 to 210 days to obtain the necessary volume. The time estimated to complete each dredge and placement cycle, including idle time, is approximately 4 to 6 hours per load for the North Reach and 6 to 8 hours for the South Reach. Hopper dredging would operationally occur over a relatively small footprint within the designated borrow area. Efficient dredging practice entails excavating sand in 1 to 4 foot thicknesses along relatively straight and adjacent runs along the seabed. The sand dredged from the hydraulic suction heads would be discharged into the vessel's open hopper, and most of the seawater effluent would spill over the sides of the hopper. The hopper dredges would transport the dredged material a distance of approximately 10 or 22 nautical miles (nm), for the North Reach and South Reach respectively, to pump-out mooring buoys positioned approximately 0.5 to 1 mile from shore, from which the material would be pumped directly from the hopper barge via pipeline to the beach. The placement and relocation of the nearshore mooring buoys used during pump-out may involve the use of tender tugboats and a pipeline hauler or crane. Alternatively, dredged material may be placed by the hopper dredges into previously permitted rehandling areas and henceforth dredged from the rehandling area and pumped onto the beach via a cutterhead pipeline dredge. The permitted North Reach rehandling area is 9,500-ft (2895.6 m) alongshore by 2,750-ft (838.2 m) wide and is centrally located along the North Reach segment between approximately 4000 and 6800 feet (1219 and 2073 m) from shore. The permitted South Reach rehandling is 4,500-ft (1372 m) alongshore by 2,450-ft (747 m) wide and is centrally located along the South Reach segment between 2,600- and 5,050-ft (793 and 1539

m) from shore (Figure 1).

The beach construction template is identical to that previously constructed along the North and South Reaches. The template would include an approximate 60 to 100-ft (18 to 30.5 m) wide berm at elevation +8.2 ft (+2.5 m) NAVD'88 (with +/- 0.5 ft (+/- 0.15 m) vertical tolerance), of which the seaward 60 to 100-ft (18 to 30.5 m) slopes to elevation +6.7 ft (+2 m) at the seaward edge of the berm at between 1(v):40(h) and 1(v):57(h) gradient, thence sloping at 1(v):15(h) along the berm face to the intersection with the existing seabed. Landward of the sloped segments, the berm (elevation +8.2 ft (+2.5 m)) is flat and of variable width, depending on the position of the existing beach, and intersecting with the existing +8.2 ft (+2.5 m) elevation or vegetation line, whichever is furthest seaward. Unless already present, the landward end of the template along the South Reach will include a dune feature with crest elevation +10.2 feet (+3.1 m) with 1V: 10H seaward and landward facing slopes. The landward end of the template toes into the existing beach profile at +7.5 ft (+2.3 m) North American Vertical Datum 1988 (NAVD88). The use of up to three bulldozers and/or pipeline movers and two trucks is anticipated on the beach during construction to distribute and grade the hydraulically placed sand. This berm has been designed to be turtle friendly. Unlike a typical beach berm, the seaward elevation of the proposed berm is lower in order to reduce potential scarping resulting from storm activity or the natural equilibration of the beach and to reduce ponding of water. Scarping (the formation of steep slopes) and ponding can prevent sea turtles from being able to crawl upon the beach to nest and can inundate existing nests with seawater.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Pursuant to the NEPA, the proposed action is being evaluated to determine the potential environmental impacts that may result from issuing a noncompetitive agreement to authorize use of OCS sand resources for beach nourishment. As previously stated, this EA supplements the EIS prepared by the USACE in 1996 and EAs prepared by the USACE in 1998 and by BOEM in 2005 and 2009. The EA provides additional information on the status of and potential impacts to archaeology/cultural resources, air quality, threatened and endangered species, non-threatened marine mammals, birds, water quality, and benthic habitat and morphology. The reasons for providing this additional evaluation include the following: 1) updated information on potential air quality impacts; 2) new observer and relocation trawling data, sea turtle nesting, and shorebird monitoring data from the 2010 dredging event; 3) listing of and adoption of measures to protect the endangered smalltooth sawfish; 4) updated information about noise produced dredging operations and potential impacts to marine mammals; 5) adoption of standard measures to protect and monitor shorebirds; and, 6) new water quality and physical monitoring data from the 2010 project.

Previous NEPA documents (USACE 1996; USACE 1998; MMS 2005; MMS 2009) evaluated impacts to other resources including aesthetics, beach and coastal habitat, benthic resources, wildlife, fish and essential fish habitat, non-threatened marine mammals, recreation and tourism, other threatened and endangered species, and cumulative impacts. These evaluations have been determined to remain valid since the project limits and construction methodologies,

Table 1: Summary of Environmental Impacts and Mitigation

ENVIRONMENTAL RESOURCE	IMPACTS 1996 EIS[1]	IMPACTS 1998 EA[2]	IMPACTS 2005 EA[3]	IMPACTS 2009 EA[4]	IMPACTS 2013 EA[5]	MITIGATION[6]
AESTHETICS	Temporary adverse visual impact from construction equipment; long-term positive visual impact from restored beach (5.27)	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated	
AIR QUALITY	Temporary and localized decrease in air quality from construction-equipment emissions. (5.33)	Temporary and localized decrease in air quality from construction-equipment emissions. (5.1)	Not evaluated.	Temporary and localized decrease in air quality from construction-equipment emissions. Estimated emissions within national ambient air quality standards.	Dispersion modeling utilizing the 2010 project data indicates that the cumulative impact for all criteria pollutants were less the National Ambient Air Quality Standards (NAAQS). Projected emissions from the proposed action would not have substantial impacts	
ARCHAEOLOGY/ CULTURAL RESOURCES	No historic or cultural properties identified in the placement area along South Reach. (5.19)	Sixteen targets detected within CS II. No effect with designation of protective buffer zones. (5.10)	No effect since investigations indicate no prehistoric sites within CS II or immediate placement area (p. 4)	Diver investigation revealed 8 space debris sites of cultural significance within or in the vicinity of CS II. No effect with designation of protective buffer zones.	Diver investigation revealed 8 space debris sites of cultural significance within or in the vicinity of CS II. No effect with designation of protective buffer zones.	Implement 300 foot avoidance buffer on 8 identified space debris sites; implement chance find clause as necessary. Implement dredge with positioning equipment.
BEACH COMPATIBILITY / COASTAL HABITAT	Stabilization of eroding beach and dune habitats (5.01).	No adverse impacts are anticipated. (5.4)	Not evaluated.	Not evaluated.	Not evaluated	Implement best construction practices, beach sampling, and beach profiling requirements of Florida DEP Consistency Certification.
BENTHIC	Short-term and	Possible mortality for	Possible mortality for	Not evaluated.	Not evaluated	

ENVIRONMENTAL RESOURCE	IMPACTS 1996 EIS[1]	IMPACTS 1998 EA[2]	IMPACTS 2005 EA[3]	IMPACTS 2009 EA[4]	IMPACTS 2013 EA[5]	MITIGATION[6]
RESOURCES	localized reduction in beach infaunal invertebrates. (5.01)	nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevation turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals. Recolonization expected to occur. (5.5)	nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevated turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals and highly adaptive benthic assemblages. Recolonization of physically dominated environment expected to occur within 2-3 years. (p. 5-9)			
BIRDS AND WILDLIFE	Short and localized disruption of feeding, foraging, and nesting during construction activities. (5.01) See U.S. FWS Coordination Act Report (1995).	Not evaluated.	Not evaluated.	Not evaluated.	During dredging and placement activities, bird habitat may be adversely or beneficially affected; similar, short-term and local disturbances may affect individual bird behavior. Implementation of bird protection policy should minimize adverse effects.	Corps's migratory bird protection plan will be implemented Surveys for nesting shorebirds conducted daily if construction occurs during April-September (FDEP) 300 ft (92 m)buffer zones around nesting or courting shorebirds Compaction testing, tilling, and escarpment removal outside of bird nesting season

ENVIRONMENTAL RESOURCE	IMPACTS 1996 EIS[1]	IMPACTS 1998 EA[2]	IMPACTS 2005 EA[3]	IMPACTS 2009 EA[4]	IMPACTS 2013 EA[5]	MITIGATION[6]
FISH AND ESSENTIAL FISH HABITAT (EFH)	Short and localized disturbance of surf zone habitat and fish during pump-out and sand re-distribution from elevated noise and Turbidity levels, as well as burial. Potential burial of nearshore coquina and scattered worm rock outcrops by longshore transport. (5.01)	Fish and EFH would be temporarily and locally impacted by dredge activity including sub-lethal and lethal effects related to turbidity, prey availability, and dredge entrainment or burial. Long term disruption not expected due to fish mobility and dredging intervals. (5.9)	Possible entrainment and sub-lethal effects from turbidity, noise, and burial. Effects are expected to be minor because of species mobility, avoidance behavior, and widespread occurrence of comparable habitat. Possible trophic effects from benthic disturbance and locally reduced prey. EFH could be temporarily and locally physically disturbed by dredging or beach shaping activity. Long term suppression not expected due to dredging intervals and widely available habitat. Minor impact to nearshore rock habitat (Habitat of Particular Concern) from burial may be avoided or mitigated with protective measures. (p. 9-24)	Not evaluated.	See Physical Impacts section	No beach fill within 50 feet (15.2 m) of any coquina or worm rock outcrops and continue monitoring program per NMFS Conservation Recommendations Turbidity monitoring in the vicinity of dredging and beach fill operations.
NON-THREATENED MARINE MAMMALS	Not evaluated.	No adverse impacts are anticipated because of species avoidance mechanisms, but strikes are possible. (5.8)	Not evaluated.	Not evaluated.	Minor behavioral effects related to noise exposure. Minor strike risk as mobile marine mammals can avoid slow moving vessels. Strike risk is minimized with use of	Use of observers during daylight and avoidance . Speed restrictions at night.

ENVIRONMENTAL RESOURCE	IMPACTS 1996 EIS[1]	IMPACTS 1998 EA[2]	IMPACTS 2005 EA[3]	IMPACTS 2009 EA[4]	IMPACTS 2013 EA[5]	MITIGATION[6]
					observers and implementation of speed restrictions.	
PHYSICAL IMPACTS	Not evaluated.	Minor effects anticipated to incident wave field and longshore transport due to bathymetric modification. Infilling of dredge cuts likely from southerly sediment transport. (5.2)	Modification of offshore bathymetry may result in minor effects in offshore sediment transport pathways, incident wave field, and longshore transport. Infilling anticipated over long-term. (p.24-39)	Not evaluated.	Monitoring indicates that infilling of 1-3 vertical feet (0.3-0.9 m) occurs following each dredging cycle. There has been no substantial change in the borrow area sediment and habitat relative to pre-dredging conditions.	Conduct pre- and post-construction bathymetric surveys to monitor physical changes in borrow area.
RECREATION AND TOURISM	Significantly increased area for beach recreation; temporary and localized visual and noise impact from construction activities. (5.30)	Local and short-term disruption to navigation. Recreational opportunities and tourism would benefit from beach nourishment. (5.11)	Not evaluated.	Not evaluated.	Not evaluated	Publish Local Notice to Mariners.
THREATENED AND ENDANGERED SPECIES	Potential increase of nesting habitat for sea turtles; potential disturbance and take of sea turtles, right whales, and related to beach scarping, lighting, dredge entrainment, and vessel strike. (5.09)	Possible entrainment dredge may lead to injury and mortality sea turtles (5.6). Noise and vessel collision may lead to injury and mortality of marine mammals (5.7). Effects to marine turtles and marine mammals may be avoided or minimized with protective measures.	Dredging may affect, but not likely to adversely affect smalltooth sawfish with approved protective measures. No effect to Johnson's seagrass or Southeastern beach mouse since no critical habitat in project area. (p.21-24)	Hopper dredging and beach placement may adversely affect marine turtles. Adverse effects to sea turtles, marine mammals, and smalltooth sawfish may be avoided or minimized with protective measures.	Hopper dredging and beach placement may adversely affect marine turtles and piping plover. Adverse effects to sea turtles, marine mammals, and smalltooth sawfish may be avoided or minimized with protective measures	Implement terms and conditions of 1) NMFS 1995/1997 Regional Biological Opinions, 2) NMFS 2009 Concurrence, and 3) 2009 USFWS BO; NMFS' Smalltooth Sawfish Construction Conditions; and the P3BO
WATER QUALITY	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) in placement area. (5.24)	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) to the water column in	Not evaluated.	Not evaluated.	Monitoring following the 2009-2010 project indicated that turbidity levels are temporarily elevated	Monitoring water quality conditions per requirements of Florida DEP Consistency

ENVIRONMENTAL RESOURCE	IMPACTS 1996 EIS[1]	IMPACTS 1998 EA[2]	IMPACTS 2005 EA[3]	IMPACTS 2009 EA[4]	IMPACTS 2013 EA[5]	MITIGATION[6]
		borrow area. Accidental spills or toxic materials are not expected. (5.3)			but do not exceed State thresholds.	Certification. Implement marine pollution control plan. Ensure compliance with U.S. Coast Guard requirements and U.S. EPA Vessel General Permit as applicable.
CUMULATIVE IMPACTS	Restore beach and ecosystem and prevent property damage. (5.37)	Not evaluated.	Currently proposed, past and future use of CS II and beach nourishments expected to be minor to possibly moderate. Of primary concern are long-term impacts to nearshore hardbottom located north of South Reach. (p.39-46)	Not evaluated.	Not evaluated.	See mitigation for Fish and Essential Fish Habitat

1 Brevard County Shore Protection Feasibility and Environmental Impact Statement (EIS) 1996 (Appendix A)
2 Environmental Assessment of a Proposed Sand Borrow Area for the Purposes of Beach Nourishment in Brevard County, Florida 1998 (USACE 1998)
3 Issuance of a Noncompetitive Lease for Canaveral Shoal II Sand and Gravel Borrow Area Brevard County Beach Erosion Control Project 2005 EA (MMS 2005)
4 Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project 2009 EA (Appendix D)
5 Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals II in the Brevard County (North and South Reach) Shore Protection Project (SPP) 2013 EA (This current document)
6 See Attachment 1 to the FONSI for Proposed Mitigation Measures

scope, and timing have remained the same, the information presented in these evaluations is otherwise valid, and relevant Federal laws have not changed in a manner that would require re-evaluation of these resources. The existing analyses adequately address most of the potential environmental impacts of the proposed action and are incorporated by reference and summarized in Table 1.

4.1 Archaeology/Cultural Resources

The north and south sand rehandling project areas were surveyed by magnetometer and sidescan sonar in 1999. The report entitled *A Submerged Cultural Resources Remote Sensing Survey of Four Proposed Borrow Areas and Archaeological Diver Identification and Evaluation of Eight Potentially Significant Submerged Targets for the Brevard County Shore Protection Project, Brevard County, Florida* (Watts 1999) found no magnetic or acoustic targets in either area. The Corps determined no historic properties affected and the Florida SHPO concurred on June 9, 1999 (DHR No. 992156).

Several geophysical surveys and diver identifications have been conducted in the proposed borrow area. This effort is documented in a number of reports dating from 1994, and all of these reports were coordinated with the SHPO. The 1994 report *A Cultural Resources Survey of Proposed Borrow Area, Vicinity of Cape Canaveral, Brevard County, Florida* (DHR file No. 942533) identified six potentially significant targets within CS II. The Watts 1999 report (DHR Nos. 992156 and 2000-02415) determined that the targets identified in 1994 were not significant, but identified eight additional potentially significant targets in an expanded borrow area. In 2001, a diver investigation was conducted in order to identify these eight targets. The State of Florida Department of Historic Resources asked that an additional six anomalies also be investigated. The results of the diver evaluations revealed that some of these objects were products of the United States space and/or missile programs, one was the remains of a modern fishing vessel, and another was identified as a section of steel cable. All of these findings are documented in the 2001 report "*Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project"* (DHR file No. 2001-316). The USACE has determined that these space and missile program objects are potentially significant cultural resources. Additional areas were surveyed in 2002 which is documented in "*A Cultural Resources Marine Remote Sensing Survey of the Offshore Borrow and Re-Handling Areas South Reach Brevard County Shore Protection Project, Brevard County, Florida"* (DHR file No. 2002-06980); however, no anomalies were identified.

In 2001, the SHPO concurred with the USACE determination that the space debris discovered within CS II, while modern, are potentially significant cultural resources. Their association with NASA and the U.S. Air Force missile program suggests that these objects may be potentially eligible for listing in the National Register. As during previous dredging events, these resources will be avoided by requiring the dredging contractor to maintain a 300 foot buffer zone around each of these sites. The USACE will also avoid dredging in the northwest portion of the CS II borrow area where the borrow area has not been previously dredged. This measure, implemented at the discretion of the USACE, will avoid any impacts to cultural resources that may be undiscovered in that area. Although available geophysical and geotechnical data indicate that the borrow area is a relatively thick Holocene sand deposit associated with the retreat of a cuspate foreland and cape-associated shoals and long-term sediment transport convergence zone (Meisburger and Field 1975), contemporary and systematic seismic data have not been collected across entire shoal complex and borrow area. More than 30 vibracores (Olsen Associates, undated) have been collected in the borrow area between 1972 and 1998 and have been used to define the Holocene, beach-compatible sand in the borrow area. The base elevation of beach-compatible sand is a minimum of 2-8 feet (0.6-2.4 m) below the maximum authorized cut depths. The authorized cut depths are based on sand compatibility with the native beach. The USACE is conducting a new geophysical survey of the shoal complex to better define the sand thickness and validate the potential for and location of pre-historic and historic resources; those results are anticipated to be available by July 2013 (Wendy Weaver, personal communication). Although the USACE does not expect to identify any new targets with the authorized borrow area and cut envelope, any new targets will be identified and avoided. In May 2013, the USACE, as lead agency, re-engaged the SHPO and tribal representatives of the Seminole and Miccosukee Tribes concerning historic properties and cultural concerns, making a no effect determination. Significant impacts to cultural resources in the borrow area are not anticipated, provided the mitigation below is implemented:

4.1.1 Onshore Prehistoric or Historic Resources

If the USACE discovers any previously unknown historic or archeological resources while accomplishing the activity on Brevard County beaches, the USACE will notify BOEM of any finding. The USACE will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4.1.2 Offshore Prehistoric or Historic Resources

There are eight anomalies (coordinates will be within the lease document) that must be avoided during dredging operations by at least 300 feet (92 m).

In the event that the parties and/or dredge operators discover any archaeological resources prior dredging operations in CS II or in the vicinity of pump-out operations, the USACE will report the discovery to the Chief, Leasing Division, BOEM electronically in a timely manner. The Corps Planning Division will coordinate with BOEM on the measures needed to evaluate, avoid, protect, and, if needed, mitigate adverse impacts from an unanticipated discovery. If investigations determine that the resource is significant, the parties will together determine how best to protect it.

If the parties and/or dredge operators discover any archaeological resources while conducting dredging operations, the USACE will require that dredge and/or pump-out operations be halted immediately and avoid the resource per the requirements of the USACE specifications for unanticipated finds. The USACE will then immediately report the discovery to Chief, Division of Environmental Assessment, BOEM electronically in a timely manner. The Corps Planning Division will coordinate with BOEM on the measures needed to evaluate, avoid, protect, and, if needed, mitigate adverse impacts from an unanticipated discovery. If investigations determine that the resource is significant, the parties will together determine the necessary further action required and how to best to protect the resource.

There is no new information in regards to archaeology/cultural resources that suggests there is the potential for significantly different effects not previously considered (i.e., those effects must be substantially different from those indicated in past analyses and effects may be possibly significant). Those previous effects analyses/conclusions are adequate and remain valid. The expected effects level on this resource is to be minor due to the implementation of the mitigation measures outlined herein.

4.2 Air Quality

In 2013, ENVIRON International Corporation completed a study entitled "Improving Emission Estimates and Understanding of Pollutant Dispersal for Impact Analysis of Beach Nourishment and Coastal Restoration Projects" (ENVIRON 2013). ENVIRON developed BOEM's Dredging Project Emissions Calculator (DPEC), a database program, to estimate criteria pollutant emissions (carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxide (SO2), particulate matter (PM)) and greenhouse gas emissions for beach nourishment and coastal restoration projects given project parameters and basic information about the diesel powered equipment to be used in the project.

Information from the 2010 maintenance construction of the Brevard County Shore Protection Project - South Reach was used to develop, test, and validate the DPEC. Project emissions were estimated from data about project equipment used, operational characteristics of that equipment, hopper dredge production, fuel consumption, *etc*. (Table 2). Apart from CO2, criteria pollutant emissions were dominated by NOx (which represents the sum of Nitric Oxide (NO) and Nitrogen dioxide (NO_2) emissions) with relatively small amounts of other criteria pollutants. With the improved parameterization of emission factors, loading factors, and project equipment, the emission estimates were notably less than previously estimated for construction of the Brevard South Reach (MMS 2009). Results confirmed that the dredge plant is the major source of emissions from the project, accounting for approximately 90% of total NOx emissions with the remainder coming from auxiliary (support) vessels and on-shore construction equipment. Table 2 provides subtotals for emissions inside and outside of the State of Florida territorial limits. While total project NOx emissions within state waters exceeded the General Conformity *de minimus* emission thresholds in the conformity regulations for extreme ozone nonattainment areas, the threshold does not apply to attainment areas, like Brevard County. Emissions estimated for other pollutants were below the *de minimus* thresholds.

Dispersion modeling was performed to estimate maximum NOx, CO, PM10, and PM2.5 concentrations based on the estimated emissions from the 2010 construction cycle (ENVIRON 2013). Table 2 summarizes the project emissions. The cumulative impact for all criteria pollutants modeled were less than the National Ambient Air Quality Standards (NAAQS). Results showed that peak short-term (1-hour) impacts occur when the dredge is located closest to shore and stationary during periods when the dredge is discharging its load. During this pump-out, peak 1-hour NO2 concentrations reached levels exceeding the 188 $\mu g/m^3$ level of the 1-hour NO2 NAAQS. However, the predicted 8th highest daily maximum 1-hour NO2 concentration was less than half the level of the NAAQS in this situation because conditions producing the peak 1-hour level (onshore winds while the dredge is at the pump-out

Table 2: Summary of project emissions by source type and location (Environ 2013)

		Emissions (short tons)						
Source Name	Type	HC	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	CO_2
INSIDE STATE WATERS								
Bulldozer	Crawler Tractors	0.01	0.01	0.03	0.09	0.01	0.01	15
Bulldozer	Crawler Tractors	0.01	0.01	0.03	0.09	0.01	0.01	15
Crew Boat	Crew Boat	0.03	0.03	0.19	1.19	0.03	0.03	81
Excavator	Excavators	0.01	0.01	0.03	0.08	0.01	0.01	15
Liberty Island Aux.	Auxiliary	0.02	0.02	0.40	1.70	0.03	0.03	109
Liberty Island Aux.	Auxiliary	0.03	0.03	0.50	2.12	0.04	0.04	136
Liberty Island Generator	Vessel-mounted	0.00	0.01	0.03	0.17	0.00	0.00	12
Liberty Island Generator	Vessel-mounted	0.01	0.01	0.04	0.22	0.01	0.00	15
Liberty Island Main	Propulsion	0.05	0.06	0.97	4.12	0.08	0.08	265
Liberty Island Main	Propulsion	0.04	0.04	0.78	3.30	0.07	0.06	213
Tender1	Tender	0.00	0.00	0.00	0.00	0.00	0.00	0
Tow Boat	Tow Boat	0.06	0.07	0.43	2.19	0.05	0.04	162
TOTALS FOR EMISSIONS SOURCES INSIDE		0.27	0.28	3.43	15.26	0.33	0.32	1037
OUTSIDE STATE WATERS								
Liberty Island Aux.	Auxiliary	0.01	0.01	0.25	1.06	0.02	0.02	69
Liberty Island Aux.	Auxiliary	0.09	0.09	1.60	6.79	0.14	0.13	437
Liberty Island Generator	Vessel-mounted	0.00	0.00	0.02	0.11	0.00	0.00	8
Liberty Island Generator	Vessel-mounted	0.02	0.02	0.11	0.69	0.02	0.02	48
Liberty Island Main	Propulsion	0.17	0.18	3.11	13.21	0.26	0.26	851
Liberty Island Main	Propulsion	0.03	0.03	0.49	2.07	0.04	0.04	133
TOTALS FOR EMISSIONS SOURCES OUTSIDE		0.32	0.33	5.57	23.94	0.48	0.46	1545
ALL LOCATIONS AND SOURCES								
		HC	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	CO_2
TOTALS FOR EMISSIONS AT ALL LOCATIONS		0.59	0.62	9.00	39.20	0.81	0.78	2583

Note: The only emissions occurring outside state waters were assumed to be generated from the dredge plant; all support (auxiliary) vessel emissions were assumed to occur within state waters because the specific operating locations of the support vessels are unknown and this provides a conservative estimate of in-state emissions. Volume assumed dredged was 650,000 cubic yards (496,960 m^3). Multiplying emissions by 3.7 scales the modeled activity to the maximum volume dredged for the proposed action; emissions related to transit are conservatively estimated owing to the closer pump-out location for the North Reach. Emissions associated with potential rehandling are not estimated.

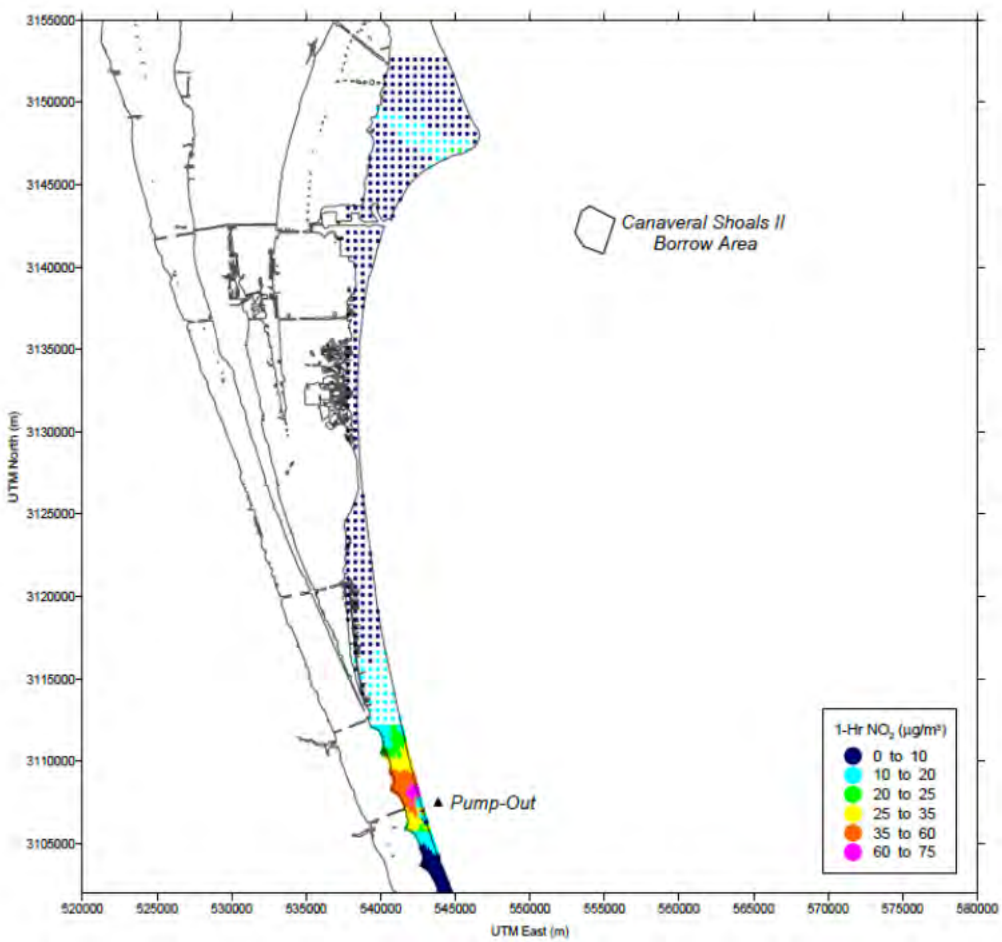

Figure 3: One-hour NO2 concentrations modeled in the project area

location) occurred on fewer than 8 days during the project. (See Figure 3.) Concentrations of all other criteria pollutants were well below their applicable NAAQS.

Extrapolating these results to the proposed dredging and placement operations and assuming the same hopper dredge will be used as in the previous construction cycles, approximately 90 tons of NOx may be released during dredging operations, whereas less than 60 tons of NOx may be released during pump-out, transit, and beach placement operations. Emissions within state waters related to pump-out operations may vary if open-water placement and cutterhead dredge rehandling occurs; cutterhead dredge emissions may increase the emission total in state waters if a cutterhead dredge is used to rehandle sand from the nearshore rehandling area. There is no new information in regards to air quality that suggests there is the potential for significantly different effects not previously considered (i.e., those effects must be substantially different from those indicated in past analyses and effects may be possibly significant). Projected emissions from the proposed action would not substantially impact air quality given the relatively low level of emissions and the likelihood for prevailing offshore winds. The dispersion results from the demonstration modeling are applicable to the proposed construction in terms of peak concentrations of criteria pollutant levels, demonstrating concentrations will be well within the NAAQS.

4.3 *Threatened and Endangered Species*

4.3.1 Sea Turtles Offshore

In 2010, the Great Lakes Dredge and Dock Company hopper dredge *Liberty Island* was used to excavate sand from the CS II borrow area and transport it to the South Reach. The dredging was performed in compliance with the 1995/1997 South Atlantic Regional Biological Opinion (RBO). Terms and conditions within the RBO include the use of rigid turtle deflectors, which are installed on the dragheads of the dredge. The deflectors move, or deflect, turtles which may be resting on the bottom away from the draghead. All dredge activities were monitored by two endangered species observers which were approved by the NMFS. The observers periodically checked the intake screens leading to the hopper for entrained sea turtles and their parts. Dredging and beach fill placement activities were conducted between February 13 and March 1, 2010 and between March 22 and April 17, 2010. During this time frame, there were no sea turtle mortalities, or lethal takes documented. Given the efficiency of the screening on the dredges, it is unlikely that turtle mortalities went unrecorded. Relocation trawling occurred from April 1, 2010 to April 17, 2010. During this time, 16 loggerhead (*Caretta caretta*) and 2 leatherback (*Dermochelys coriacea*) sea turtles were non-lethally taken and relocated by the *F/V Lady Paige*. Prior to relocation trawling, sweep trawling was performed on board the *F/V Lady Paige* from March 22 to March 31, 2012 with a total of 579 sweeps.

The USACE previously determined that the use of a hopper dredge may adversely affect sea turtles (USACE 1998). NMFS has concurred with this determination in their 1995/1997 RBO and July 30, 2009, concurrence, and determined that take resulting from hopper dredging activity will not jeopardize the continued existence of any sea turtle species. The USACE notified NMFS of its intent to utilize the RBO for this proposed renourishment of the North and South Reaches by email on April 13, 2013 (Appendix E). In compliance with the RBO, the following protective measures, in summary, shall be implemented to minimize the risk of taking sea turtles during proposed hopper dredging activities at the CS II borrow area:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as sea turtles, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the Endangered Species Act. The Contractor may be held responsible for any threatened and endangered species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of sea turtles.

- Any take concerning a sea turtle or sighting of any injured or incapacitated sea turtle shall be reported immediately to the USACE contracting officer.

- Hopper dredge drag heads shall be equipped with rigid sea turtle deflectors which are rigidly attached. No dredging shall be performed by a hopper dredge without an installed turtle deflector device approved by the USACE contracting officer.

- The Contractor shall install baskets or screening over the hopper inflow(s) with no greater than 4" x 4" openings. The method selected shall depend on the construction of the dredge used and shall be approved by the contracting officer prior to commencement of dredging. The screening shall provide 100% screening of the hopper inflow(s). The screens and/or baskets shall remain in place throughout the performance of the work.

- The Contractor shall install and maintain floodlights suitable for illumination of the baskets or screening to allow the observer to safely monitor the hopper basket(s) during non-daylight hours or other periods of poor visibility. Safe access shall be provided to the inflow baskets or screens to allow the observer to inspect for turtles, turtle parts or damage.

- The Contractor shall operate the hopper dredge to minimize the possibility of taking sea turtles and to comply with the requirements stated in the Incidental Take Statement provided by the NMFS in their RBO.

- The turtle deflector device and inflow screens shall be maintained in operation condition for the entire dredging operation.

- When initiating dredging, suction through the drag heads shall be allowed just long enough to prime the pumps, and then the drag heads must be placed firmly on the bottom. When lifting the drag heads from the bottom, suction through the drag heads shall be allowed just long enough to clear the lines, and then must cease. Pumping water through the drag heads shall cease while maneuvering or during travel to/from the disposal area.

- Raising the drag head off the bottom to increase suction velocities is not acceptable.

- The Contractor shall keep the drag head buried a minimum of 6 inches in the sediment at all times.

- During turning operations the pumps must either be shut off or reduced in speed to the point where no suction velocity or vacuum exists.

The entire suite of terms and conditions to implement the prudent measures required by NMFS is provided in the 1995 /1997 *Regional Biological Opinions on Hopper Dredging along the South Atlantic Coast*. The 1997 RBO authorized annual incidental take, by injury or mortality, of 35 loggerheads, 7 Kemp's ridley, 7 green sea turtles, and 2 hawksbill. Any takes will be counted against the regional incidental take statement.

4.3.2 Sea Turtles Onshore

Three sea turtle species are known to nest within the North and South Reach beach placement areas. In order of abundance, they are the loggerhead, green, and leatherback sea turtles. The most recent marine turtle monitoring reports are associated with the 2005 renourishment of the

North Reach and 2010 renourishment of the South Reach. Both of these projects were constructed with Canaveral Shoals II sand. Monitoring during the 2007 nesting season reported 429 loggerhead turtle nests in the North Reach monitoring area (28.4 per km). This was a 17% increase in loggerhead nesting from the 2006 nesting season, but a 34% decrease compared to the North Reach post-2001 nourishment high of 654 loggerhead nests documented in 2003. Preliminary data from the FWCC Statewide Nesting Beach Survey program indicates loggerhead nesting statewide was slightly down from 2006, which would make 2007 the second lowest year recorded for nesting with 2004 showing the lowest number recorded since the program began 17 years ago (Ehrhart and Williamson 2009).

Density surveys of loggerhead turtle nests from the 2012 nesting season along the South Reach indicated 3101 nests were deposited by August 31, 2012. Three additional clutches were laid between September 2-7, 2012, bringing the total to 3104 or 477.5 nests per km. The distribution of these nests corresponds with patterns seen in previous years, with high numbers nesting toward the southern end of the beach. Previously, nest densities recorded from the South Reach area ranged from 185 to 518 nests per km between 1989 through 2008 nesting seasons (Ehrhart and Williamson 2009). Table 3 shows the distribution of loggerhead turtle nests along the beach profile.

Table 3. Distribution of loggerhead turtle nests on the South Reach beach profile in 2012 (Ehrhart et al. 2012).

Location	Nests	% Overall Nesting
Gradient Scarp	0	0.0%
Gradient	19	0.6%
Berm	2934	94.5%
Dune	151	4.9%
Total	3104	100.0%

Five green turtle nests were reported along the North Reach in 2007and a total of 192 green turtle nests were deposited on the South Reach by 31 August 2012. An additional 23 nests were deposited along the South Reach during the late season, bringing the total number of green turtle nests for the 2012 season to 215. Table 4 shows the distribution of green sea turtle nests along the beach profile.

Table 4. Distribution of green sea turtle nests on the South Reach beach profile in 2012 (Ehrhart et al. 2012.)

Location	Nests	% Overall Nesting
Gradient Scarp	1	0.47%
Gradient	2	0.9%
Berm	114	53.0%
Dune	98	45.6%
Total	215	100.0°/o

Leatherback nests in Brevard County are relatively few in number when compared with Florida beaches to the south, especially Martin and Palm Beach Counties (NMFS and USFWS), 1992; B. Brost 2002, pers. comm.). In 2007, there were five leatherback nests reported in the North

Reach area. Leatherback nesting within the South Reach ranged from 0 to 7 between 2005 and 2008 (Ehrhart et al. 2006-2009) and the 2012 monitoring reported 8 nests. Table 5 shows the distribution of leatherback turtle nests along the beach profile.

Table 5. Distribution of leatherback turtle nests on the South Reach beach profile in 2012 (Ehrhart et al. 2012).

Location	Nests	% Overall Nesting
Gradient	1	12.5%
Berm	7	87.5%
Dune	0	0%
Total	8	100.0°/o

Data from both the 2007 and 2012 monitoring reports indicate that CS II sand is a viable sand source for successful sea turtle nesting habitat. The data obtained from nests inventoried during the 2007 North Reach monitoring season showed excellent loggerhead hatching (83.8%) and hatchling emergence (81.9%) success. The 2012 monitoring of South Reach indicated that Term Hatching Success Rates (from nests that incubated to term and were inventoried) was relatively high for both loggerheads (80.43%) and for green turtles (81.6%). These results are comparable to many beaches Statewide and exceed documented statewide means of 50.77% for hatching and 48.03% for hatchling emergence success for loggerhead sea turtles. The higher hatching and hatchling emergence success in 2006 and again this year indicates the fill is suitable for sea turtle nesting purposes. Only one nest of each species, from marked nests, was washed out and no depredations were seen. Sand grain size was relatively large with a good mixture of shell fragments which may have prevented the hydraulically placed fill material from compacting too much, adversely affecting sea turtle nesting success (Ehrhart et al. 2012).

The USACE has determined that the beach placement of dredged material may adversely affect nesting sea turtles. The USFWS issued a biological opinion, dated Statewide Programmatic Biological Opinion (SPBO) on August 22, 2011, for the USACEplanning and regulatory sand placement activities in Florida and their effects on loggerhead *(Caretta caretta),* green *(Chelonia mydas).* leatherback *(Dermochelys coriacea),* hawksbill *(Eretmochelys imbricata),* and Kemp's ridley *(Lepidochelys kempii)* sea turtles, and the southeastern *(Peromyscus polionotus niveiventris),* Anastasia Island *(Peromyscus polionotus phasma),* Choctawhatchee *(Peromyscus polionotus allophrys),* St. Andrews *(Peromyscus polionotuspeninsularis),* and Perdido Key *(Peromyscus polionotus trissyllepsis)* beach mice and their designated critical habitat. (It did not include take for the non-breeding piping plover *(Charadrius melodus)* and its designated critical habitat. (Appendix G).)

The USFWS determined that take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

The terms and conditions of the Biological Opinion shall be implemented in order to avoid or minimize take of sea turtles. These conditions, in abbreviated summary, include:

- Use of beach quality sand suitable for sea turtle nesting, incubation and hatchling emergence.
- No construction activity or equipment on the beach from May 1 through October 31.
- Daily early morning nesting surveys and restricted nest relocation and/or avoidance beginning March 1 if beach construction activities occur between March 1 and April 30.
- Daily early morning nesting surveys beginning 65 days prior to construction, through September 30 for beach construction activity from November 1 through 30.
- Measurement of sand compaction and tilling of the nourished beach if required, prior to March 1, after construction and for three subsequent years.
- Visual surveys for escarpments after construction and for three subsequent years, and removal of escarpments prior to March 1 (and thereafter, pursuant to coordination with the USFWS and Florida Fish and Wildlife Conservation Commission (FWCC) that interfere with sea turtle nesting.
- Minimization of storage of construction equipment upon the beach from March 1 through April 30 and from November 1 through 30.
- Avoidance and minimization of lighting of the beach and nearshore waters, and upon offshore equipment, from March 1 through April 30 and from November 1 through 30.

4.3.3 Marine Mammals

During the 2010 South Reach project, endangered species observers reported two sightings of right whales (*Eubalaena glacialis*) (02/14/10, 02/16/10) and two sightings of humpbacks (*Megaptera novaeanglia*) (02/20/10, 02/21/10) from the dredge. The dredge operated at 5 knots or less on 8 nights due to confirmed right whale sightings from the dredge or from aerial surveys and other sources. Dredging operations did not appear to harass or induce any behavioral response in these species.

Dredging operations may present risk of vessel strike and noise-related harassment to North Atlantic right whales and humpback whales. Principal effects or risk of exposure would be limited to strike risk and/or possible harassment from broad band, vessel and dredging noise < 10 kHz. Strike risk is limited in a number of ways, including speed restrictions in right whale critical habitat during December 1 to March 30, observer monitoring during transit and dredging operations, mandatory 500 yard separation distance during transit and survey operations, and mandatory participation in the Early Warning System. The southeastern U.S. coast is a known wintering area for North Atlantic right whales and calving occurs from December through March. In an on-going study to describe the acoustic behavior of North Atlantic right whale mother-calf, mother-calf pairs produced very few sounds that were detectable (at ranges of ~100m or more) in the Southeastern U.S. when the calf was less than four months of age (Reeb personal communication). Instances when sounds were documented involved interaction between the mother-calf pair and either another whale or a novel object in their environment that elicited a curious approach. In terms of surface behavior, calves were consistently in much closer proximity to their mothers in the Southeastern U.S. and spent more time at the surface compared to mother and older calf pairs in the Bay of Fundy. These preliminary results indicate that masking of mother/calf communication when calves are less than four months of age (in the Southeastern U.S.) is of less a concern than potential communication masking in the Northeast U.S. when the calves are older.

The USACE has previously determined that hopper dredging activities may affect, but is not likely to adversely affect protected species of whales. With implementation of the necessary protective measures, NMFS determined in the July 30, 2009 concurrence that the risk to North Atlantic right whales and humpback whales is discountable (Appendix E). In compliance with the 1995/1997 South Atlantic RBO, during the period December through March, barges or dredges moving through project waters shall implement the following precautionary measures in order to protect listed whales:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as whales, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing whales, which are protected under the Endangered Species Act and the Marine Mammal Protection Act. The Contractor may be held responsible for any protected species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of whales.

- During the period 1 December through 30 March, daily aerial surveys within 15 nm of the dredging and placement sites will be conducted by others to monitor for the presence of the right whale. Right whale sightings will be immediately communicated by marine radio to the dredging contractor. During evening hours or when there is limited visibility due to fog or sea states greater than Beaufort 3, the tug/barge or dredge operator shall slow down to 5 knots or less when traversing between areas if whales have been spotted within 15 nm of the vessels path within the previous 24 hours.

- If a right whale or any other species of whale is reported within the area, then the vessel operator will be required to follow the NMFS' Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners. The tug/barge or dredge operator shall maintain a 500-yard buffer between the vessel and any whale.

- If a stranded/injured/incapacitated whale is observed within the construction site, the contractor is requested to immediately contact the NMFS Whale Stranding Network pager number at 305-862-2850.

4.3.4 Smalltooth Sawfish

Smalltooth sawfish (*Pristis pectinata*) is currently listed as endangered by NMFS and rarely occur within the project area; however, it has not been observed during previous dredging events. The National Sawfish Encounter Database (http://www.flmnh.ufl.edu/fish/sharks/sawfish/regional4.html) managed by the Florida Museum of Natural History, University of Florida revealed 9 encounters offshore Brevard County from as far back as 1895. Six of the observations occurred in the Indian River Lagoon, and three occurred in the Atlantic coastal waters. One of the sightings was a small juvenile and occurred as recently as from May 2010 and May 2011 offshore of southern Brevard County. Currently, the core of the smalltooth sawfish Distinct Population Segment is surviving and reproducing in the waters of southwest Florida and Florida Bay, primarily within the jurisdictional boundaries of Everglades National Park where important habitat features are still present and less fragmented than in other parts of the historic range. The NMFS proposed critical habitat for the sawfish in 2008, but the project area does not overlap any of these proposed locations.

The project area is not an established nursery or foraging area for smalltooth sawfish, and it generally does not support the type of habitat favored by juvenile sawfish. While adults may move through or forage in the project area, NMFS has previously determined that the South reach project would not impact the sawfish from critical habitat loss or entrainment. The risk of injury was presumed to be discountable due to the species' mobility and implementation of NMFS' Smalltooth Sawfish Construction Conditions. In their July 30, 2009 concurrence for dredging and construction operations associated with the South Reach, NMFS determined that the smalltooth sawfish may be affected, but is not likely to be adversely affected by the proposed action. On May 17, 2013, the USACE and BOEM requested concurrence that the proposed nourishment of North and South Reaches may affect, but was not likely to adversely affect smalltooth sawfish (Appendix F).

In order to protect this species, the USACE proposes to implement the smalltooth sawfish construction conditions (Appendix F), which include the following:

- The Contractor shall instruct all personnel associated with the project of the potential presence of this species and the need to avoid collisions with smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of smalltooth sawfish.

- The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing smalltooth sawfish, which are protected under the Endangered Species Act.

- Siltation barriers shall be made of material in which a smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment.

- All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

- If a smalltooth sawfish is seen within 100 yards (92 m) of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet (15.2 m) of a smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a smalltooth sawfish is seen within a 50-ft (15.2 m) radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

- Any collision with and/or injury to a smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

4.3.5 Piping Plover

The piping plover, (*Charadrius melodus*), is a species listed Federally in 1985. The piping plover is a small, migratory shorebird that breeds only in three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes, and on riverine systems and prairie wetlands of the Northern Great Plains. The Great Lakes population is listed as endangered, whereas the Atlantic Coast and Great Plains populations are listed as threatened. In 2001, the USFWS designated 137 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas as critical habitat for the wintering population of the piping plover. The critical habitat includes approximately 2,891 kilometers of mapped shoreline and approximately 165,211 acres along the Gulf and Atlantic Coasts and margins of interior bays, inlets, and lagoons. Though this species does not breed in Florida, individuals from the three breeding populations winter in Florida (USFWS 1999). The complete winter distribution of the piping plover remains to be determined, but generally the plover arrives from July through September and returns to breeding sites from February to May. Neither North Reach nor South Reach are listed as critical wintering habitat for the piping plover. The closest critical habitat is found north of Brevard County in a small area near Daytona Beach and south of Brevard County in a small area in Palm Beach County. The USACE is lead agency (BOEM is cooperating agency) on the Peninsular Piping Plover Biological Opinion (P3BO) consultation with the USFWS. The USACE and BOEM initiated consultation with the USFWS on May 7, 2013 for piping plovers, making a may affect, not likely to adversely affect determination and seek to apply the P3BO to the proposed activities. On May 22, 2013 the NMFS issued the P3BO, all terms and conditions of which will be applied to this project (Appendix G).

The USACE has proposed to implement the following Conservation Measures to reduce impacts on piping plovers for all projects (those in both non-optimal and optimal piping plover habitat) included in the P3BO consultation with the potential to affect piping plovers or their critical habitat:

- Adhere to appropriate seasonal windows to the maximum extent possible;
- Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the “surveys” must be limited to the term of the construction unless they are otherwise authorized and funded by Congress;
- Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;
- Avoid impacts to the primary constituent elements (PCEs) of piping plover Critical Habitat to the maximum extent possible;
- The Corps or Applicant will evaluate the project area prior to consultation for the presence of piping plover PCEs as a basis for making their initial determination of effect;
- The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (i.e., washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose.
- The Corps will attempt to time the construction of Civil Works sand placement and dredging projects to prevent two adjacent beaches or inlets from being constructed in the same year.
- The Corps Civil Works program will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (i.e., emergent spits, sand bars, etc.) within each inlet’s management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex.
- The Corps Civil Works program will consider placing dredged materials in the nearshore region as an alternative to beach placement to minimize effects to piping plovers and their habitat.

There is no new information in regards to threatened and endangered species that suggests there is the potential for significantly different effects not previously considered (i.e., those effects must be substantially different from those indicated in past analyses and effects may be possibly significant). Those previous effects analyses/conclusions are adequate and remain valid. The expected effects level on this resource is to be moderate to minor due to the implementation of the mitigation and minimization measures outlined herein. For sea turtles (swimming and nesting) and marine mammals, implementation of the terms and conditions of 1) NMFS 1995/1997 Regional Biological Opinions, 2) NMFS 2009 Concurrence, and 3) 2009 USFWS BO. For the smalltooth sawfish, implementation of NMFS’ Smalltooth Sawfish Construction Conditions. For the piping plover, implementation of the terms and conditions within the 2013 the P3BO.

4.4 Non-threatened Marine Mammals

The most common species of marine mammals found in the project area are bottlenose and spotted dolphins (Hammer et al. 2005, Zarillo et al. 2009). Protected species observers observed several bottlenose dolphins in the vicinity of the dredge during 2010 construction operations, but those individuals showed no specific behavioral response attributable to dredging or vessel operations. Other dolphin species and non-listed marine mammals typically observed in deeper waters of the Atlantic rarely occur in waters less than 100 m deep unless stranded. Marine mammals generally exhibit avoidance behavior in the presence of slow-moving dredge vessels, and, with trained observers on-board the dredge during operations along with avoidance requirements, no collision fatalities are expected and any animal avoidance of vessels is not expected to rise to the level of harassment as defined by the Marine Mammal Protection Act (MMPA). Another impact-producing factor potentially affecting marine mammals includes noise from dredge operation or service vessels, including the operation of echosounders. Dredge noise may be audible up to several kilometers from the source, depending on dredge characteristics and environmental conditions (Thomsen et al. 2009; Reine et al. in preparation). It is anticipated that the peak frequency of electromechanical sound sources on the dredge plant, support vessels, and survey vessels will be outside the hearing range of even high-frequency cetaceans. Despite the overlap in low-frequency broadband vessel and dredge plant noise and marine mammal hearing, the potential injury of marine mammals due to noise is considered low since source levels generally do not exceed 180-190 dB re 1µPa at 1 m, and sound levels rapidly dissipate (Thomsen et al. 2009; Reine et al. in preparation). Some short-term, intermittent behavioral impacts may occur as a result of continuous sound sources if feeding/foraging/resting is interrupted when marine mammals cannot otherwise avoid the project area. The mitigation measures required for ESA-listed marine mammals (e.g., observers, vessel speed restrictions; avoidance measures; see *Listed Whales)* also apply to marine mammal species not listed under the ESA, but afforded protection under the MMPA. With implementation of the proposed mitigation, potential impacts on marine mammals would be localized and temporary in nature.

4.5 Migratory Birds

Many species of pelagic, migrant, and coastal birds can be found along the coastal beaches, wetlands, and adjacent inner shelf of eastern Florida. The U.S. FWS has designated an extensive number of bird species as priority birds of conservation concern, and the FWCC has listed several of the same bird species as imperiled. Some of these shorebirds, waterfowl, wading birds, seabird, raptors, and passerines may be present in or in adjacent to the project area. However, the majority of the species are not expected to nest in the footprint of the project area because the beach and dune areas undergo high traffic as recreational beaches (M. McGarry, personal communication). Gulls and terns are more likely to forage along the beach. Many coastal species use a specific habitat for nesting, but forage over a much larger coastal and marine landscape (Guilfoyle et al. 2007). Therefore, offshore sand ridges may be foraging grounds for various waterbirds, including seabirds, loons, and sea ducks. Species most likely to occur in the dredging area are pelagic birds, pelicans, gulls, and terns (Zarillo et al. 2009).

The Florida FWCC monitors solitary and colony shorebird and seabird nesting along Brevard

County beaches (http://legacy.myfwc.com/bnb/data.asp and https://public.myfwc.com/crossdoi/shorebirds/index.html). There have not been any recently documented ground colonies within the project limits. Least terns have nested east of the project area along the roof tops of private homes and commercial buildings. During the previous beach nourishment in 2009, shorebird monitoring did not find any nesting or courting shorebirds (McGarry, personal communication). Solitary or colonial nesting by seabird species, such as least terns, is very unlikely on the beach in the area.

During dredging and placement activities, bird habitat may be adversely or beneficially affected; similar, short-term and local disturbances may affect individual bird behavior (Guilfoyle et al. 2007; Grippo et al. 2007; Cook and Burton 2010). Bird species may forage for fish in the hopper as it is being filled during dredging since dredging entrains possible prey items. There is a remote risk of injury to and mortality of individual seabirds diving into the hopper during the influx of sediment slurry (Zarillo et al. 2009). Dredging also results in temporary increases in turbidity and sedimentation, removal and burial of benthic species, and displacement of fishes that could adversely impact foraging local opportunities. However those effects are minor given the short-duration (e.g., several months) of activities and widespread availability of equivalent habitat. Temporary displacement and noise related to use of heavy construction equipment could disturb nesting and foraging birds during the nesting season. Birds may forage in the immediate area of equipment operation where heavy equipment is used to shape dewatering sediment discharged from the pipeline. Temporary adverse effects may also occur from a reduction in available food sources following burial. Beach fill alongshore generally occurs at an alongshore rate of 300-500 feet (92- 152 m) of beach per day; benthic invertebrates can immediately recolonize the newly created habitat (Defeo et al. 2009). Any tilling and scarp removal that must be done to shape the beach to accommodate nesting sea turtles should be done outside the shorebird nesting season (FDEP 2005). Following construction, the newly created beach will create suitable shorebird nesting habitat. Detailed borrow area and beach compatibility analysis, as required by state law, has been performed to ensure the beach fill matches the native or existing beach.

The USACE, with the U.S. FWS, Florida Freshwater Game and Fish Commission, and Audubon Society has developed a statewide plan, the Migratory Bird Protection Plan, to avoid and monitor impacts to birds and bird habitat. The USACE has developed procedures for dredge contractors to follow during construction operations. The Contractor shall keep all dredging and construction activities under surveillance, management, and control to prevent impacts to migratory birds and their nests. The Contractor may be held responsible for harming or harassing the birds, their eggs or their nests as a result of their activities. The Florida DEP JCP permit and Corps' protection plan jointly require monitoring of shore birds and operation restrictions during the nesting season between April and September, when nesting and courting behavior is most prevalent.

- Within the project area, a 300 ft (92 m)-wide buffer zone will be established around any location where shorebirds have been engaged in courtship or nesting behavior, or around areas where protected birds occur or winter migrants congregate in significant numbers. Any and all construction activities, including movement of vehicles, should be prohibited in the buffer zone.

- If shorebird nesting occurs within the project area, a bulletin board will be placed and maintained in the construction area with the location map of the construction site showing the bird nesting areas and a warning, clearly visible, stating that "BIRD NESTING AREAS ARE PROTECTED BY THE FLORIDA THREATENED AND ENDANGERED SPECIES ACT AND THE FEDERAL MIGRATORY BIRD TREATY ACT".

- If it will be necessary to extend construction pipes past a known nesting site or over-wintering area, then whenever possible those pipes should be placed landward of the site before birds are active in that area. No sand shall be placed seaward of a known nesting site during the nesting season.

There is no new information in regards to migratory birds and bird habitat that suggests there is the potential for significantly different effects not previously considered (i.e., those effects must be substantially different from those indicated in past analyses and effects may be possibly significant). Those previous effects analyses/conclusions are adequate and remain valid. The expected effects level on this resource is to be minor due to the implementation of the mitigation measures outlined herein.

4.6 Water Quality

During the 2010 South Reach renourishment project, turbidity monitoring was conducted every 6 hours of daylight construction activity at the borrow area and beach fill site. Background (ambient) turbidity was measured 500 meters upcurrent from the activity and compliance turbidity was measured not more than 150 meters downcurrent from the activity in the densest portion of the visible plume. Samples were collected from the surface and one meter above the seabed. Maximum permitted turbidity was +29 Nephelometric Turbidity Units (NTU) above background. (Olsen Associates, Inc. 2010)

The typical construction-related turbidity of all aspects of the project was minimal (See Table 6). Overall, the turbidity averaged about +4.5 NTU above background measurements: +4.9 NTU near the water surface and +4.1 NTU near the seabed. Activity at the beach fill disposal area resulted in similar (or slightly less) overall turbidity than that observed at the borrow area. Turbidity at the borrow area averaged +5.4 NTU above background measurements while the beach fill disposal area averaged +3.5. Out of 228 measurements, none exceeded the +29 NTU maximum. The single greatest difference in turbidity measurements was +18.5 NTU. There was

Table 6: Summary of turbidity monitoring data related to the 2010 renourishment of South Reach (Olsen Associates, Inc. 2010)

	Surface Measurement (NTU)			Seabed Measurement (NTU)			Surface & Seabed Difference
	Compliance	Background	Difference	Compliance	Background	Difference	
Beach fill Disposal Area -- 110 Datapoints							
Average	9.1	5.1	+4.0	8.4	5.3	+3.0	+3.5
St. Dev.	4.1	2.4	+2.9	3.6	2.2	+2.3	+2.6
Max	25.2	10.8	+16.4	18.7	10.1	+8.9	+16.4
Min.	3.5	1.9	0.0	3.0	2.0	+0.1	+0.0
Borrow Area -- 118 Datapoints							
Average	10.0	4.3	+5.7	10.2	5.1	+5.1	+5.4
St. Dev.	6.3	2.8	+4.7	6.9	3.0	+4.8	+4.7
Max	33.2	15.2	+18.0	33.7	15.7	+18.5	+18.5
Min.	2.4	0.9	0.0	2.9	1.0	+0.3	+0.0
Beachfill Disposal & Borrow Area -- 228 Datapoints							
Average	9.6	4.7	+4.9	9.3	5.2	+4.1	+4.5
St. Dev.	5.4	2.6	+4.0	5.6	2.7	+3.9	+4.0
Max	33.2	15.2	+18.0	33.7	15.7	+18.5	+18.5
Min.	2.4	0.9	0.0	2.9	1.0	+0.1	0.0

no discernible variation in the data, with time, as construction progressed (Olsen Associates, Inc. 2010).

The results from this 2010 monitoring data from the South Reach project indicate that there will not be significant impacts to water quality from the proposed action. The FDEP will require similar water quality/turbidity monitoring as a permit condition/mitigation measure for this project. There is no new information in regards to water quality that suggests there is the potential for significantly different effects not previously considered. Those previous effects analyses/conclusions are adequate and remain valid. The expected effects level on this resource is expected to be minor, localized and temporary.

4.7 Physical Impacts to Borrow Area Habitat and Geomorphology

Habitat and morphology changes within the CSII borrow area have been monitored by since 2000. Dredging has led to the cumulative loss of approximately 7,580,000 cy (5,795,325 m^3) of sand from the CS II borrow area (Olsen and Associates 2010). Figure 4 depicts the change in seabed elevation at CS II between the December 2009 (pre-construction) and May 2010 (post-construction) associated with last dredging cycle. Areas in red depict sediment loss, whereas areas in blue depict sediment gains. Cut depths are between 0 and 4 feet (1.2 m) below the seabed and are typical for dredging cycles. Across the overall survey area, comparison of the pre- and post-construction surveys indicates gross seabed loss of -630,300 cy, and gross seabed gains of +373,000 cy. The latter was principally associated with an apparent influx of material from the shallower banks along the west-northwest edge of the borrow area, outside of the area dredged. The net overall change was a loss of -257,300 cy from before the 2010 dredging event to post-2010 event.

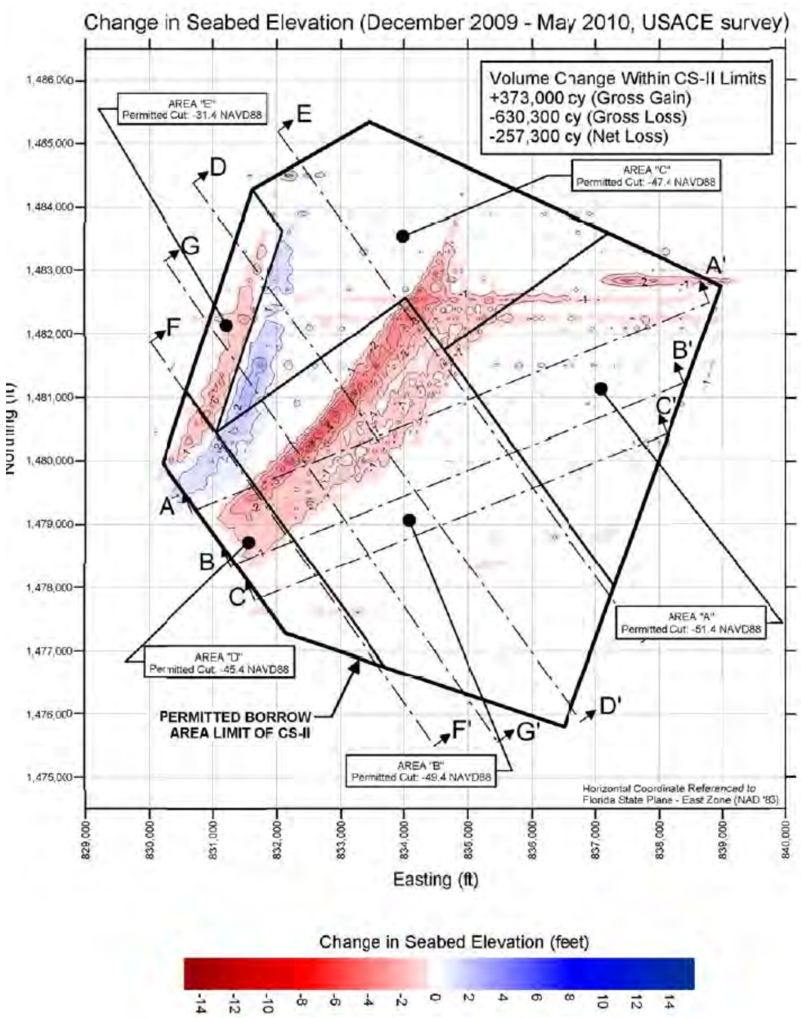

Figure 4: Change in seabed elevation and volumes computed for the 2010 dredge event (Olsen and Associates, 2010).

Bathymetric survey data from prior to the initial dredge event in 2000 and data post-2010 dredge event were also compared to examine the change in seabed elevation during a decade of dredging operations (Figure 5). The pre-2000 and post-2010 comparison indicates a gross gain of +934,700 cy versus a gross loss of -7,574,900 cy for an overall net loss of -6,640,200 cy across the borrow area. During this 9.6 year interval, approximately 7,580,000 cy were dredged from the borrow area. A net gain of about 940,000 cy occurred over the monitoring period. The total current volume within the limits of the CS II borrow area is approximately 22,000,000 cy (16,820,206 m^3) of sand.

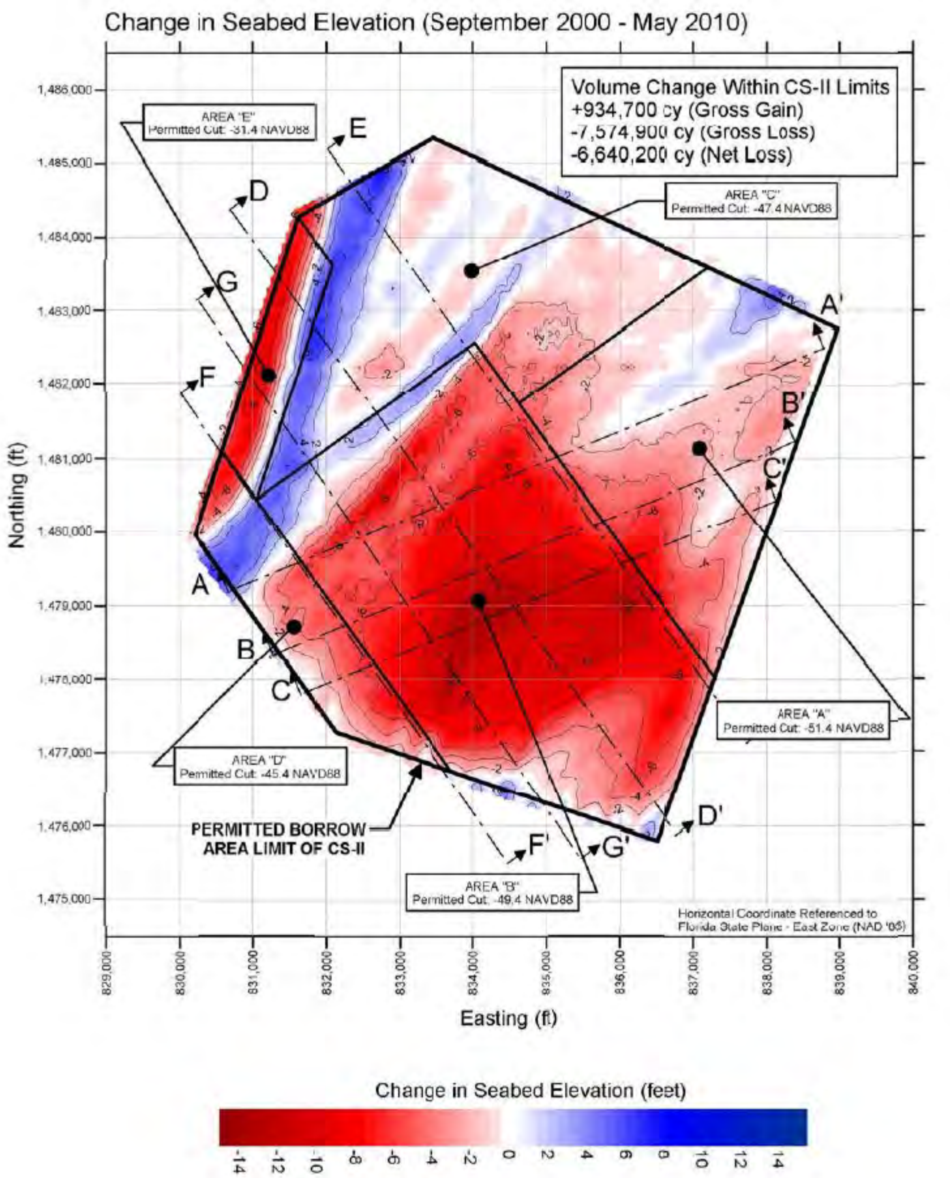

Figure 5: Change in seabed elevation and volumes computed from pre-2000 to post-2010 (Olsen and Associates 2010). Bathymetric isopach includes a vertical datum adjustment between the 2005 (MLLW) and 2009 (NAVD88) survey data.

Short-term infilling of the CS II borrow area can also be assessed by comparing bathymetric surveys. Inter-annual bathymetric survey comparisons indicate an average annual net volumetric recovery rate of approximately 150,000 cy/yr, but there is substantial variability in this physically, storm-dominated setting. Monitoring data indicate that seabed infilling of 1-3 vertical feet (0.3-0.9 m) occurs across the entirety of the borrow area following each dredging event. Beach-side sampling and grain size analyses of placed dredged material during the last three construction cycles also demonstrates that there has been no substantial change in the borrow area sediment relative to pre-dredging conditions. The most dynamic changes are associated with a migrating sand ridge in the northwestern quadrant of the borrow area. The most recent dredging activities were located along the eastern base and leading edge of this feature. These observed effects to the borrow area habitat and morphology are consistent with previous effects analyses.

In Patrick Air Force Base's 2010-2011 Essential Fish Habitat consultation for proposed use of the CS II borrow area in a different, but adjacent beach nourishment project, the National Marine Fisheries Service Habitat Conservation Division recommended dredging the zones in the borrow area most likely to infill, development of a specific dredging plan before each use of the borrow area, and physical monitoring of the borrow area to help minimize and monitor long-term impacts (NMFS HCD 2010). The same recommendations were not provided during the USACE's earlier consultation addressing use of the CS II borrow area. The USACE and Brevard County have an adaptive plan to use the sand resources strategically and that addresses dredge production concerns, project cost implications, and beach compatibility concerns. BOEM will require that bathymetric surveys be conducted pre- and post-construction and 3 years after construction to continue monitoring physical changes.

There is no new information in regards to physical impacts that suggests there is the potential for significantly different effects not previously considered. Those previous effects analyses/conclusions are adequate and remain valid. The expected effects level on this resource is to be moderate due to the loss of substrate within the borrow area although some degree of infilling is to be expected.

5 ALTERNATIVE TO THE PROPOSED ACTION

The BOEM considered the following as an alternative to the proposed action:

Do Not Authorize Use of OCS Sands: Under this alternative, the USACE and Brevard County Board of County Commissioners would not be authorized to use the CSII borrow area. The project proponents could either:

(a) Re-evaluate the project to choose another alternative method or sand source to restore the North and South Reaches, or
(b) Locate an onshore source of comparable high-quality sand.

Option A may be viable if another sand source, such as CS I, is considered. The borrow area at CS I has several constraints that limit this as an option. First, the water depth is too shallow to utilize a hopper or cutterhead dredge. Therefore, a cut would need to be made through the borrow site to allow for vessel usage. This extra effort would not only be a financial burden but could also lead to additional environmental concerns. Additional alteration of the habitat would lead to loss in benthic resources and potential habitat. Second, while the sand in CS I has been deemed beach quality, the sand in CS II has been shown to be well suited for beach renourishment and sea turtle nesting.

Option B is not considered to be viable as sources of approved onshore sand are limited. Plus, even if a sufficient amount of high-quality sand is located onshore, Option B is likely to result in increased environmental disruption/effect from the onshore excavation of and overland transport.

6 CONSULTATION AND COORDINATION

6.1 List of agencies and persons consulted:

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is inthe best interests of all our people by encouraging stewardshp and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.

www.boem.gov

APPENDIX A

United States Army Corps of Engineers
Final Environmental Impact Statement
Brevard County, Florida Shore Protection Project Review Study
(1996)

FINAL
ENVIRONMENTAL IMPACT STATEMENT

BREVARD COUNTY, FLORIDA
SHORE PROTECTION PROJECT REVIEW STUDY

September 1996

PREPARED BY:

U.S. Army Corps of Engineers
Jacksonville District
Jacksonville, Florida

FINAL ENVIRONMENTAL IMPACT STATEMENT
BREVARD COUNTY SHORE PROTECTION STUDY

The responsible lead agency is the U.S. Army Corps, Jacksonville District. The non-Federal sponsor for the study is the Brevard County Board of County Commissioners, Melbourne, Florida.

ABSTRACT: This Final Environmental Impact Statement (FEIS) describes the selected plan for a proposed beach restoration project along 20 miles of Atlantic Ocean shoreline within Brevard County, Florida. The recommended project includes placing approximately 2,500,000 cubic yards of sand along 9.4 miles of beach in the north reach of the project area and 1,645,000 cubic yards along 3.4 miles of the south reach. In the Draft EIS the selected plan included all 10.5 miles of the south reach within the study area. Approximately 32 acres of nearshore rock outcrops or hardgrounds exist along the northern two thirds of the south reach. Beach nourishment along the entire south reach would result in burial of this resource. Therefore the selected plan for the south reach has been modified to avoid impacts to the nearshore rock outcrops. The borrow area is located approximately 2-3 miles offshore of Canaveral Bight. The environmental consequences of the project will depend on the quality of the material in the borrow area and the season in which construction occurs. The compatibility of the fill material with the existing beach sand will determine recolonization of the beach by invertebrates as well its suitability for use by nesting sea turtles and subsequent hatching success. Geotechnical analysis of the borrow area indicates that the material is compatible with that on the beach. The benthic community within the area dredged will reestablish itself within a sort time after construction is completed. Construction activities on the beach will not occur during the main part of the sea turtle nesting season. This will ensure that adverse impacts to nesting females and hatchlings will be minimal.

THE OFFICIAL CLOSING DATE FOR THE RECEIPT OF COMMENTS IS 30 DAYS FROM THE DATE ON WHICH THE NOTICE OF AVAILABILITY OF THE FINAL EIS APPEARS IN THE FEDERAL REGISTER.

If you would like further information on this statement, please contact:
Mr. Michael Dupes, CESAJ-PD-ER
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019
Telephone: (904) 232-1689

Note: Information, displays, maps, etc. discussed in the Feasibility Report for the Brevard County, Florida Shore Protection Project Review Study are incorporated by reference in the EIS.

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1.00 SUMMARY.

1.01 Major Conclusions and Findings. The study area is comprised of the 24 miles of Atlantic Ocean shoreline located in Brevard County between Florida Department of Environmental Protection (FDEP) survey monuments R-1 through R-137 (Figure 1). It includes the City of Cape Canaveral, Cocoa Beach, Satellite Beach, Indian Harbor, Indialantic, and Melbourne Beach. The north reach of the study area is approximately 9.4 miles in length and runs from FDEP monuments R-1 through R-53. The south reach is about 10.5 miles long and extends from R-76 through R-137. The 4.5 miles of shoreline between monuments R-53 and R-76 is part of Patrick Air Force Base (PAFB) which has been excluded from the study at their request. Beaches within the study area are in a state of severe erosion and shoreline recession. The processes which generated this condition continues to degrade the beaches. Investigations and analyses have shown that construction of a protective beach along the 20 miles of shoreline within the north and south reaches to be the optimum means of reducing damage to structures and shorefront property. Approximately 32 acres of nearshore rock outcrops composed of lithified coquina limestone and scattered patches of sabellariid worm rock exist along the northern two thirds of the south reach. Any beach nourishment along this section of the south reach would bury this resource. The recommended plan for the south reach has been modified to avoid impacts to the hardgrounds.

1.02 Areas of Controversy. The U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Environmental Protection Agency (EPA), Florida Game and Fresh Water Fish Commission (GFWFC) and the Florida Department of Environmental Protection (FDEP) have expressed concern over probable adverse impact the proposed project would haveon nearshore coquina rock outcrops and scattered worm rock communities. According to these agencies the nearshore rock-reef habitats present in Brevard County represent a unique biological feature, important to the marine ecosystem and should be preserved. The FDEP has also indicated that construction of the south reach as originally proposed would result in a significant marine habitat loss and would not be consistent with section 370.12, Florida Statutes (F.S.), and would not meet the permit criteria of Chapter 373, F.S. This would make the proposed project inconsistent with the Florida Coastal Zone Management Program (CZMP) unless modifications to the project design were made that would eliminate or significantly reduce impacts to the nearshore hardground habitat. Therefore, the selected plan for the south reach has been modified to avoid impacts to the nearshore hardgrounds (refer to section 3.07).

1.03 Unresolved Issues. With the design modification to the south reach, avoiding adverse impacts to hardgrounds, there are no unresolved issues.

1.04 Section 404(b) Evaluation Report Determination. The selected plan has been evaluated in accordance with Section 404 of Public Law 92-500 and has been determined to be consistent

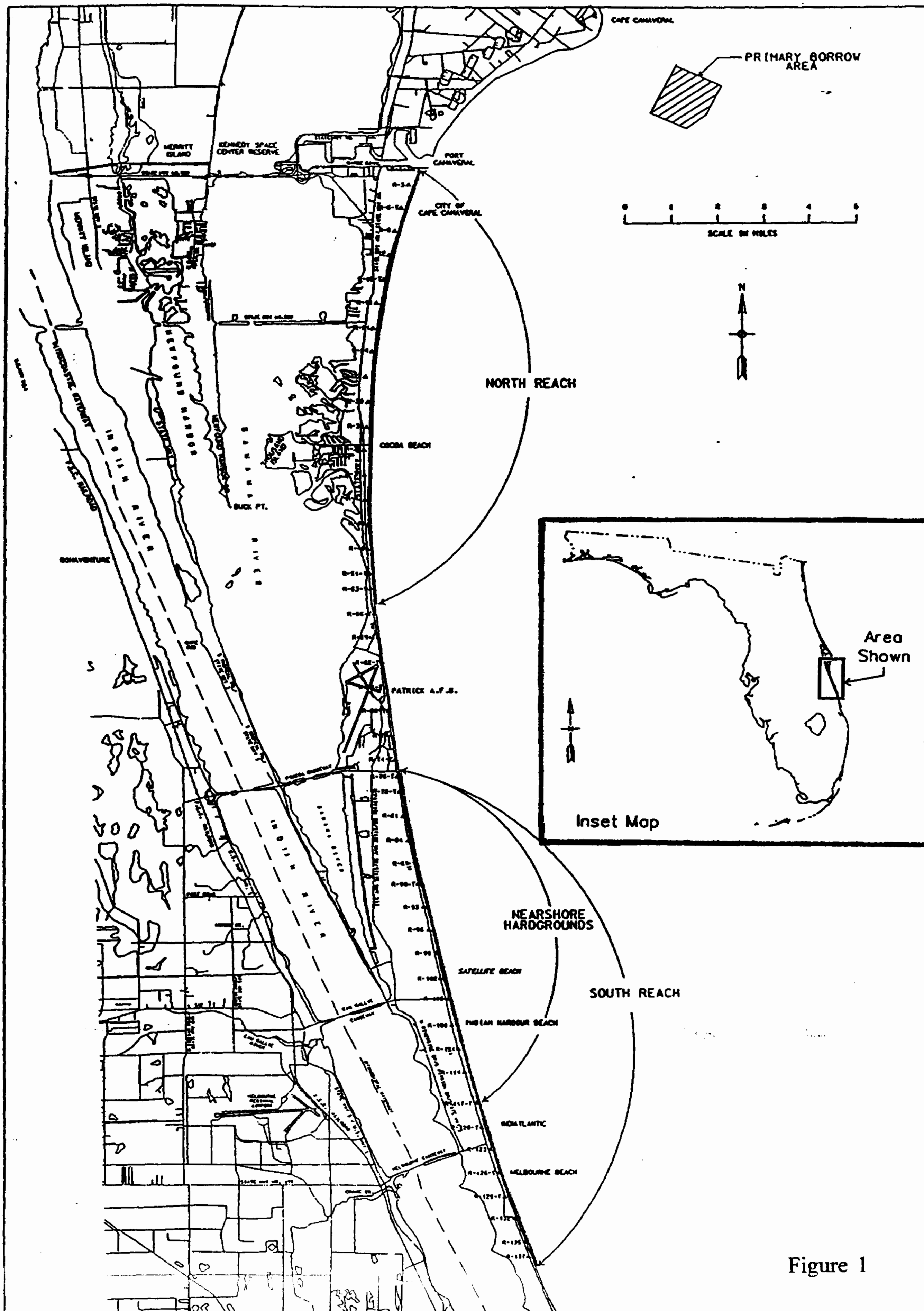

Figure 1

BREVARD COUNTY LOCATION AND VICINITY MAP with the public interest. A Section 404(b) Evaluation Report has been prepared and is included as Appendix A.

1.05 Coastal Zone Management Act Consistency Evaluation. A Coastal Zone Management Consistency Evaluation has been prepared and is included as Appendix B. The U.S. Army Corps of Engineers has determined that the proposed project is consistent with the Florida Coastal Zone Management Program at this stage.

2.00 NEED AND OBJECTIVES OF ACTION

2.01 Study Authority. The Brevard County Shore Protection Review Study was authorized by the following resolution adopted September 23, 1982 by the Committee on Public Works and Transportation, U.S. House of Representatives:

> "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Brevard County, Florida, published in House Document No. 352, 90th Congress, 2nd Session, with a view to determining the advisability of modifying the existing project at the present time, with particular reference to the advisability of providing beach erosion control works in the area from the south line of Patrick Air Force Base southerly to the north line of the Town of Indialantic, with consideration given to the economic and recreational benefits of beach restoration as well as the technical requirements for implementation of restoration projects, and extending the period of Federal participation in the cost of periodic nourishment of the authorized beach erosion control project."

2.02 The Federally authorized Brevard County, Florida, beach erosion control project, as described in House Document No. 352, 90th Congress, 2nd Session dated 8 July, 1968, was authorized by the River and Harbor Act of August 13, 1968. The authorization provides for a protective and recreational beach having a berm 50 feet wide at elevation 10 feet above mean low water and a natural slope seaward as would be shaped by wave action along 14,600 feet of beach at the city of Cape Canaveral and 10,600 feet of beach at Indialantic and Melbourne Beach, and for periodic nourishment of the restored beach at Indialantic and Melbourne Beach. Nourishment of the restored beach at the City of Cape Canaveral would be by the authorized sand-transfer plant being planned for Canaveral Harbor.

2.03 Public Concerns. The primary concern within the study area is the continual shoreline erosion, subjecting existing shorefront structures, infrastructure, and public beach to potential storm related damage. The erosion problem is a threat to private commercial, residential and public recreational properties within Brevard County. The USFWS, NMFS, EPA, GFWFC, and FDEP have expressed concerns regarding potential impacts to nearshore hardground and worm rock communities that exist along a portion of the study area. They are also concerned about potential adverse impacts to sea turtle nesting and hatching.

2.04 Planning Objectives. The primary planning objective for this study is to provide an effective, economically justified, and environmentally acceptable way of providing storm damage reduction to upland development within the study area thus, preventing damage to public and private property.

3.00 ALTERNATIVES. This section describes the alternative plans considered, plans eliminated from further action, the no action alternative, the final recommended plan and other reasonable alternatives that were studied in detail.

3.01 Plans Eliminated From Further Study. Several alternatives were considered during the plan formulation process before arriving at the recommended plan. These alternatives can be generally classified as either structural or non-structural. The following non-structural alternatives were considered: no action (NS-1), construction control line (NS-2), moratorium on construction (NS-3), establish a no-growth program (NS-4), relocation of structures (NS-5), flood proofing of structures (NS-6), condemnation of land and structures (NS-7) and various combinations of the preceding non-structural alternatives (NS-8). All of these alternatives were rejected during plan formulation since they failed to meet the planning objectives.

(1) NS-1 -- the no action alternative perceives the continuation of existing conditions and provides no solutions to the existing problems. However, it also avoids any undesirable effects that may be associated with structural or nonstructural plans of improvement. The no action alternative does not provide the benefits needed to protect the coast from the effects of erosion and storm damage and therefore, does not address any of the planning objectives for this study.

(2) NS-2 -- a construction control line would not affect existing development and could only be effective in the unforeseeable future as buildings are razed and destroyed by storms. However, this alternative is acknowledged and included in the nonstructural combination plan, and plans are developed around it. A construction control line that does not prohibit construction, but does provide stringent structural restrictions, has been established by the State of Florida for all of Brevard County.

(3) NS-3 -- a moratorium on construction is rejected by the non-Federal sponsor and local interests since the desired growth of the area is oriented towards tourism and recreation, attracting retirees, and promoting a stable construction industry.

(4) NS-4 -- the establishment of a no-growth program is rejected by local interests. Growth in the area, particularly that in connection with beach activities, is needed to provide economic depth to the communities. This alternative is therefore excluded from detailed studies.

(5) NS-5 -- the relocation of the structures would allow the area to continue to erode and the land in this area would be lost until an equilibrium shoreline was reached. However, most structures within the area cannot be economically or physically moved from the area which would be lost and would have to be abandoned with new structures provided for the existing residents. In addition, implementation of this alternative would result in the loss of valuable recreational beach as shoreline recession continues and would necessitate the condemnation of the land and structures in this area.

(6) NS-6 -- flood proofing of existing structures and regulation of flood plain and storefront development are considered part of building code modifications and is not considered as a separate alternative.

(7) NS-7 -- condemnation of land and structures would allow the shoreline to erode in the area with a loss of land until shoreline equilibrium was established. This alternative is excluded as it fails to meet the planning objectives.

(8) NS-8 -- it is recognized that various aspects of many of the preceding non-structural solutions would be prudent to implement either collectively or in combination with structural alternatives. For the study shoreline, a single non-structural plan does not seem applicable for the entire area.

3.02 The following structural alternatives were also considered: seawalls (S-1), revetments (S-2), beach nourishment (S-3), Groins (S-4), submerged artificial reefs (S-5), nearshore placement (S-6), breakwaters (S-7), dunes and vegetation (S-8) and a combination of beach fill and nearshore placement (S-9). Eight of these alternatives were eliminated from further consideration. The reasons for eliminating each alternative are discussed below:

(1) S-1 -- the construction of additional concrete seawalls or improvements to and maintenance of the existing bulkheads/seawalls would provide a significant degree of protection; however, this would be accomplished at the expense of a recreational beach, resulting in substantial economic loss to the area. Reflecting wave energy off the existing seawalls and bulkheads has resulted in a steepening of the offshore profiles with resulting hazardous bathing conditions due to increased undertow and runouts. The high initial costs of seawall construction in addition to the adverse effects on coastal processes eliminate this alternative from further consideration.

(2) S-2 -- revetments have been placed on similar beaches over the past to protect critically damaged or eroding areas. These measures have provided temporary relief but have not reduced the erosion of the beaches. The hardening of the beach in one area will merely transfer the location of the problems further down the beach. Emergency construction of revetment type

structures, in-line with current State of Florida coastal armoring statutes, is implicit in the storm damage analysis, but is not carried forward as an implementable project alternative.

(3) S-4 -- Groins. Project designed groins or a groin field in the problem area would help hold a beach in front of existing development and prevent further losses of land. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins are considered as a method to help hold the fill in place and to reduce the periodic renourishment requirements. Groins could also be considered to offer additional stabilization to inlet areas. This alternative is excluded as it fails to meet the planning objectives.

(4) S-5 -- Submerged Artificial Reefs. This alternative would use the perched beach concept to limit the amount of underwater fill and retain the dry beach for a longer period. This would be accomplished by placement of an artificial submerged reef as a perched beach structure to reduce fill quantities, reduce nourishment requirements and mitigate the environmental impacts of nearshore rock outcropping burial. Hardgrounds in the south reach of the study area are located in shallow depths which would not facilitate construction of submerged artificial reefs. This alternative would not be effective in the study area and is excluded from future consideration.

(5) S-6 -- Nearshore Placement. Dredged material would be place in the nearshore to provide wave attenuation benefits, nourishment of the active profile, or a combination of both. This method is now feasible due to improvements in dredging technology, allowing placement is waters as shallow as 15 feet deep. Its low cost compared to onshore disposal by hopper dredge has been shown to generate higher benefit to cost ratios where haul distance preclude the use of pipeline dredges. Placement in the nearshore, if determined to be economically justified, would be handled in such as way as not to adversely impact existing hardbottom communities. Landward movement of material placed in the nearshore would be limited to the landward extent of the swash zone. This alternative by itself would not provide onshore design elevations adequate for the requisite storm damage reduction. Therefore, this alternative is not considered for further analysis.

(6) S-7 -- the construction of breakwaters offshore along the Brevard County problem area is considered as an alternative to reduce periodic nourishment quantities needed to maintain a protective and recreational beach fill in this area. Such structures would reduce the amount of wave energy reaching the shoreline in their lee. The formation of a partial tombolo would occur if the breakwaters are of sufficient size, thus, decreasing the rate of annual erosion and thereby decreasing the annual nourishment requirements. Costs, State regulations, and environmental concerns preclude further consideration of this alternative.

(7) S-8 -- Dunes and Vegetation. Along high energy coasts, vegetation will stabilize the beach only as related to losses by deflation. This is being considered by State and sponsor interests, and will not be addressed in this report.

(8) S-9 -- Combined Placement: Beach fill and Nearshore Placement. This alternative involves the placement of suitable beach quality sand on both the dry beach and the active portion of the offshore beach profile. Combined placement has been considered herein as an alternative to the construction of a typical beach fill design template in order to avoid burial of nearshore rock outcrops located along a portion of the study area. The method would be used to place the optimized volume of material within the active portion of the beach profile with the combination of dry beach and nearshore placement. The equilibrium profile theory is used to predict the volume of fill which, if placed on the beach face, would "toe out" landward of the nearshore hardbottom. An additional volume of fill, designed to remain seaward of the nearshore hardbottom, would be bottom dumped along the active portion of the offshore beach profile. This alternative was dropped from further consideration based on the following. Existing engineering guidance on offshore placement of fill material for the expressed purpose of nourishing the existing profile or providing wave attenuation benefits is inadequate. Furthermore, the impacts associated with the combined placement alternative on wave transformation, water level, nearshore circulation and other physical processes are not well known. Also, the uncertainty associated with quantification of project benefits and disbenefits render the combined placement alternative unacceptable at this time.

3.03 The remaining structural alternative, beach nourishment (S-3), was the only alternative plan not eliminated from consideration. This was the only plan that met all of the planning objectives and therefore, has become the selected plan. This alternative would provide a beach with appropriate project dimension size for a buffer against wave attack. An offshore source of sand is considered as inland sources do not contain sufficient quantities of beach quality sand. The proposed borrow area is located between 2 to 3 miles east of the tip of Cape Canaveral, within the area known as Canaveral Shoals. Renourishment of the beach would be undertaken periodically to maintain the recreational and erosion control features within design dimensions. Dimensions of the beach fill would be based on the degree of protection the project should provide.

3.04 No Action Alternative. Although this option, was eliminated from further consideration, it is carried throughout the plan formulation process as a basis of comparing the effects of other alternatives.

3.05 Selected Plan. The following paragraphs describe the selected plan. Plates 1 through 16 enclosed with the Feasibility Report display plan views and cross sections of the north and south reach design templates as well as the advance nourishment and construction sections of the selected plan.

3.06 The recommended plan identified for the north reach of the study area consists of beach fill with a 1,500 foot transition section at the southern limit of the reach. The north reach is bounded by the south jetty of Canaveral Harbor to the north and by PAFB to the south. The design berm elevation is +10.0 feet (ft) mean low water (MLW) extending from the shoreward intersection of the existing profile seaward to the location of the pre-project mean high water (MHW) shoreline. At the location of the MHW shoreline, the design template slopes 1 vertical (V) to 15 horizontal (H) seaward to the location of MLW thence 1 V to 50 H out to intersection with the existing profile. Construction of the north reach would require placement of approximately 1,984,000 cubic yards (cy) of initial fill and 516,000 cy of advance material (2,500,000 cy total). Construction of the north reach is anticipated in 1998. The primary borrow source would be the Canaveral Shoals located between 2 to 3 miles offshore of the tip of Cape Canaveral in 8 ft to 20 ft of water. Future nourishments in the amount of 516,000 cy would be provided in 6 year intervals at years 6, 12, 18, 24, 30 and 36. The final nourishment in year 42 of the project would require the placement of 688,000 cy of fill. Cost estimates developed for various alternatives indicate that a pipeline dredge would be the most cost effective plant for construction of the north reach.

3.07 In the Draft Feasibility Report and DEIS the recommended plan for the south reach consisted of beach nourishment from PAFB south to Spessard Holland Park (R-76 to R-137). Constructing the design template for this plan would bury approximately 32 acres or more of intertidal and nearshore coquina rock outcrops located between R-76 and R-117. The location of these rock outcrops are shown on plates 8 - 13 in the feasibility report. The burial of 32+ acres of hardgrounds was determined to be inconsistant with the Florida CZMP (refer to section 1.02); therefore the south reach was shortened to avoid impacts to the hardground resource. The modified recommended plan for the south reach consists of a beach fill between R-119 and R-137 with a 1,000 foot transition section at the northern limit and a 1,500 foot transition section at the southern limit of the reach. The northern end of the transition fill would be approximately 500 feet south of the closest hardground (plate 13). The design berm elevation is +10.0 feet (ft) mean low water (MLW) extending from the shoreward intersection of the existing profile seaward to the location of the pre-project mean high water (MHW) shoreline. At the location of the MHW shoreline, the design template slopes 1 vertical (V) to 15 horizontal (H) seaward to the location of MLW thence 1 V to 50 H out to intersection with the existing profile. Construction of the south reach would require placement of approximately 1,044,000 cy of initial fill and 601,000 cy of advance material for a total of 1,645,000 cy. The primary borrow source for the south reach would also be Canaveral Shoals. Future nourishments of the south reach, in the amount of 601,000 cy would be conducted in 6 year intervals at years 6, 12, 18, 24, 30 and 36. The final nourishment in year 42 of the project would require the placement of 801,000 cy of fill. Cost estimates developed for various alternatives indicate that a hopper dredge with pumpout would be the most cost effective plant for construction of the south reach.

3.08 Analysis of Impacts of Selected Plan and No-Action Plan on Significant Resources. Impacts projected under the selected and the no-action alternatives are displayed in Table 1. Details on impacts can be found in Section 5.00 Environmental Consequences of the FEIS.

3.09 Mitigation. The selected plan for the south reach has been modified to avoid impacts to the nearshore rock outcrops and associated worm rock. Therefore, no mitigation is proposed.

4.00 AFFECTED ENVIRONMENT.

4.01 General Environmental Conditions. The study area is located in Brevard County on the east coast of Florida approximately halfway down the state peninsula. The navigation channel at Canaveral Harbor is the north boundary of the study area and serves Port Canaveral, the U. S. Air Force, and the U. S. Navy Trident Submarine facility. The Canaveral peninsula, is a barrier island that separates the Atlantic Ocean from the Banana River. The Banana River is bounded on the west by Merritt Island, which is separated from the mainland by the Indian River. The Banana and Indian Rivers are shallow, tidal lagoons, except for portions maintained for navigational purposes. The public is allowed free and unrestricted use of the beaches south of the harbor. North of the harbor, military installations and the Merritt Island National Wildlife Refuge take up most of the beach frontage. The barrier island ranges in width from approximately 10 miles at the Cape to a few hundred feet just north of Patrick Air Force Base. Land elevations are generally less than 12 feet mean low water (MLW), except for occasional dunes that range from 9 to 25 ft NGVD (MLW = -1.9 NGVD). The beach sediments are primarily fine to medium quartz sand with varying percentages of shell content (Olsen Assoc., 1989). The mean range of ocean tide is 3.5 feet, with a spring range of 4.1 feet. Littoral drift is predominantly southerly, except for a seasonal reversal in May through September.

4.02 Fish and Wildlife Resources.

4.03 Dune Community. An upland dune system is present throughout most of the study area ranging from well developed in the southern part to weakly defined or nonexistent in the north. The dune is generally narrow where it exist, except for some relatively wider parts located within state, county or local parks and recreation areas. The seaward face of the dune has been severely eroded by wave action and is very steep. From Cocoa Beach north to the Canaveral Harbor entrance channel, the dune has been virtually eliminated by the construction of seawalls and revetments.

4.04 The natural dune areas are characterized as coastal strand and maritime hammock ecosystems. The coastal strand is typically vegetated with sea oats (*Uniola paniculata*), dune grass (*Ammophila breviligulata*), sea grape (*Coccoloba uvifera*), sea rocket (*Cakile edentula*), cacti (*Opuntia compressa*), croton (*Croton puntatus*), pennywort (*Hydrocotyle bonariensis*), beach elder (*Iva imbricata*), sea purslane (*Sesuvium portulacustrum*), wild bean (*Strophostyles helvola*), and morning glory (*Ipomea purpurescens*). The maritime hammock is composed of sea

Table 1. Summary of Impacts of Selected Plan and No-Action Plan on Significant Resources.

	NO ACTION	SELECTED PLAN
Fish and wildlife resources	Erosion of beach and dune habitats.	Stabilization of the beach/dune habitats; short-term reduction in beach and borrow area infaunal invertebrate populations; some disruption to fish during construction.
Hardground resources	No effect	Plan for the south reach has been modified to avoid hardgrounds. No effect is anticipated.
Threatened and endangered species	Increased erosion of sea turtle nesting habitat; increased erosion of dune may impact any existing beach mouse habitat.	Potential increase of sea turtle nesting habitat; protection of dune system and potential beach mouse habitat; potential effects related to sea turtle nest relocation and beach lighting during night construction; slight increase in the risk of manatee/vessel collision.
Cultural resources	No effect	No anticipated effect. Borrow area designed to avoid potentially significant cultural resources.
Air quality	No effect	Temporary and localized decrease in air quality from equipment during construction.
Water quality	No effect	Temporary increase in turbidity during initial construction and future renourishments.
Aesthetic values	Natural beach characteristics preserved but beach will narrow and portions of the dune may erode.	Temporary adverse visual effect during construction activities; wider natural appearing beach with dune protected.
Recreation	Continued erosion reducing beach width and opportunities for beach recreation activities.	Increased area for beach recreation; temporary disruption of beach activities during construction.

myrtle (*Baccharis halimilifolia*), salt cedar (*Timorous gallic*), wax myrtle (*Maraca cerifera*), yaupon (*Ilex vomitoria*), senna (*Cassia fasiculata*), southern red cedar (*Juniperus silicicola*), muscadine (*Vitis rotundifolia*), Virginia creeper (*Partenocissuss quinquefolia*), and greenbriar (*Smilax bona-nox*).

4.05 Wildlife species that are expected to occur in the beach dune, coastal strand and maritime hammock communities include small mammals, birds, reptiles and invertebrates. Mammals include raccoon (*Procyon lotor*), domesticated and feral cats (*Felis cattus*), domesticated dogs (*Canis familiaris*), house mouse (*Mus musculus*), and possibly the threatened southeastern beach mouse (*Peromyscus polionotus niveiventris*). Typical birds that can be observed include brown pelican (*Pelicanus occidentalis*), gulls, herons, terns, doves, and sandpipers. Florida scrub jays (*Aphelocoma c. coerulescens*) were also obsevered during field investigation of the study area. Reptiles include threatened and endangered sea turtles, loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*) that utilize the beach for nesting, various snakes and lizards. Invertebrates expected to occur include the ghost crab (*Ocypode quadrata*), and various insects and spiders.

4.06 Beach and Nearshore Community. The proposed project fill area is comprised of sandy beaches and sandy nearshore bottom with some nearshore rock outcrops. Olsen (1989), describes the overall character of the existing beach as fairly uniform, fine grained quartz sand with only slight variances in shell content. The mean grain size and shell content increased while the sorting value decreased from the north to the south. The composite grain size ranged from 2.07 to 2.97 phi (0.24 to 0.13mm) and averaged 2.45 phi (0.19mm). The composite sorting (+/- phi standard deviation) ranged from 0.47 to 0.88 and averaged 0.82 or moderately sorted. The shell content varied from 0.1 to 35.0 percent with an average composite value of 4.0 percent. The silt content ranged from 2.9 to 9.6 percent with a average of 5.1 percent.

4.07 The intertidal beach zone within the study area is generally characterized by a quartz sand and shell hash bottom with occasional coquina rock outcrops. The intertidal zone extends from MHW to MLW and is routinely inundated by water and influenced by wave action during each tidal cycle. The beach in this zone is generally populated by small benthic macroinfauna that are short lived and highly fecund. The mole crab (*Emerita talpoida*), coquina clams (*Donax variabilis, D. parvula*) and several species of polychaetes tend to be the dominant species within the intertidal zone (Nelson, 1985; Gorzelany and Nelson, 1987). Other invertebrates known to inhabit the intertidal zone within the project area include several species of gastropods, isopods, and amphipods (Gorzelany and Nelson, 1987). Shorebirds that can be found utilizing the intertidal zone for foraging are the least tern (*Sterna antillarum*), royal tern (*Sterna maxima*), sandwich tern (*Sterna sandvicensis*), black skimmer (*Rynchops niger*), and snowy plover (*Charadrius alexandrinus*) (Myers and Ewel 1990).

4.08 The bottom characteristics of the nearshore area within the surfzone are similar to the intertidal zone except that the sand is constantly inundated with water. Benthic invertebrate species reported to inhabit this area include bivalves, gastropods, polychaetes, amphipods, portunid crabs, and sand dollars. The dominant fish species that occur in this zone are bottom feeding carnivores that feed on the benthic invertebrate fauna (Gilmore, et al., 1981). These include catfish (*Arius felis*), lizardfish (*Synodus foetens*), croakers and kingfish (Sciaenidae), and pompano (*Trachinotus carolinus*) (Nelson 1985; Gilmore. et al., 1981). Other fish species that can be found in the surfzone periodically include jacks (Carangidae), mackerals (Scombridae), ladyfish (*Elops saurus*), bluefish (*Pomatomus saltator*), anchovies (Engraulidae) and herrings (Clupeidae) (Gilmore, et al., 1981).

4.09 Nearshore Rock Outcrop Community. Continental Shelf Associates 1989, reported a well developed line of rock outcroppings running approximately 10 miles from Patrick Air Force Base (R-59) south to Paradise Beach Park (R-110). They reported the rock to be low, showing little relief at the northern and southern extremes, with higher well defined ledges of 2-3 feet of vertical relief in the middle between R-78 and R-93. The rock outcrops are comprised of lithified coquina rock of the Pleistocene Anastasia Formation (Olsen 1989). The coquina rock provides substrate for the sabellariid polychaete worm *Phragmatopoma lapidosa*. These worm construct reefs by collecting sand grains of suitable size and cementing them together by mixing the sand with a protein mucus (Barnes 1974). The worm reefs expand as worm larvae settle on existing worm tubes and the entire process is continually repeated (Kirtley 1974; Jaap and Halloack 1991). These worm reefs provide two very important functions. First, as hardened structures, the reef helps to dissipate destructive wave energy. Second, the reefs provide substrate for sessile benthic invertebrates and plants, and structural habitat for a wide variety of invertebrates and fishes. Although worm reefs are found from Cape Canaveral to Key Biscayne, they are best developed between St. Lucie and Martin Counties off Hutchinson Island. In the project study area, colonies of worm rock were observed by Corps of Engineers and USFWS biologists growing on various places along the coquina rock outcrops. These colonies ranged from large dense patches of worm rock to small isolated patches located along the sides of the rock ledges. Based on field observations, it is estimated that worm rock comprises 5 to 10 percent of the hardground habitat. Using aerial photographs taken in July 1995, hardground areas were outlined and digitized to determine areal extent. The amount of rock outcrop and associated worm rock within the study area (R-76 through R-117) was determined to be approximately 32 acres. The location of these outcrops are shown on plates 8 - 13 of the feasibility report. Some species reported to inhabit nearshore rock outcrops include amphipods, isopods, decapod and stomatopod crustaceans including the porcellanid crab (*Pachycheles monilifer*), the xanthid crab (*Menippe nodifrons*), and the graspid crab (*Pachygrapsus transversus*) (Gore et al. 1978). Gilmore et al. (1984), lists 107 fish species associated with nearshore hardgrounds in this area. They are dominated by two demersal blenny species *Labrisomus nuchipinnis* and *Blennius cristatus*, and three semi-demersal species, spottail pinfish (*Diplodus holbrooki*), porkfish (*Anisotremus virginicus*), and sailors choice (*Haemulon parrai*). Sergeant majors (*Abudefduf saxatilis*) were also observed in the field. Several species of macroalgae consisting of green algae (Chlorophyta), red algae (Rhodophyta) and brown algae

(Phaeophyta), were found growing on the rocks, and invertebrate species observed consisted of amphipods, isopods, crabs, tunicates, bryozoans, and the boring sponge (*Cliona lampa*).

4.10 During June 1994 Continental Shelf Associates performed a side-scan sonar and hardground mapping survey of the nearshore waters adjacent to the study area shoreline. The survey encompassed the entire study area from the Canaveral Harbor entrance channel south through Melbourne Beach from as close to shore as possible out to approximately 2,000 feet from shore. The results of the survey indicate that no hardbottom areas, other than the nearshore rock outcrops previously discussed, exist within the study area (Continental Shelf Associates 1994).

4.11 Borrow Area Community. The proposed offshore borrow area is located within the Cape Canaveral shoal system, between two and three miles southeast of the Canaveral Bight. The borrow area is approximately 6000 feet by 6500 feet in area and contains and estimated volume of 16 million cubic yards of dredgeable beach quality sand. The water depth ranges from 18 feet on the western side to 6 feet on the eastern side of the borrow area. A side-scan sonar survey was performed by Continental Shelf Associates (CSA, 1994) to describe the bottom features within and adjacent to the borrow area. The results of the survey indicated that the bottom type within the borrow area was bare sand with no evidence of hardbottom areas or features of biological significance. Infauna and other benthic fauna that can be expected within the borrow area include bivalves, decopod crustaceans, echinoderms, and neritic icthyofauna (Gilmore, et al., 1981).

4.12 Based on the analysis of core borings, the sand within the borrow area contains poorly graded fine quartz sand with varying amounts of whole and broken shell. The composite mean grain size of the sand is 1.75 phi (0.30mm) with a composite sorting of 1.03 or poorly sorted. The average silt content of the borrow area is 5.5 percent. The visual estimates of shell content ranged from 2 to 23 percent with an average of 9 percent. A more detailed discussion on the borrow area can be found in the Geotechnical Report prepared for this study which is included as Appendix E in the Feasibility Report that accompanies this FEIS.

4.13 Threatened and Endangered Species.

4.14 Listed Species. Listed species which may occur in the vicinity of the project are: loggerhead turtle (*Caretta caretta*, T), green turtle (*Chelonia mydas*, E), leatherback turtle (*Dermochelys coriacea*, E), hawksbill turtle (*Eretmochelys imbricata*, E), Kemp's ridley turtle (*Lepidochelys kempii*, E), finback whale (*Balaenoptera physalus*, E), humpback whale (*Megaptera novaeangliae*, E), right whale (*Eubalaena glacialis*, E), sei whale (*Balaenoptera borealis*, E), sperm whale (*Physeter macrocephalus catodon*, E), and the manatee (*Trichecus manatus*, E). All can be found in the Atlantic coastal waters off Brevard County during certain times of the year. Loggerhead, green and leatherback sea turtles are also known to utilize the beaches for nesting. The southeastern beach mouse (*Peromyscus polionitus niveiventris*, T) may be found inhabiting the dune and scrub communities within the study area.

4.15 All the sea turtle species listed above are known to occur in the coastal waters of eastern Florida. Of these species the loggerhead, green and leatherback turtles are regular nesters in Florida (Meyland et al. 1995). The loggerhead, green, and Kemps' ridley are also know to congregate within the Canaveral Harbor entrance channel during certain times of the year.

4.16 The loggerhead was listed as threatened on July 28, 1978. Within the United States it nests primarily on beaches from North Carolina to Florida. Approximately ninety percent of loggerhead nesting within the U.S. occurs in Florida (Murphy and Hopkins 1984). The highest density nesting beaches in Florida occur from Canaveral National Seashore, Volusia County south to John U. Lloyd State Recreation Area in Broward County (Conley and Hoffman 1986). Nesting densities vary from less than one nest per kilometer on the average for some beaches in the northeast, southeast, and the panhandle of Florida to over 600 nests per kilometer on some stretches of beach in south Brevard County (Ehrhart and Witherington 1986). The U.S. loggerhead population, one of the two most significant nesting populations in the world, may represent up to 30 percent of the worldwide loggerhead nesting population (Ross 1982). This is in contrast to all other sea turtle species where nesting occurs largely outside the U.S. The loggerhead nesting season encompasses late April - September with most nesting occurring in June and July. Incubation period is temperature dependent and most nests hatch within 60 days although up to 70 days may be required for some nests in the northern periphery of the nesting range. Within the study area nesting activity is relatively low north of Patrick Air Force Base. Most of the shoreline is armored from Cocoa Beach to Cape Canaveral and little suitable nesting beach is available. Nesting data from Jetty Park at Port Canaveral from 1990 through 1992 (Meylan et al. 1995) shows nesting densities ranging from 7-34 nests per kilometer. Nesting activity increases to the south. Nesting densities at Patrick Air Force Base during the period from 1989 through 1992 (Meylan et al. 1995) ranged from a low of 132 nests/km to a high of 247 nests/km. Nesting along the south Brevard beaches ranged from 323 nests/km to 484 nest/km for the same period (Meylan et al. 1995).

4.17 Green turtle nesting within the U.S. occurs principally along southeast Florida coast from Volusia through Broward Counties (Meylan et al. 1995). Nesting densities are much lower than for the loggerhead and range from 1-5 nests per kilometer on most beaches within its major nesting range to 13-30 nests per kilometer on high density green turtle nesting beaches in south Brevard County and south Jupiter Island in Palm Beach County (Ehrhart and Witherington 1986; Meylan et al. 1995). Brevard County accounts for 39.5% of the green turtle nesting in the state with the majority of the nesting occurring on the South Brevard Beaches (Meylan et al. 1995), which includes part of the study area. Nesting occurs from May - September with the peak nesting occurring in July - August. Hatching period is similar to the loggerhead. The green turtle was listed on July 28, 1978 as endangered in Florida and the west coast of Mexico and threatened elsewhere.

4.18 The leatherback was listed as endangered throughout its range on June 2, 1970. Nesting within the U.S. occurs primarily in Puerto Rico and the Virgin Islands. Eighty-nine leatherback nests however, were recorded on Florida east coast beaches in 1985 (Conley and Hoffman 1986). Nesting begins as early as late February and terminates by late July. Much of the nesting occurs in St. Lucie, Martin, and Palm Beach Counties but scattered nesting has been recorded on almost all Florida east coast county beaches (Meylan et al. 1995). South Brevard County is documented by Meylan et al. 1995 to have nesting activity as recent as 1992, but most occurs out of the proposed project area. Cape Canaveral and Kennedy Space Center also report nestings in 1992 (Meylan et al. 1995).

4.19 The hawksbill listed as endangered on June 2, 1970, is a rare nester on southeastern U.S. beaches with only 1-2 nests recorded annually on Florida beaches (Lund 1985; McMurtray and Richardson 1985; Meylan et al. 1995). Nesting has occurred from June through October and has been documented from Volusia, Martin, Palm Beach, Broward, Dade and Monroe Counties (McMurtray and Richardson 1985; Lund 1985; Meylan et al. 1995). No nesting has been recorded for Brevard County.

4.20 The West Indian Manatee can be found in the coastal and esturine areas of Brevard County during most of the year. The Indian and Banana Rivers are important manatee feeding, resting and travel areas. Manatees have been observed in the ocean within the study area but are not known to utilize ocean waters for feeding or resting. Manatees use both the Canaveral Harbor Channel and Sebastian Inlet to move to and from the ocean and the Indian/Banana River lagoon system.

4.21 Of the whale species listed in section 4.14, the National Marine Fisheries Service (NMFS) has determined that the only right whale and the humpback whale may be adversely impacted by dredging operation associated with beach nourishment projects (NMFS, Biological Opinion, August 25, 1995). Right whales are the most endangered of the large whale species, whose population in the North Atlantic is estimated at a few hundred individuals. The nearshore waters of northeast Florida and southern Georgia have been identified as calving and nursery areas for the right whale and were formally designated as critical habitat on June 3, 1994. The critical habitat extends from the mouth of the Altamaha River in Georgia to Sebastian Inlet in Florida and includes the coastal waters within the study area. The calving season for the right whale occurs during the period from December 1 through March 31. Humpback whales occur in the coastal waters of the United States throughout the year and can be found in Florida waters during annual migrations between their summer and winter ranges.

4.22 The Southeastern beach mouse was listed in the Federal Register as threatened on May 12, 1989 (USFWS 1992). Historically, the Southeastern beach mouse ranged from Ponce Inlet in Volusia County, Florida south to Hollywood Beach in Broward County, Florida (USFWS 1992). Populations of this species currently exist on, Cape Canaveral National Seashore, Merritt Island

National Wildlife Refuge, Kennedy Space Center, Cape Canaveral Air Force Station and the southern half of Sebastian Inlet State Recreation Area (USFWS 1992, Stout 1992). The beach mouse inhabits primary sand dune areas vegetated by sea oats and dune panic grass. The mouse can also be found in sandy areas with scattered scrub found behind primary dune. The decline of beach mouse populations can be attributed to loss of suitable habitat by development and erosion along the beach and from predation. Competition from other mouse species can also be a threat. Fieldwork performed by the U.S. Fish and Wildlife Service (USFWS) in the study area revealed remnant mouse habitat; however, their was no indication of mouse habitation in the area. Of the dune areas observed within the study area, optimum beach mouse habitat still remains at Lori Wilson County Park.

4.23 Section 7 Coordination. Coordination and consultation with the U. S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) is required by Section 7 of the Endangered Species Act of 1973, as amended, to avoid and minimize impacts to listed threatened and endangered species. Section 7 consultation with both agencies has been completed for this study. A Regional Biological Opinion (RBO) for hopper dredging along the South Atlantic Coast was issued by the NMFS on August 25, 1995. The RBO addresses the dredging of sand from offshore borrow sites to be used for beach nourishment projects. A copy of the RBO can be found in Appendix C of this EIS. The USFWS included a Biological Opinion (BO) in their Fish and Wildlife Coordination Act Report (CAR) for the study, dated December 7, 1995. The CAR and BO can also be found in Appendix C.

4.24 Cultural, Historic, and Archeological Resources. Archival research and field investigations, in addition to consultation with the Florida State Historic Preservation Officer (SHPO), have been conducted for the Brevard County Shore Protection Project. European exploration of Florida began in the early 16th century. On the return to Europe, the ships traveled through the Straits of Florida and followed the Gulf Stream north to Cape Canaveral. From this landmark, the ships turned northeast toward Bermuda before heading east to the Azores and Europe. During the historic period, a number of shipwrecks were recorded in the vicinity of Cape Canaveral. The actual locations of most of these wrecks are not known.

4.25 Because of the probability that historic shipwreck material may be located in the study area, a cultural resource magnetometer survey was conducted for the Canaveral Shoal borrow area, located southeast of Cape Canaveral. The results of these investigations are included in the report *A Cultural Resources Survey of Proposed Borrow Area, Vicinity of Cape Canaveral, Brevard County, Florida*, prepared by Tidewater Atlantic Research. The magnetometer survey and the report referenced above were completed under contract with the U.S. Army Corps of Engineers, Jacksonville District. Nine magnetic targets were identified during this survey. Eight of these targets are included in two clusters which may represent significant historic properties. Three hundred foot radius "no work zones" will be established around these two clusters. One target, CC-06, is an isolated ferrous object and is not believed to represent significant historic material.

4.26 Field investigations were not conducted for the beach segments which are scheduled to be nourished for this shore protection project. Most of the property located along the beach has been developed and about 20% of the beach in this study area has been previously nourished. Because erosion has occurred along the beach segments included in this study area, it is not likely that significant historic properties are located there. Beach nourishment will protect any unidentified historic properties, which may be located west of the beach, from the effects of erosion.

4.27 Water Quality. The waters within the project area are used for swimming, fishing, boating and other recreational uses; therefore, the quality of the Atlantic Ocean waters is affected by those activities. The State of Florida lists the area's waters as Class III which is suitable for recreation and the propagation and management of fish and wildlife.

4.28 Air Quality. Air quality within the project area is good due to the lack of industrial development and presence of either on or offshore breezes. Brevard County is classified as an attainment area for all Federal Air Quality Standards.

4.29 Aesthetic Resources. The proposed project study area comprises two separate segments (North Segment and South Segment) of the Atlantic Ocean coastline in Brevard County, Florida. The Brevard County project beach aesthetics typically range from moderate to good with varying dune and vegetation widths, depending on development encroachment. The beach is a light tan with a somewhat constant width., and gentle slope to the ocean. The panoramic Atlantic Ocean picks up the famous Caribbean blue appearance which contrasts strikingly with the sandy shoreline color. Nearshore and shoreline wormrock outcroppings contrast with the ocean, breakers, and beach, and add interest to the county beach experience.

4.30 The North Segment begins at the Canaveral Harbor south jetty and stretches south for 9.4 miles to the Patrick Air Force Base north property line. Project aesthetics near the jetty area are very good due to the wide beach, more natural dune and background vegetation within Canaveral Jetty Park lands. To the south of the park, the beach narrows and development impacts the dunes. Where native vegetation occurs it provides a positive aesthetic backdrop. High-rise and multi-story commercial and residential development generally adversely impacts aesthetics more than single family residential development. Bulkheads, riprap, denuded dunes, footpaths, and boardwalks also decrease dune and beach aesthetic values. Beachfront parks, undeveloped oceanfront lots, and dune friendly oceanfront development provide the good aesthetic values of the north segment project area.

4.31 The South Segment begins at the Patrick Air Force Base south property line and stretches 10.5 miles into Melbourne Beach. The south project segment possesses good aesthetics values along much of the beachfront area. The northern portion of the segment has more high-rise and multi-story commercial and residential development with bulkheads and cleared dunes. This adversely impacts aesthetics in those areas. Interspersed amongst the condos and hotels are large tracts of undeveloped oceanfront lots which improve aesthetics in those areas. To the south of Melbourne Causeway, A1A narrows and single family residential development is common. High-rise impacts are decreased but single family development produces impacts to the aesthetics of the dunes and adjacent beach.

4.32 Recreation. The project study area experiences local, state, and national recreational use throughout most of the calendar year. The beach, nearshore and offshore water are used by sunbathers beachcombers, fishermen, swimmers, snorkelers, SCUBA divers, windsurfers, surfers, and various types of boaters. Space shuttle launches are ideally viewed from the beaches. Many local businesses cater to the recreating public which frequent Brevard County Beaches. Many county beachfront parks provide beach recreation access, restrooms, and vehicular parking.

5.00 ENVIRONMENTAL CONSEQUENCES.

5.01 Effects on Fish and Wildlife Resources.

5.02 No-Action Alternative. If no action is taken the shoreline within the study area would continue to erode. This could diminish the beach area available to sea turtles for nesting. Impacts due to project implementation would be avoided.

5.03 Selected Alternative. Implementation of the selected alternative would restore some of the beach's ability to provide protection against storms and coastal flooding. It would also enhance the appearance and suitability for recreation along the beach. The placement of sand on the beach would benefit and help stabilize the existing dune system and may provide additional nesting areas for sea turtles.

5.04 Effects on Dune, Beach and Nearshore Communities. In those areas where dunes exist, the placement of sand may impact the seaward toe of the dune. Depending on the depth of material placed at the toe of the dune, some of the lower vegetation at the toe and pioneer zone may be buried. The vegetation in this area is adapted to inundation by shifting sand and can probably withstand some minor coverage without detrimental effects. The new beach fill will provide additional sand to the dunes and will help to stabilize the seaward face of the dune. The additional beach widths provided by the project will reduce the effects of storms on dune vegetation.

5.05 During the placement of sand on the beach there may be some interruption of foraging and resting activities for shorebirds that utilize the project area. This impact would be short-term and limited to the immediate area of disposal and time of construction. There would be sufficient beach area north and south of the renourishment sites that can be used by displaced birds while construction takes place. Increased foraging opportunities for some species, such as sea gulls, may also occur as a result of the discharge activity. Elevated turbidity levels within the immediate vicinity of the discharge site may interfere with foraging by sight feeders such as the brown pelican (*Pelecanus occidentalis*). However, increased turbidity levels would be limited to a small portion of the shoreline and should not result in significant impacts to foraging activities.

5.06 Dredging activities in the borrow area and the disposal of sand on the beach would have temporary impacts to the macroinfaunal communities within those areas. Some organisms may be buried and lost, but many organisms inhabiting the intertidal and surf zones are well adapted for burrowing and would be able to burrow up through the fill material and survive. Turbidity levels along the disposal site would temporarily increase, but would return to normal after beach equilibrium is achieved. Organisms inhabiting this zone would be impacted by the run off from the disposal area but are adapted for survival in such conditions and impacts should be minor. Dominant infaunal inhabitants of the intertidal zone, such as amphipods, isopods and polychaetes typically possess high fecundity and rapid turnover rates during their breeding season. Because of this, any losses due to construction activities would be replaced within a short time. The sand to be used as beach fill material is similar to the sand that currently exists on the beach. This will minimize the impacts to the benthic infaunal communities and will enhance recovery to pre project population levels. No long-term adverse effects are anticipated to the intertidal macroinfaunal community due to nourishment activities (Deis, et al. 1992, Nelson 1985, Gorzelany & Nelson 1987).

5.07 Effects on Fishes. Impacts on fish within the surf zone and immediate nearshore area would include temporary increases in turbidity, noise, and disturbance of the sediment in general. The effects of turbidity fish are difficult as most nearshore fish are adapted to periodic short-term, storm generated turbidity. Clogging of gill membranes could occur in some less adapted species or if sediment loads stay high for extended periods of time and fish do not migrate out of the area. The overall impact on fishes are expected to be minimal.

5.08 Effects on Nearshore Rock Outcrop Communities. Coquina rock outcrops and scattered worm rock reef exist within the study area from Patrick Air Force Base (R-76) south to Paradise Beach Park (R-117). Based on aerial photography it has been estimated that approximately 32 acres of rock outcrops exist in the study area. Because the selected plan for the south reach has been modified to avoid the nearshore harground communities, no adverse impacts are expected.

5.09 Impact on Threatened and Endangered Species.

5.10 No-Action Alternative. If no action is taken, the beach would continued to erode. This would ultimately result in the loss of sea turtle nesting habitat and/or poor nest site selection. No adverse impacts are expected on other listed species.

5.11 Selected Alternative. Consultation with the NMFS and USFWS is required and has been completed for the proposed project in accordance with Section 7 of the Endangered Species Act of 1973, as amended. The consultations have resulted in Biological Opinions from NMFS and USFWS that the proposed activity will not be likely to jeopardize the continued existence of any Federally listed threatened or endangered species. Section 7(b)(4) of the Act requires that when a proposed action is found consistent with Section 7(a)(2) of the Act and the project may result in the take of some individuals of the listed species, the NMFS and USFWS will issue a statement that specifies the amount or extent of such incidental taking. The Act also requires that reasonable and prudent measures, coupled with terms and conditions to implement these measures, be provided to minimize such impacts. The reasonable and prudent measures and terms and conditions issued by the NMFS and USFWS for the proposed action are outlined in their Biological Opinions which are included as Appendix C to the FEIS.

5.12 Sea Turtles. Beach nourishment would provide a higher and wider dry beach area that would be less susceptible to inundation during storm events. This would be a positive impact on sea turtles by providing more dry beach area for nesting and would reduce the chance of nests being destroyed by inundation. Other potential effects of beach nourishment activities have been well documented by Erhart and Raymond (1983), Nelson (1987), and Nelson and Dickerson (1989). Beach nourishment and associated activities have the potential to impact sea turtles and may have the following effects.

1. Scarp development leading to hinderance or blockage of accessibility to nesting habitat.

2. Adverse alteration of moisture levels or temperature in beach due to modified nesting material.

3. Compaction and cementation of beach sediments that cause reduced nesting success and aberrant nest cavity construction resulting in reduced nesting and/or hatching success.

4. If carried out during the nesting season, there is a potential for the destruction of nests that are not identified during the daily nest survey and relocation program.

5. Disruption of nesting activities that could lead to poor nest site selection and energetic cost diminishing egg production.

6. Disorientation or misorientation of hatchlings from adjacent beaches by artificial lights on dredge equipment or construction equipment on the beach.

By using proper management techniques such as, nest relocation, tilling of compacted beaches, use of compatible sand, and smoothing of scarp formations, most of the negative effects can be corrected (Nelson and Dickerson, 1989).

5.13 Artificial lighting along the beach is known to effect the orientation hatchlings (Nelson and Dickerson, 1989; Witherington, 1991) and to effect the emergence of nesting females onto the beach (Witherington, 1992). Construction activities may occur during the early (March 1 through April 30) or late (November 1 through November 30) part of sea turtle nesting season. If construction occurs a night during that time, lighting on the beach may effect hatchlings and nesting females. Research has shown that low pressure sodium (LPS) lights that emit only yellow wavelengths do not attract hatchlings (Dickerson and Nelson 1988 and 1989; Nelson and Dickerson, 1989b). Witherington (1992) demonstrated that LPS lights on the beach did not significantly effect the nesting behavior of green or loggerhead sea turtles. The use of LPS lighting at the construction site can reduce the potential for lighting effects on sea turtles.

5.14 Hopper dredging in harbors and entrance channels is known to adversely effect sea turtles by entrainment. These incidents occur because sea turtles utilize and are concentrated in these channels during certain times of the year. Sea turtles have been documented to occur in the Canaveral Harbor entrance channel throughout the year. The NMFS is concerned that sea turtles may utilize sand bottoms as internesting or resting habitat. It is not expected that sea turtles will concentrate in the sandy borrow area as they do in navigation channels; however, since sea turtles are known to congregate in the Canaveral Harbor channel it is likely that they could be found within the proposed borrow area located a few miles north of the channel. During past beach nourishment projects there has been no evidence of sea turtles being entrained by a hopper dredge dredging sandy material from an offshore borrow area. To ensure that sea turtles are not entrained by the dredge, the use of a newly developed rigid deflector draghead would be required on the dredge. The deflector draghead is designed to form a sand wedge in front of it that will push out of the way any sea turtle that it comes in contact with. This new deflector draghead has been successfully tested at a site with a historical problem of sea turtle entrainment (Canaveral Harbor) while significant numbers of sea turtles were present in the channel.

5.15 Manatees. No significant impacts to the manatee are expected by the proposed activities. There are no seagrass beds or other known food sources for manatee within the project area. Manatees are known to use both the Canaveral Harbor entrance channel and Sebastian Inlet to travel to and from the ocean and the Indian and Banana Rivers. It is likely that manatees may also be found travelling along the beaches within the project area. The primary concern to manatees is increased boat and barge traffic associated with dredging and nourishment activities and the potential for vessel impact with a manatee. It is expected that manatees will avoid the project area during construction activities, however, various protective measures will be implemented during construction to avoid injuring manatees.

5.16 In order to protect any manatee that might be encountered in the project area, the following contract requirements will be implemented:

To insure the contractor and his personnel are aware of the potential presence of the manatee in the project area, their endangered status, and the need for precautionary measures, the contract specifications will include the standard protection clauses concerning manatees. The contractor will instruct all personnel associated with the construction of the project about the presence of manatees in the area and the need to avoid collisions with manatees. All vessels associated with the project shall operate at 'no wake' speeds at all times while in shallow waters, or channels, where the draft of the boat provides less than three feet clearance of the bottom. Boats used to transport personnel shall be shallow draft vessels, preferably of the light-displacement category, where navigational safety permits. Vessels transporting personnel between the landing and any work boat shall follow routes of deep water to the extent possible. Shore crews or personnel assigned to the disposal site for the workshift shall use upland road access if available. All personnel would be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act and the Marine Mammal Protection Act. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project. If a manatee is sighted within 100 yards of the dredging area, appropriate safeguards would be taken, including suspension of dredging, if necessary, to avoid injury to manatees. The contractor shall keep a log of all sightings, collision, injuries, or killings of manatees during the contract period. Any manatee deaths or injuries will be immediately reported to the Corps of Engineers and the USFWS (Jacksonville Field Office).

5.17 Southeastern Beach Mouse. Except for possibly Lori Wilson County Park in Cocoa Beach, optimum beach mouse habitat was not found in the study area. Field reconnaissance of the study area by the USFWS did not indicate any presence of the southeastern beach mouse. Although no evidence of beach mice was found, they may still inhabit the area, specifically in Lori Wilson County Park. If they do occur, beach nourishment activities may impact any beach mice that may be found at the toe of the primary dune. In their BO the USFWS has determined that the proposed project is not likely to jeopardize the continued existence of the southeastern beach mouse. To minimize any potential impacts, construction equipment will not be permitted on the primary and secondary dune systems and a trapping program will be initiated during construction for any beach mice that may be affected.

5.18 Right and Humpback Whales. One of the primary human caused sources of injury and mortality for right and humpback whales are collisions with vessels. If a hopper dredge is used during beach nourishment activities, the transit of the hopper dredge from the borrow are to the beach disposal site is likely to result in increased vessel traffic in the vicinity of right and humpback whales. This increased vessel traffic may increase the likelihood of whale/vessel interactions. Although whales have been observed in areas of hopper dredge operations, there have been no documented collisions between hopper dredges and whales. To insure that adverse impacts to whales are avoided the precautions recommended in NMFS Regional Biological Opinion will be followed (refer to Appendix C).

5.19 **Effects on Cultural, Historic, and Archeological Resources**.

5.20 No-Action Alternative. The no-action alternative would have no effect on cultural, historic or archeological resources.

5.21 Selected Alternative. Eight potentially significant magnetic targets were identified in the proposed Canaveral Shoal borrow area. The targets are divided into two clusters, one in the northwest corner and the other in the south central section of the borrow area. A 300 foot radius "no work zone" will be established around each of the two clusters to protect potentially significant historic properties from the effects of dredging. Because "no work zones" will be established, dredging in this borrow area will not have an adverse effect on potentially significant historic properties.

5.22 Although the beach segments scheduled for nourishment have not been subjected to a systematic survey, the shoreline has eroded and most of the properties along the beach have been developed. It is not likely that significant historic properties are located on the beach in the study area. If any resources eligible for inclusion in the National Register of Historic Places are located on property west of the beach, project construction will protect those resources from the adverse effects of shoreline erosion.

5.23 It is the Corps of Engineers' determination that the proposed project, including dredging in the borrow area and placement of sand on the beach will have no adverse effect on historic properties included in or eligible for inclusion in the National Register of Historic Places. The Florida State Historic Preservation Officer (SHPO) concurred with this determination in an August 9, 1994 letter.

5.24 **Effects on Water Quality**.

5.25 No-Action Alternative. If no action was taken, present water quality conditions would be maintained.

5.26 Selected Alternative. The project would cause temporary increases in turbidity at dredging and beach disposal sites. The State of Florida water quality regulations require that water quality standards not be violated during dredging operations. The standards state that turbidity outside the mixing zone shall not exceed 29 NTU's above background. Results from turbidity monitoring at previous beach nourishment projects have shown that the turbidity did not exceed the standard. Various protective measures and monitoring programs would be conducted during construction to ensure compliance with state water quality criteria. Should turbidity exceed State water quality standards as determined by monitoring, the contractor would be required to cease work until conditions returned to normal. The project has been evaluated in accordance with

Section 404 of the Clean Water Act and a 404(b) evaluation report has been included as Appendix A of this FEIS.

5.27 Effects on Aesthetics.

5.28 No-Action Alternative. Without the proposed project the shoreline would continue to erode. This would eventually result in the loss of existing sand dunes and local beach park facilities which would reduce the visual aesthetics of the area.

5.29 Selected Alternative. There would be a temporary increase in the noise level during construction. The principle noise would stem from the vicinity of the discharge point on the beach and the dredge. Construction equipment would be properly maintained to minimize the effects of noise. Increases to the current levels of noise as a result of this project would be localized and minor, and limited to the time of construction. Engine exhaust fumes would be rapidly carried away by breezes. Any temporary decrease in air quality caused by this work would be corrected once work is completed. Hundreds of feet of dredge pipe lying on the beach or just offshore would have a negative visual impact on the aesthetics of the area. This impact would only be temporary and would be removed along with the pipe at the completion of the work. The negative visual impacts of the equipment and pipe would be offset to an extent by the natural curiosity of some individuals to see what is going on and how work is progressing. There would also be a temporary increase in turbidity during construction adjacent to the point of discharge. Turbidity would return to normal levels once construction activities cease. Once completed the proposed project would result in an overall improved aesthetic quality. The placement of sand on the beach would restore the natural appearance of the shore. Existing dunes would be protected maintaining their pleasing visual appearance.

5.30 Effects on Recreation.

5.31 No-Action Alternative. Without the proposed project the shoreline would continue to erode. This would eventually reduce the amount of beach available for recreation and would result in the degradation or loss of local beach park facilities thus, adversely impacting the recreational opportunities within the area.

5.32 Selected Alternative. During nourishment activities, the use of the beach in the vicinity of construction would drop or be restricted temporarily. Use of the beach in the immediate area of the discharge pipe and equipment would be restricted for public safety. Noise from the heavy equipment needed to spread and smooth the sand would disturb some users as well. Many visitors would seek quieter areas for sunbathing or swimming. As portions of the renourished beaches come available, use by the general public would increase once more. After nourishment of the beach, use by the general public and those who stay at the condominiums and hotels would return to pre-erosion activity levels. The general public would be more inclined to use these beaches rather than by-passing them for others with more sand above the high tide line. There would be a temporary adverse effect on recreational fishing in the immediate area of beach fill operations and at the borrow area due to construction activities and turbidity. Fishing would not be affected outside the area of immediate construction.

5.33 **Effects on Air Quality.** The short-term impact from emissions by the dredge and other construction equipment associated with the project would not significantly impact air quality. The Florida Department of Environmental Protection does not regulate marine or mobile emission sources (dredge and construction equipment) within Brevard County. No air quality permits would be required for this project. Brevard County is designated as an attainment area for Federal air quality standards under the Clean water Act. Since the project is located within an attainment area EPA's General Conformity Rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity determination is not required.

5.34 **Hazardous, Toxic and Radioactive Waste (HTRW) Assessment.** A Phase I Environmental Site Assessment was performed in conformance with ER 1165-2-132 and the scope and limitations of ASTM Practice E 1527. The area involved in the assessment included 24 miles of Brevard County Atlantic Ocean Shoreline located Between FDER monuments R-1 through R-137. This area included the City of Cape Canaveral, Cocoa Beach Satellite Beach, Indian Harbor, Indialantic, and Melbourne Beach. The 4.5 mile of shoreline within Patrick Air Force Base (monuments R-53 through R-76) is not part of the Brevard County Shore Protection Study and was not included in the HTRW assessment. The area assessed was found to be free of hazardous or toxic wastes. A comprehensive record search November 28 through December 2, 1995, consisted of a study of aerial photographs, and interviews. Several aerial photographs were reviewed for the purpose of delineating the actual property for the purpose of detecting any signs that would indicate past activity that could have resulted in the existence of a current hazard. None of the above items revealed any indication of potential HTRW contamination.

5.35 **Energy Requirements and Conservation.** The energy requirements for this construction activity would be confined to fuel for the dredge, labor transportation, and other construction equipment. The no-action alternative would eliminate the energy requirement related implementation of the proposed project. However, it would allow conditions to develop that may endanger coastal property from storm surges and wave erosion during future storm events. On-site preventive measures and post clean-up under the no-action alternative would likely demand greater energy than that required of the proposed action.

5.36 **Natural or Depletable Resources.** The beach quality sand used to construct the project is a depletable resource. Using sand from the proposed borrow area would deplete the sand source at that site. Eventually sand would return to offshore areas and be redistributed over nearshore areas. It is unlikely that the redistributed sand would return to where it was removed, resulting in a depletion of that resource in the borrow area. The gasoline and diesel fuel used by the dredge and other construction equipment is also a depletable resource.

5.37 **Cumulative Impacts**. Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The proposed project would result in long-term benefits which should outweigh any short-term environmental losses. The cumulative impact of shore protection projects along the Florida coast has been to restore and maintain many beaches which otherwise would have experienced severe erosion or would have totally disappeared. In addition, these activities have reduced property damage and helped to maintain property value. Monitoring would be performed to facilitate comparison of pre-project conditions with post-project conditions in order to determine short-term and long-term impacts to the nearshore hardbottom, fishes, benthic infauna, water quality, and sea turtles.

5.38 **Irreversible and Irretrievable Commitment of Resources**. The use of the sand from the proposed borrow area would (for all practical purposes) irreversibly diminish the quantity of suitable sand reserves within the area dredged that could be used for beach renourishment. The sands would not replenish, in sufficient quantity, to use the borrow area again for future nourishment activities. There will however, be sufficient sand remaining in the dredged area for recolonization of benthic organisms. The energy and fuel used during construction would also be an irreversible commitment of resources. Benthic organisms within the borrow area and beach fill area that would be eliminated during construction would be irretrievably lost for a period of time. However, the high rate of repopulation expected from these organisms reduces the significance of the loss.

5.39 **Unavoidable Adverse Environmental Effects**. Some of the relatively non-motile infaunal invertebrates that inhabit the borrow area and the beach sites to be filled would be lost during dredging and beach fill operations. Populations of these organisms are expected to recover within a short time after construction. There would be an unavoidable reduction in water clarity and increased siltation and sedimentation in the immediate dredging and beach fill areas during construction. This impact will be temporary and should disappear shortly after construction activities cease.

6.00 RELATIONSHIP OF THE RECOMMENDED PLAN TO ENVIRONMENTAL REQUIREMENTS. Table 2 shows the relationship of the proposed project to Federal and State environmental laws and other policies.

Table 2. Relationship of the proposed project to Environmental Protection Statutes and Other Environmental Requirements.

Federal Acts	Project Compliance
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 468, et seq. P.L. 93-291	Full Compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq. P.L. 91-604	Full Compliance
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq. P.L. 92-500	Full Compliance
Coastal Barrier Resources Act, 16 U.S.C. 3501, et seq. P.L. 97-348	Full Compliance
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq. P.L. 92-583	Full Compliance
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq. P.L. 93-205	Full Compliance
Estuary Protection Act, 16 U.S.C. 1221, et seq. P.L. 90-454	Full Compliance
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq. P.L. 89-72	Full Compliance
Fish and Wildlife Coordination Act, 48 Stat. 401, as amended, 16 U.S.C. 661, et seq. P.L. 85-624	Full Compliance
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601-4601-11, et seq. P.L. 88-578	Not Applicable
Marine Mammal protection Act, 16 U.S.C. 1361, et seq. P.L. 92-522	Full Compliance
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, et seq. P.L. 92-532	Not Applicable
National Historic Preservation Act, as amended, 16 U.S.C. 470a, et seq. P.L. 89-655	Full Compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq. P.L. 91-190	Full Compliance
River and Harbor Act, 33 U.S.C> 401, et seq.	Full Compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq. P.L. 83-566	Not Applicable
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq. P.L. 90-542	Not Applicable

Executive Orders	
Floodplain Management (E.O. 11988)	Full Compliance
Protection of Wetlands (E.O. 11990)	Full Compliance
Protection and Enhancement of Environmental Quality (E.O. 11514, Amended E.O. 11991)	Full Compliance
Protection and Enhancement of the Cultural Environment (E.O. 11593)	Full Compliance
Federal Compliance with Pollution Control Standards	Full Compliance

Table 2. Relationship of the proposed project to Environmental Protection Statutes and Other Environmental Requirements, continued.

Other Federal Policies	
CEQ Memorandum of August 11, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA	Not Applicable
CEQ Memorandum of August 10, 1980: Interagency Consultation to avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory	Not Applicable
Migratory Bird Treaties and Other International Agreements listed in the Endangered Species Act of 1973, as amended, Section 2(a)(4)	Full Compliance
State Policies	
Florida Coastal Zone Management Program	Full Compliance

Definitions:

Full Compliance: Having met all requirements of the Statute, Executive Order, or other environmental requirements for the current stage of planning (either pre- or post-authorization).

Partial Compliance: Not having met some of the requirements that normally are met in the current stage of planning. Partial compliance entries should be explained in appropriate places in the report and/or Environmental Impact Statement and referenced in the table.

Non-Compliance: Violation of a requirement Statute, Executive Order, or other environmental requirement. Non-compliance entries should be explained in appropriate places in the report and/or Environmental Impact Statement and referenced in the table.

Not Applicable: No requirements for the Statute, Executive Order, or other environmental requirement for the current stage of planning.

7.00 LIST OF PREPARERS.

Name	Discipline/ Expertise	Role in EIS Preparation	Experience
Kenneth R. Dugger	Chief, Environmental Coordination Section	Supervisor	10 years Corps biologist at Savannah & Jacksonville Districts, 5 years Puerto Rico DNR biologist, 2 years EPA biological technician
Michael Dupes	Biology	Biological impact assessment; principle writer	4 years water quality, 10 years Natural Res. Mgmt, 6 years environmental studies; Jacksonville District
Janice E. Adams	Archeology	Historic properties impact assessment	10 years historic properties management
Paul C. Stevenson	Landscape Architect	Aesthetic and recreation analysis	6 years Jacksonville District, 5 years private practice, Registered Landscape Architect - Florida
Peter Besrutschko	Chemical/Environmental Engineering	Water quality and HTRW assessment	4 years production, 5 years design & construction 10 years environmental design and audit
Thomas D. Smith	Coastal Engineering	Technical study manager. Performed engineering design and economic analysis	6 years- engineering, economic analysis, and study management - Jacksonville District. Registered professional engineer, Florida.
Garry Holem	Coastal Geology	Geotechnical analysis of borrow area sands	6 years geotechnical analysis, Jacksonville District

8.00 PUBLIC INVOLVEMENT, REVIEW AND COORDINATION.

8.01 Public involvement for the feasibility phase of the study was initiated with a scoping letter dated October 5, 1994. A Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement (DEIS) was published in the Federal Register on October 24, 1994. The Draft Feasibility Report and DEIS were circulated for agency and public review and comment on May 31, 1996. A Notice of Availibility was published in the Federal Register on June 14, 1996. The public comment period ended on July 29, 1996. All comment letters and other pertinent correspondence concerning the DEIS are included Appendix D of the FEIS.

8.02 Required Coordination. The proposed project has been coordinated with the following agencies: U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Florida State Clearinghouse, Florida State Historic Preservation Officer (SHPO), Florida Department of Environmental Protection, Canaveral Port

Authority, U. S. Navy, and the U.S. Air Force. The comments received from these parties are included in Appendix D. Additional coordination was conducted with the USFWS under the Fish and Wildlife Coordination Act (FWCA) and with USFWS and NMFS under Section 7 of the Endangered Species Act (ESA). Results of this coordination can be found in Appendix C.

8.03 Statement Recipients.

Federal Agencies

Advisory Council on Historic Preservation, Washington, D.C.
Environmental Protection Agency, Washington, D.C.
Environmental Protection Agency, Atlanta, Georgia
Department of the Interior, U.S. Fish and Wildlife Service, Atlanta, Georgia
Department of the Interior, U.S. Fish and Wildlife Service, Jacksonville, Florida
National Marine Fisheries Service, Panama City, Florida
National Marine Fisheries Service, St. Petersburg, Florida
Federal Emergency Management Administration, Atlanta, Georgia
Federal Maritime Commission, Washington, D.C.
U.S. Dept. of Commerce, Director, Ecology and Conservation Office, Washington, D.C.
Housing and Urban Development, Atlanta, Georgia
U.S. Coast Guard, Seventh District, Miami, Florida
U.S. Air Force, Patrick Air Force Base, Florida

State Agencies

Florida State Clearinghouse, Department of Community Affairs, Tallahassee, Florida
Florida Department of Environmental Protection, Florida Marine Institute, Tequesta, Florida
Florida Department of Environmental Protection, Office of Aquatic Preserves, Ft. Pierce, Florida
Florida Department of Environmental Protection, Division of Beaches and Coastal Systems, Tallahassee, Florida
Florida Dept. of Environmental Protection, Bureau of State Lands, West Palm Beach, Florida
Florida Game and Fresh Water Fish Commission, Tallahassee, Florida
Division of Historical Resources, State Historic Preservation Officer, Tallahassee, Florida
St. Johns River Water Management District, Palatka, Florida

Local Agencies

Brevard County Board of County Commissioners, Melbourne, Florida
Brevard County Natural Resources Management Division, Melbourne, Florida

Canaveral Port Authority, Cape Canaveral, Florida
Brevard County Administrator, Melbourne, Florida
Town Manager, Melbourne Beach, Florida
City Manager, Melbourne, Florida
City Manager, Satellite Beach, Florida
City Manager, Cape Canaveral, Florida
Town Manager, Indialantic, Florida
City Manager, Indian Harbour Beach, Florida
City Manager, Cocoa Beach, Florida

Individuals and Interest Groups

Florida Audubon Society, Casselberry, Florida
Isaak Walton League, Palm Beach, Florida
Florida Wildlife Federation, Tallahassee, Florida
Professor John Gifford, Rosenstiel School of Marine and Atmospheric Science, Miami, Florida
Environmental Services, Inc., Jacksonville, Florida
Caribbean Conservation Corporation, Gainsville, Florida

8.04 Results of Coordination. The results of FWCA and ESA coordination are discussed in the appropriate sections of the FEIS. Written comments on the DEIS were received from the following Federal agencies: U.S. Environmental Protection Agency, U.S. Department of Commerce - NOAA (National Marine Fisheries Service and National Geodetic Survey), Department of the Interior (U.S. Fish and Wildlife Service), Department of Health & Human Services, and Department of Housing and Urban Development. State agencies responding to the DEIS include: Department of Community Affairs (State Clearinghouse), Department of Environmental Protection, Florida Game and Fresh Water Fish Commission, Florida Department of State (Division of Historical Resources - SHPO), Department of Transportation, Department of Health and Rehabilitative Services, and St. Johns River Water Management District. Local agencies responding included the Brevard County Office of Natural Resources Management and the City of Melbourne. No individuals or interest groups responded. All letters of comment received on the DEIS have been reproduced and are included in Appendix D.

8.05 The great majority of comments received on the DEIS, from NMFS, USFWS, EPA, FDEP and GFWFC, concerned the burial of approximately 32 acres of nearshore limestone rock crops and scattered patches of worm rock. Adequate mitigation for the loss of these hardground resources was also an issue. To avoid impacting the hardground resources, the recommended plan for the south reach of the project has been modified. The modified plan shortens the length of beach to be filled, thus avoiding the section of shoreline where hardgrounds exist (refer to sections 1.01, 1.02 and 3.07). The modified plan completely avoids any adverse impacts to the nearshore hardgrounds, therefore, mitigation will not be needed.

8.06 The National Geodetic Survey (NGS) was concerned about potential effects the project may have on their horizontal and vertical geodectic control monuments. NGS also indicated that the National Ocean Service (NOS) would require copies of "as built plans" upon project completion in order to revise future editions of NOS nautical charts. During the development of plans and specifications for this project the Corps will coordinate with NGS to identify any control monuments that may be affected. Once the project is constructed the results of post-construction surveys will be provided to NOS to update nautical charts.

8.07 In addition to comments concerning impacts to hardgrounds, EPA had other comments on the feasibility report and DEIS. Corps of Engineers responses to these comments immediately follow EPA's letter in Appendix D.

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INDEX

APPENDIX A

SECTION 404(b) EVALUATION

SECTION 404(b) EVALUATION

BREVARD COUNTY, FLORIDA
SHORE PROTECTION PROJECT REVIEW STUDY

I. Project Description

a. Location. The proposed work will be performed along the Florida Atlantic Coast within Brevard County. The north reach of the proposed project area runs from Florida Department of Environmental Protection (FDEP) monument R-1 through R-53 with a 1,500 foot tapered transition fill extending south of R-53. The north reach includes the City of Cape Canaveral and Cocoa Beach. The south reach extends from R-119 through R-137 and includes the cities of Satellite Beach, Indian Harbour Beach, Indialantic, and Melbourne Beach. Tapered transition fills will extend 1,000 feet north of R-119 and 1,500 feet south of R-137. Refer to location map, figure 1, in the Final Environmental Impact Statement (FEIS).

b. General Description. The proposed plan calls for the nourishment of 12 miles of shoreline along two reaches as identified in 1a, above. Approximately 4,145,000 cubic yards (cy) of sand material will be required for the initial beach fill including the first advance fill. The sand will come from an offshore borrow area.

c. Authority and Purpose. The existing authorized shore protection project for Brevard County was authorized by the River and Harbor Act of August 13, 1968 and described in House Document No. 352, 90th Congress, 2nd Session dated July 8, 1968. The Brevard County Shore Protection Project Review Study is in response to a resolution adopted September 23, 1982 by the Committee on Public Works and Transportation, U.S. House of Representatives.

d. General Description of Dredged or Fill Material.

(1) General Characteristics of Material. The sand that will be used to renourish the beach will come from an offshore borrow area located within the Cape Canaveral shoal system, between 2-3 miles southeast of the cape. The material is poorly graded fine quartz sand with varying amounts of whole and broken shell. The composite mean grain size of the sand is 1.75 phi (0.30mm) with composite sorting of 1.03 or poorly sorted. The average silt content of the borrow area is 5.5 percent. The visual estimates of shell content ranged from 2 to 23 percent with an average of 9 percent.

(2) Quantity of Material. Construction of the north reach (R-1 through R-53 plus transition fill) of the proposed project would require placement of approximately 1,984,000 cy of

initial fill and 516,000 cy of advance material (2,500,000 cy total). Future nourishments of 516,000 cy would be accomplished in 6 year intervals at years 6, 12, 18, 24, 30 and 36. The final nourishment in year 42 would require the placement of 688,000 cy of sand. Construction of the south reach (R-119 through R-137 plus transition fills) would require placement of approximately 1,044,000 cy of initial fill and 601,000 cy of advance material for a total of 1,645,000 cy. Future nourishments of 601,000 cy would be accomplished in 6 year intervals at years 6, 12, 18, 24, 30 and 36. The final nourishment in year 42 would require the placement of 801,000 cy of sand.

(3) Source of Material. Beach compatible material for this project will come from an offshore borrow area located between 2 and 3 miles south east of Cape Canaveral (figure 1 in FEIS). The borrow area is approximately 6000 ft by 6500 in size and lies in 6 to 18 feet of water.

e. Description of the proposed Discharge Site.

(1) Location. The north reach of the project fill is approximately 9.4 miles long and extends from FDEP monument R-1 to about 1,500 feet south of R-53. The south reach of the project is approximately 3.4 miles long and extends from approximately 1,000 feet north of FDEP monument R-119 to about 1,500 south of R-137.

(2) Size. Approximately 322 acres of beach will be filled within the north reach and approximately 217 acres in the south reach.

(3) Type of Site. The site for disposal of the sand material is a segment of eroded, sandy, recreational beach and inshore seabed.

(4) Type of Habitat. The habitat within the disposal area consists of a currently eroding quartz sand beach and inshore seabed.

(5) Timing and Duration of Discharge. The exact time that nourishment activities will occur is not known. However, construction will not occur during the peak sea turtle nesting season between May 1 and October 31. The actual dates of construction will be determined during the process of contractor selection and contract award.

f. Description of Disposal Method. It is anticipated that the material will be obtained from the offshore borrow area either by a hydraulic pipeline dredge pumping directly on the beach, or by a hopper dredge with pumpout capability. However, it is possible that a mechanical (clamshell) dredge loading into a barge with pumpout capability could also be used. Once the material is pumped on the beach, grading will be implemented by the use of conventional earth moving equipment to achieve the desired construction profile.

II. Factual Determinations

a. Physical Substrate Determinations.

(1) Substrate Elevation and Slope. The design berm elevation for both the north and south reaches, is +10.0 feet mean low water (MLW) extending from the shoreward intersection of the existing profile seaward to the location of the pre-project mean high water (MHW) shoreline. At the location of the MHW shoreline, the design template slopes 1 vertical (V) to 15 horizontal (H) seaward to the location of MLW thence 1 V to 50 H out to where it intersects with the existing bottom.

(2) Sediment Type. The material in the offshore borrow area that will be placed on the beach consists of fine quartz sand with calcium carbonate shell fragments.

(3) Dredge/Fill Material Movement. The beach fill material will be subject to erosion by waves with the net movement of fill material to the south.

(4) Physical Effects on Benthos. Some benthic organisms inhabiting the intertidal beach zone will be buried by the beach fill. Benthic organisms found in the intertidal areas along the project beach are adapted for existence in an area with considerable substrate movement, thus most will be able to burrow up through the fill material. Recolonization is expected to occur within a year after construction activities cease. It is anticipated that no long-term adverse impacts will occur.

b. Water Circulation, Fluctuation and Salinity Determination.

(1) Water Column Effects. The placement of fill on the beach will increase turbidity in the nearshore area. Because the immediate nearshore area is a high wave energy system and subject to naturally occurring elevated turbidity, increases due to the project will not be significant. Fill placement will have no long-term or significant impacts, if any, on salinity, water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients or eutrophication.

(2) Current Patterns and Circulation. Currents in the project area are both tidal and longshore. Net movement of water due to the longshore current is from the north to the south. The project will have no significant effect on current patterns or flow, velocity, stratification or the hydrologic regime in the area.

(3) Normal Water Level Fluctuations and Salinity Gradients. Fill placement will not affect normal tide fluctuations or salinity.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site. The project would cause temporary increases in turbidity levels at the borrow area during dredging and along the beach fill sites during discharge. Turbidity will be short-term and localized and no significant adverse impacts are expected. The Florida State water quality standards for turbidity (29 NTU above background) outside an allowable mixing zone will not be exceeded.

(2) Effects on the Chemical and Physical Properties of the Water Column.

(a) Light Penetration. Light penetration will decrease during discharge in the immediate area where sand is being deposited on the beach. There may also be some decrease of light penetration in the vicinity of the borrow area. This effect will be temporary and will have no adverse impact on the environment.

(b) Dissolved Oxygen. Dissolved oxygen levels will not be altered by this project due to the high energy wave environment and associated adequate reaeration rates.

(c) Toxic Metals, Organics, and Pathogens. Because of the inert characteristics of the material to be dredged and placed on the beach, no toxic metals, organics, or pathogens are expected to be released by the project.

(d) Aesthetics. The aesthetic quality of the water adjacent to the project will be reduced during construction due to increased turbidity. This will be a short-term temporary condition. The placement of clean beach compatible material on an erosive beach will likely improve the aesthetic quality of the immediate area.

(3) Effects on Biota.

(a) Primary Productivity and Photosynthesis. Primary productivity is not a recognized, significant phenomenon in the surf zone, where a temporarily increased level of suspended particulates will occur. There will be no effect on the nearshore productivity as a result of the proposed beach fill.

(b) Suspension/Filter Feeders. An increase in turbidity could adversely impact burrowing invertebrate filter feeders along the beach fill area. It is not expected that a short-term, temporary increase in turbidity will have any long-term negative impact on these highly fecund organisms.

(c) Sight Feeders. No significant impacts on these organisms are expected as the majority of sight feeders are highly motile and can move outside the project area.

d. Contaminant Determinations. Deposited fill material will not introduce, relocate, or increase contaminants. The material to be dredged is clean sand compatible with the existing beach. An initial Hazardous Toxic and Radioactive Waste (HTRW) assessment for the area has indicated that there is no potential for HTRW problems.

e. Aquatic Ecosystem and Organism Determinations. The fill material that will be placed on the beach will consist of quartz sand with some shell that is similar enough to the existing substrate so that no impacts are expected. The materials meet the exclusion criteria, therefore, no additional chemical-biological interactive testing will be required.

(1) Effects on Plankton. No adverse impacts on autotrophic or heterotrophic organisms are anticipated.

(2) Effects on Benthos. There may be some mortality of benthic infauna along the beach fill area and within the area that is dredged. Recolonization of these organisms are expected within one year after construction. No adverse long-term impacts to non-motile or motile benthic invertebrates are anticipated.

(3) Effects on Nekton. No adverse impacts to nektonic species are anticipated.

(4) Effects on the Aquatic Food Web. No adverse long-term impact to any trophic group in the food web is anticipated.

(5) Effects on Special Aquatic Sites.

(a) Hardground and Coral Reef Communities. No hardground or coral reef communities exist within the area proposed for beach fill.

(6) Endangered and Threatened Species. There will be no significant adverse impacts on any threatened or endangered species or on critical habitat of any threatened or endangered species. Both the National Marine Fisheries Service and the U. S. Fish and Wildlife Service have been consulted under Section 7 of the Endangered Species Act. Project construction will not occur during the main part of the sea turtle nesting season (May 1 through October 31). If construction takes place during the early or late part of the nesting and hatching season, a nest relocation program will be implemented. All sea turtle nests discovered within the beach disposal area will be removed and relocated to a nearby self-release beach hatchery. All relocation and incubation efforts will conform to the guidelines in the "Manual of Sea Turtle Research and Conservation Techniques", Second Edition, 1983, prepared for the Western

Atlantic Sea Turtle Symposium and distributed by the Florida Department Environmental Protection.

(7) Other Wildlife. No adverse impacts to small foraging mammals, reptile, or wading birds are expected.

(8) Actions to Minimize Impacts. All practical safeguards will be taken during construction to preserve and enhance environmental, aesthetic, recreational, and economic values in the project area. Specific precautions are discussed elsewhere in this 404(b) evaluation and in the FEIS for this project.

f. Proposed Disposal Site Determinations.

(1) Mixing Zone Determination. Clean sand, compatible with the existing beach, would be placed on the beach. This will not cause unacceptable changes in the mixing zone water quality requirements as specified by the State of Florida's Water Quality Certification permit procedures. No adverse impacts related to depth, current velocity, direction and variability, degree of turbulence, stratification, or ambient concentrations of constituents are expected from implementation of the project.

(2) Determination of Compliance with Applicable Water Quality Standards. Because of the inert nature of the fill material, Class III water quality standards will not be violated.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supplies. No municipal or private water supplies will be impacted by the implementation of the project.

(b) Recreational and Commercial Fisheries. Fishing in the immediate beach disposal area will be prohibited during construction. Otherwise, recreational and commercial fisheries will not be impacted by the disposal of dredged material on the beach or by dredging construction activities within the borrow area.

(c) Water Related Recreation. Beach/water related recreation in the immediate vicinity of the beach fill will be prohibited during construction activities. This will be a short-term impact. Water related recreation will be preserved and enhanced by the nourishment of the beach.

(d) Aesthetics. The existing environmental setting will not be adversely impacted. The disposal of sand on the beach will maintain a natural appearing protective beach. Construction activities will cause a temporary increase in noise and air pollution caused by equipment as well as some temporary increase in turbidity. These impacts are not expected to adversely affect the aesthetic resources over the long term and once construction ends, conditions will return to pre-project levels.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. No such designated sites are located within the project area.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. There will be no cumulative impacts that result in a major impairment of water quality of the existing aquatic ecosystem as a result of the placement of fill at the project site.

h. Determination of Secondary Effects on the Aquatic Ecosystem. There will be no secondary impacts on the aquatic ecosystem as a result of the beach nourishment project.

III. Findings of Compliance or Non-compliance with the Restrictions on Discharge.

a. No significant adaptations of the guidelines were made relative to this evaluation.

b. No practicable alternative exists which meets the study objectives that does not involve discharge of fill into waters of the United States.

c. After consideration of disposal site dilution and dispersion, the discharge of fill materials will not cause or contribute to, violations of any applicable State water quality standards for Class III waters. The discharge operation will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

d. The disposal of beach compatible material on the beach will not jeopardize the continued existence of any species listed as threatened or endangered or result in the likelihood of destruction or adverse modification of any critical habitat as specified by the Endangered Species Act of 1973, as amended.

e. The placement of fill material will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic species and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values will not occur.

f. On the basis of the guidelines, the proposed disposal site for the discharge of dredged material is specified as complying with the requirements of these guidelines.

APPENDIX B

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM
FEDERAL CONSISTENCY DETERMINATION

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM
FEDERAL CONSISTENCY EVALUATION PROCEDURES

BREVARD COUNTY, FLORIDA
SHORE PROTECTION PROJECT REVIEW STUDY

1. Chapter 161, Beach and Shore Preservation.

The intent of the coastal construction permit program established by this chapter is to regulate construction projects located seaward of the line of mean high water and which might have an effect on natural shoreline processes.

Response: The proposed plans and information will be submitted to the state in compliance with this chapter.

2. Chapters 186 and 187, State and Regional Planning.

These chapters establish the State Comprehensive Plan which sets goals that articulate a strategic vision of the State's future. It's purpose is to define in a broad sense, goals, and policies that provide decision-makers directions for the future and provide long-range guidance for an orderly social, economic and physical growth.

Response: The proposed project has been coordinated with various Federal, State and local agencies during the planning process. The project meets the primary goal of the State Comprehensive Plan through preservation and protection of the shorefront development and infrastructure.

3. Chapter 252, Disaster Preparation, Response and Mitigation.

This chapter creates a state emergency management agency, with the authority to provide for the common defense; to protect the public peace, health and safety; and to preserve the lives and property of the people of Florida.

Response: The proposed project involves the placing of beach compatible material onto an eroding beach as a protective means for residents, development and infrastructure located along the Atlantic shoreline within Brevard County. Therefore, this project would be consistent with the efforts of Division of Emergency Management.

4. Chapter 253, State Lands.

This chapter governs the management of submerged state lands and resources within state lands. This includes archeological and historical resources; water resources; fish and wildlife resources; beaches and dunes; submerged grass beds and other benthic communities; swamps, marshes and other wetlands; mineral resources; unique natural features; submerged lands; spoil islands; and artificial reefs.

Response: The proposed beach nourishment would create increased recreational beach and potential sea turtle nesting habitat. No seagrass beds are located within the area proposed to receive fill. The proposed project would comply with the intent of this chapter.

5. Chapters 253, 259, 260, and 375, Land Acquisition.

This chapter authorizes the state to acquire land to protect environmentally sensitive areas.

Response: Since the affected property already is in public ownership, this chapter does not apply.

6. Chapter 258, State Parks and Aquatic Preserves.

This chapter authorizes the state to manage state parks and preserves. Consistency with this statute would include consideration of projects that would directly or indirectly adversely impact park property, natural resources, park programs, management or operations.

Response: The proposed project area does not contain any state parks or aquatic preserves nor are there any within the immediate vicinity of the project that would be affected. The project is consistent with this chapter.

7. Chapter 267, Historic Preservation.

This chapter establishes the procedures for implementing the Florida Historic Resources Act responsibilities.

Response: This project has been coordinated with the State Historic Preservation Officer (SHPO). Cultural resources investigations were conducted in the project area. An archival and literature search, in addition to a magnetometer survey of the proposed borrow area were conducted. The SHPO has indicated that the proposed project will not adversely affect any significant cultural or historic resources. The project will be consistent with the goals of this chapter.

8. Chapter 288, Economic Development and Tourism

This chapter directs the state to provide guidance and promotion of beneficial development through encouraging economic diversification and promoting tourism.

Response: The proposed beach nourishment would provide more space for recreation and the protection of recreational facilities along the receiving beach. This would be compatible with tourism for this area and therefore, is consistent with the goals of this chapter.

9. Chapters 334 and 339, Public Transportation.

This chapter authorizes the planning and development of a safe balanced and efficient transportation system.

Response: No public transportation systems would be impacted by this project.

10. Chapter 370, Saltwater Living Resources.

This chapter directs the state to preserve, manage and protect the marine, crustacean, shell and anadromous fishery resources in state waters; to protect and enhance the marine and estuarine environment; to regulate fishermen and vessels of the state engaged in the taking of such resources within or without state waters; to issue licenses for the taking and processing products of fisheries; to secure and maintain statistical records of the catch of each such species; and, to conduct scientific, economic, and other studies and research.

Response: The proposed beach fill may represent a temporary short-term impact to infaunal invertebrates by burying these organisms. However, these organisms are highly adapted to the periodic burial by sand in the intertidal zone. These organisms are highly fecund and are expected to return to pre-construction levels within 6 months to one year after construction. Nourishment activities would not be performed during the main part of the sea turtle nesting season. It is not expected that sea turtles would be significantly impacted by this project. Based on the overall impacts of the project, the project is consistent with the goals of this chapter.

11. Chapter 372, Living Land and Freshwater Resources.

This chapter establishes the Game and Freshwater Fish Commission and directs it to manage freshwater aquatic life and wild animal life and their habitat to perpetuate a diversity of species with densities and distributions which provide sustained ecological, recreational, scientific, educational, aesthetic, and economic benefits.

Response: The project will have no effect on freshwater aquatic life or wild animal life.

12. Chapter 373, Water Resources.

This chapter provides the authority to regulate the withdrawal, diversion, storage, and consumption of water.

Response: This project does not involve water resources as described by this chapter.

13. Chapter 376, Pollutant Spill Prevention and Control.

This chapter regulates the transfer, storage, and transportation of pollutants and the cleanup of pollutant discharges.

Response: The contract specifications will prohibit the contractor from dumping oil, fuel, or hazardous wastes in the work area and will require that the contractor adopt safe and sanitary measures for the disposal of solid wastes. A spill prevention plan will be required.

14. Chapter 377, Oil and Gas Exploration and Production.

This chapter authorizes the regulation of all phases of exploration, drilling, and production of oil, gas, and other petroleum products.

Response: This project does not involve the exploration, drilling or production of gas, oil or petroleum product and therefore, this chapter does not apply.

15. Chapter 380, Environmental Land and Water Management.

This chapter establishes criteria and procedures to assure that local land development decisions consider the regional impact nature of proposed large-scale development.

Response: The proposed renourishment project will not have any regional impact on resources in the area. Therefore, the project is consistent with the goals of this chapter.

16. Chapter 388, Arthropod Control.

This chapter provides for a comprehensive approach for abatement or suppression of mosquitoes and other pest arthropods within the state.

Response: The project will not further the propagation of mosquitoes or other pest arthropods.

17. Chapter 403, Environmental Control.

This chapter authorizes the regulation of pollution of the air and waters of the state by the Florida Department of Environmental Regulation (now a part of the Florida Department of Environmental Protection).

Response: A Final Environmental Impact Statement addressing project impacts has been prepared and will be reviewed by the appropriate resource agencies including the Florida Department of Environmental Protection. Environmental protection measures will be implemented to ensure that no lasting adverse effects on water quality, air quality, or other environmental resources will occur. Water Quality Certification will be sought from the State prior to construction. The project complies with the intent of this chapter.

18. Chapter 582, Soil and Water Conservation.

This chapter establishes policy for the conservation of the state soil and water through the Department of Agriculture. Land use policies will be evaluated in terms of their tendency to cause or contribute to soil erosion or to conserve, develop, and utilize soil and water resources both onsite or in adjoining properties affected by the project. Particular attention will be given to projects on or near agricultural lands.

Response: The proposed project is not located near or on agricultural lands; therefore, this chapter does not apply.

APPENDIX C

U.S. FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE COORDINATION ACT REPORT
AND ENDANGERED SPECIES ACT BIOLOGICAL OPINION

NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT REGIONAL BIOLOGICAL OPINION
FOR HOPPER DREDGING OF CHANNELS AND BEACH NOURISHMENT
ACTIVITIES IN THE SOUTHEASTERN UNITED STATES FROM
NORTH CAROLINA THROUGH FLORIDA EAST COAST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive, South
Suite 310
Jacksonville, Florida 32216-0912

IN REPLY REFER TO:

DEC 07 199[illegible]

A.J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

In accordance with the Fiscal Year 1995 Transfer Fund Agreement between the Fish and Wildlife Service and the Jacksonville District Corps of Engineers, this letter transmits the Final Coordination Act Report and Biological Opinion on the proposed Brevard County Shore Protection Project, Brevard County, Florida.

Copies of the final are also being sent to the National Marine Fisheries Service, the Florida Department of Environmental Protection, Indian River Lagoon National Estuary Program, Florida Game and Freshwater Fish Commission, the Brevard County Environmental Division, Dr. L. Erhart (UCF), and Dr. W. Nelson (FIT).

If you have a question, please contact Deborah Manz in this office (904-232-2580).

Sincerely,

Michael M. Bentzien
Assistant Field Supervisor

cc:
Brevard County
FDEP
FFFG
IREP
NMFS
Dr. L. Ehardt (UNF)
Dr. W. Nelson (FIT)
File (with pictures)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

Colonel James H. Simms, USA
Acting Commander
South Atlantic Division, Corps of Engineers
Room 313, 77 Forsyth St., S.W.
Atlanta, Georgia 30335-6801

AUG 25 1995

Dear Colonel Simms:

Enclosed is the biological opinion that concludes formal Endangered Species Act Section 7 consultation on hopper dredging of channels and beach nourishment activities in the southeastern United States from North Carolina through Florida East Coast. The National Marine Fisheries Service (NMFS) concurs with COE findings that dredging windows and further development of the rigid draghead deflector reduces the effects of hopper dredging on sea turtle species, while allowing dredging to continue. As you know, this consultation supersedes a previous regional opinion issued to the COE South Atlantic Division (SAD) on channel dredging in which NMFS found that continued hopper dredging activity in southeast channels along the Atlantic Coast was likely to jeopardize the continued existence of the Kemp's ridley sea turtle (November 25, 1991). The reasonable and prudent alternative issued with the 1991 opinion included the prohibition of hopper dredging in the Canaveral channel, seasonal restrictions which allowed hopper dredging from December through March in channels from North Carolina through Canaveral, or use of other dredges in all southeastern U.S. channels. Since the implementation of this alternative in the winter of 1991, only 14 takes of sea turtles, including three live turtles, have been documented on board hopper dredges in channels along the southeastern U.S. Atlantic Coast.

The Incidental Take Statement, reasonable and prudent measures, and conservation recommendations listed in the enclosed opinion have been discussed with the COE's SAD staff. Of note, hopper dredging windows are modified from the windows established in 1991 and observer requirements have been expanded to incorporate beach nourishment activities. The continued deployment of observers, and participation in the Right Whale Early Warning System, are also listed requirements within this biological opinion. Please note that the authorization for this incidental take expires August 5, 2000. In addition, consultation must be reinitiated when 75% of the authorized incidental take is reached.

Hopper dredging in Cape Canaveral, Florida is not considered under this consultation since turtle concentrations in Canaveral remain high year-round. Projects requiring the use of a hopper dredge in Canaveral will require further, project-specific, consultation.

Much of the new information considered in the enclosed opinion was the result of extensive research efforts recently concluded by COE in six southeast channels: Morehead City Harbor entrance channel, Charleston Harbor entrance channel, Savannah Harbor entrance channel, Brunswick Harbor entrance channel, Fernandina Harbor-St. Marys River entrance channel, and the Canaveral Harbor entrance channel. The results of this research support some modifications to previous seasonal restrictions for hopper dredging in these channels. Additionally, a draghead deflector has been developed that has shown promising results during preliminary tests and field application.

Through an extensive sea turtle research program and participation on the Right Whale Recovery Plan Implementation Team, the COE's SAD has become a leader among Federal action agencies in the southeast region in endangered species research and conservation. We look forward to continued cooperative efforts with your division.

Sincerely,

William W. Fox, Jr., Ph.D.
Director
Office of Protected Resources

Enclosure

cc: ACOE Charleston District, Col. George Hazel
Wilmington District, Col. Robert Sperperg
Savannah District, William Bailey
Jacksonville District, A. J. Salem
F/SE013 - Oravetz

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency: U.S. Army Corps of Engineers, South Atlantic Division

Activity: Hopper dredging of channels and beach nourishment activities in the Southeastern United States from North Carolina through Florida East Coast

Consultation Conducted By: National Marine Fisheries Service, Southeast Regional Office

Date Issued: August 25, 1995

BACKGROUND

The U.S. Army Corps of Engineers (COE) has primary responsibility for maintaining navigational channels in U.S. waters. To accomplish this task, dredging is periodically required. A variety of dredge types and techniques are employed on a channel-specific basis, dependent upon the characteristics of channels, availability of disposal sites, local environmental regulations, types of material to be removed, proposed timing of the dredging, etc. In the southeastern United States, at least three types of dredges (hopper dredges, clamshell dredges, and pipeline dredges) are commonly used.

In addition, Congress has mandated that the COE provide periodic beach nourishment to certain beaches in the southeastern U.S. that suffer severe erosion rates. Nourishment activities consist of dredging coarse high-quality sand from offshore borrow areas then pumping the material onshore.

A formal consultation conducted on dredging and beach nourishment operations from North Carolina through Cape Canaveral, Florida, in 1991, and incorporated by reference, concluded that clamshell and pipeline dredges were not likely to adversely affect listed species. There is no new information to change the basis for that finding. Lethal takes of sea turtles by hopper dredges have been documented, however, and consultations on takes have been conducted since 1980.

Previous Consultations

Consultation on the effects of hopper dredging in the Canaveral ship channel was initiated in August 1978, after NMFS trawl surveys verified reports of high turtle abundance in the channel. On March 30, 1979, NMFS issued a biological opinion based on a threshold examination of the situation. This opinion concluded that insufficient information existed to determine whether or not dredging was likely to jeopardize the continued existence of sea turtles. Through agreement with the COE and the U.S. Navy, trawl surveys were implemented to further assess turtle abundance and distribution in the channel.

On January 22, 1980, the National Marine Fisheries Service (NMFS) issued a biological opinion concluding that "dredging may result in the loss of large numbers of loggerhead sea turtles but is not likely to result in jeopardizing either the loggerhead or Atlantic ridley sea turtle stocks." This opinion recommended that NMFS-approved observers be placed aboard hopper dredges in the Canaveral channel to monitor turtle take, and that dredging be restricted to the period of August 1 through November 1. No evidence of turtle take by hopper dredges existed at this point, but the potential for take was recognized.

A total of 71 turtle takes by hopper dredges were documented in the Canaveral channel over the period of July 11 through November 13, 1980. These takes were considered minimum estimates of mortality due to restrictions inherent in observing turtles within the dredged material. From 1980 through 1986, NMFS, the COE, and the U.S. Navy continued efforts to reduce or eliminate turtle take by hopper dredges in the Canaveral entrance channel. Efforts included attempts to scare turtles out of the channel, detect and capture turtles, remove and relocate turtles, and deflect turtles from the draghead. No acceptable means of eliminating the take of sea turtles by hopper dredges was identified, and take of sea turtles continued.

Trawl surveys of five east coast channels, conducted during 1981 and 1982 (Butler _et al_., 1987), indicated that these channels did not contain sea turtles at abundances approaching those observed in Canaveral. One or two turtles were collected in each of the surveyed channels, while hundreds were caught in the Canaveral channel. Because NMFS had no information to suggest that turtle takes in other channels was significant, additional channel surveys were not required, and the Canaveral hopper dredging project was treated as a unique problem.

In 1986, the U.S. Navy reinitiated Endangered Species Act (ESA) Section 7 consultation on Kings Bay, Georgia, channel dredging. The scope of the project involved widening and deepening existing channels and extension of the channel approximately 14 miles. The Navy proposed to implement sea turtle conservation measures including observer coverage, screening of the dredge, and a stand-by trawler to catch and remove turtles, if necessary. From July 1987 through December 1989, a total of 21 turtles were taken during hopper dredging operations in the Kings Bay project.

Turtle take by hopper dredges in Kings Bay resulted in major changes in NMFS policy on channel dredging. This was the first documented take of turtles by hopper dredges anywhere other than in the Canaveral channel. Additionally, while takes in Canaveral were confined to loggerhead turtles, Kings Bay takes included three endangered Kemp's ridley turtles and three endangered green turtles. NMFS began to consider the additive consequences of hopper dredging along the southeast coast.

The Jacksonville District COE and the COE Waterways Experiment Station jointly sponsored a May 11-12, 1988, "National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles," held in Jacksonville, Florida. This workshop brought together representatives of the COE, NMFS, the U.S. Navy, the dredging industry and the environmental community to discuss the dredging/sea turtle conflict. In a July 8, 1988, letter from the Assistant Administrator for Fisheries to the Acting Commander of the COE, NMFS applauded the COE efforts in sponsoring the workshop and advised the COE of agency plans to assess the cumulative impacts to sea turtles of dredging in channels other than Canaveral. Formal consultation was requested for all areas in which hopper dredging was proposed, and observers were required on 25-100 percent of all hopper dredging activities in Brunswick, Savannah, and Wilmington Harbor dredging projects.

Consultation was reinitiated in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles, during hopper dredging in Brunswick and Savannah channels. The biological opinion, issued November 25, 1991, found that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. A reasonable and prudent alternative was given which included the prohibition of hopper dredging in the Canaveral channel, seasonal restrictions which allowed hopper dredging from December through March in channels from North Carolina through Canaveral, or use of alternative dredges in all southeastern U.S. channels.

The reasonable and prudent alternative issued in the 1991 biological opinion has proven very effective in reducing sea turtle captures. Since the implementation of the measures of the 1991 biological opinion, only 14 takes of sea turtles, includfng three live turtles, have been documented on board hopper dredges in channels along the southeastern U.S. Atlantic coast.

The COE has recently concluded extensive research in six southeast channels: Morehead City Harbor entrance channel, Charleston Harbor entrance channel, Savannah Harbor entrance channel, Brunswick Harbor entrance channel, Fernandina Harbor - St. Marys River entrance channel, and the Canaveral Harbor entrance channel. Seasonal restrictions were supported by the research; however, refinements in the restrictions due to new, more precise information were requested in the COE request for a new consultation, dated November 8, 1994. Additionally, a draghead deflector has been developed that has shown promising results in preliminary tests.

PROPOSED ACTIVITY

This consultation addresses COE channel dredging activities along the southeastern Atlantic seaboard from North Carolina through Key West, Florida (see Figure 1 from COE's Biological Assessment submitted November 8, 1994). This includes maintenance dredging, new construction dredging, and beach nourishment activities. A summary of major channel dredging projects in which hopper dredges are normally used include: Oregon Inlet, Morehead City, and Wilmington Harbor in North Carolina; Charleston and Port

Royal in South Carolina; Savannah, Brunswick, and Fernandina-St. Marys in Georgia (King's Bay); Jacksonville, St. Augustine, Ponce Inlet, Canaveral, West Palm Beach, and Miami in Florida.

Information on the timing and amount of materials removed during past hopper dredging projects in these channels was provided in the Biological Assessment (COE, November 8, 1994). Generally, the COE has asked that channel hopper dredging windows specified in the 1991 biological opinion be modified from no hopper dredging in Canaveral and dredging in other regional channels from December through March to:

HOPPER DREDGING IN SOUTH ATLANTIC DIVISION

LOCATION	HOPPER DREDGING WINDOW[1]	INCIDENTAL TAKE MONITORING[2]
North Carolina to Pawles Island, S.C.	Year Round	1 May - 1 Nov
Pawles Island, S.C. to Tybee Island, Ga.	1 Nov - 31 May	1 Nov - 1 Jan 1 Apr - 31 May
Tybee Island, Ga. to Titusville, Fla.	15 Dec - 1 May	15 Dec - 1 Jan 15 Mar - 1 May
Titusville, Fla. to Key West, Fla.	Year Round[3]	Year Round

1 Applies to all hopper dredging along South Atlantic Coast. Use of sea turtle deflecting draghead is required unless waiver is granted by CESAD.

2 For navigation projects this requires inflow screens and NMFS approved observers. For beach nourishment projects this can be accomplished by either monitoring the beach or use of observers and screens on the hopper dredge.

3 Use of hopper dredging at Canaveral Navigation Channel will be restricted to those times when there is an urgent need for this type of equipment.

During a meeting between the COE and NMFS in February 1995, it was determined that the impacts of beach nourishment activities along the southeastern U.S. Atlantic coast should also be considered in this biological opinion. Therefore, projects being considered in this consultation include those listed in the Biological Assessment submitted on November 8, 1994, as well as channels south of Canaveral, and beach nourishment activities along the southeastern U.S. Atlantic coast in which hopper dredges may be used. Specific projects which have been considered in ongoing consultations include: Palm Beach Harbor maintenance dredging; the Fort Pierce Harbor entrance channel and turning basin; and the Dade County Beach Erosion Control Project at the northern end of Sunny Isles.

LISTED SPECIES AND CRITICAL HABITAT

Listed species under the jurisdiction of the NMFS that may occur in channels along the southeastern United States and which may be affected by dredging include:

THREATENED:
(1) the threatened loggerhead turtle - *Caretta caretta*

ENDANGERED:
(1) the endangered right whale - *Eubalaena glacialis*
(2) the humpback whale - *Megaptera novaeangliae*
(3) the endangered/threatened green turtle - *Chelonia mydas*
(4) the endangered Kemp's ridley turtle - *Lepidochelys kempii*
(5) the endangered hawksbill turtle - *Eretmochelys imbricata*
(6) the endangered shortnose sturgeon - *Acipenserbrevirostrum*

Green turtles in U.S. waters are listed as threatened, except for the Florida breeding population which is listed as endangered.

Information on the biology and distribution of these species was given in the 1991 biological opinion, and is incorporated by reference. Channel-specific information has been collected by COE for channels at Morehead City, Charleston, Savannah, Brunswick, Fernandina and Canaveral, and is presented in detail in the COE summary report entitled "Assessment of Sea Turtle

Abundance in Six South Atlantic US Channels" (Dickerson et al., 1994) and in the COE Biological Assessment. New information is included below.

Additional endangered species which are known to occur along the Atlantic coast include the finback (Balaenoptera physalus), the sei (Balaenoptera borealis), and sperm (Physeter macrocephalus) whales and the leatherback sea turtle (Dermochelys coriacea). NMFS has determined that these species are unlikely to be adversely affected by hopper dredging activities.

PROPOSED, THREATENED:
(1) Johnson's seagrass - Halophila johnsonii

According to federal regulations (50 CFR Section 402.10), a conference is required if a planned federal action is likely to jeopardize the continued existence of a proposed species. At this time, NMFS is unable to make a determination on the collective effects of hopper dredging in and adjacent to channels in which Johnson's seagrass occurs. The COE should develop estimates of annual take of seagrass anticipated by projects within Florida's intracoastal waterways within Johnson's seagrass habitat. Consideration of impacts to H. johnsonii should continue on a project-by-project basis until collective impacts have been estimated and/or listing has been finalized.

ASSESSMENT OF IMPACTS

Sturgeon

Table 1, taken from the February 6, 1995 draft Shortnose Sturgeon Recovery Plan (NMFS, 1995), gives the current, best available information on the distribution and abundance of shortnose sturgeon. South of the Chesapeake Bay, there is inadequate information to estimate the shortnose sturgeon population size in most rivers. Low abundance estimates have been made for the Ogeechee and Altamaha rivers.

Generally in southern rivers, adult sturgeon remain in estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. Embryos produced tend to remain in areas of irregular bottom, where they appear to seek cover. Juveniles, like adults, occur primarily at the interface between salt and freshwater. Recent observations suggest that salinity levels greater then seven ppt are harmful (Smith et al., 1992). In the Savannah River, shortnose sturgeon are found over sand/mud substrate in 10-14 m. depths (Hall et al., 1991). Spawning occurs in upstream channels of the Savannah, where the substrate consists of gravel, sand and logs (Hall et al., 1991). Shortnose sturgeon feed on crustaceans, insect larvae, and molluscs (NMFS, 1995).

Impacts of hopper dredging on sturgeon

NMFS believes that shortnose sturgeon may be adversely affected by hopper dredging within some channels and seasons. While endangered species observers on hopper dredges have documented the take of Atlantic sturgeon, no take of a shortnose sturgeon has been observed. Sturgeon may be encountered in channels north of Pawles Island, South Carolina, where dredging may be conducted year-round. Winter windows south of Pawles, however, will reduce the period in which shortnose sturgeon may be impinged. Adult sturgeon may occur in estuarine and tidal waters until February, when they migrate upstream to spawn. Salinity ranges favorable to adults and juveniles can exist in inner harbors during fall months. Use of the rigid draghead deflector developed to reduce the likelihood of incidental take of sea turtles by hopper dredges may also reduce the take of shortnose sturgeon. The impacts on small juveniles, larvae, and eggs, by other suction dredge types used upriver, will be considered on a case-by-case basis.

In addition to the possibility of a direct take of sturgeon, maintenance dredging by all dredge types has likely reduced foraging areas within dredged channels, since inter-dredging periods may be too brief to allow forage species to re-establish. Current primary foraging habitat is thought to occur outside of dredged channels.

Shortnose sturgeon are not likely to be affected by beach nourishment activities.

Sea Turtles

Precise data regarding the total number of sea turtles in waters of the southeastern U.S. Atlantic are not available. Trends in turtle populations are identified through monitoring of their most accessible life stages on the nesting beaches, where hatchling production and the number of nesting females can be directly measured. Figures 2 through 4 illustrate loggerhead, green and Kemp's ridley nesting trends at regularly monitored nesting beaches.

Index nesting beaches on which data collection methods and effort were standardized were established in Florida in 1989. Over 90 percent of all U.S. loggerhead nests occur in Florida, and over 80 percent of these are within indexed beaches (B. Schroeder, pers comm). During the six years monitored in this standardized manner, illustrated in Figure 2, loggerhead nesting appears to be stable. All green turtle nests in the United States occur in Florida, and most occur on index beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring (Figure 3).

The abundance of ridleys nests in Rancho Nuevo, Mexico, have been increasing since 1987 (Figure 4). Over 1500 nests were observed during the 1994 nesting season, representing the highest nesting year since monitoring was initiated in 1978. While these data need to be interpreted cautiously due to expanded monitoring efforts since 1990, up to 110,000 hatchlings were released from Rancho Nuevo during 1994, compared to 50,000 to 80,000 over the previous five to six years (Byles, pers comm).

Stranding data are generally believed to reflect the nearshore distribution of sea turtles (Figure 5). The use of turtle excluder devices (TEDs) in shrimp trawls is likely responsible for the sharp decrease in strandings after 1990 through a reduction in mortality resulting from incidental capture in shrimp trawls. While TEDs were required seasonally in most areas during much of 1990, compliance was poor until 1991. Since 1991, documented strandings of loggerheads were steady, while green turtle strandings increased in 1994 and ridleys in 1993 and 1994. Factors that may be affecting the distribution and abundance of sea turtles and turtle mortalities (ie. the distribution of strandings) include: vessel activity, fishery operations, and environmental factors such as storms, temperature changes, and eutrophication events.

The data suggest that green and Kemp's ridley turtle populations may be rising. While this supports cautious optimism, the numbers are well below recovery criteria established in the recovery plans.

Impacts of hopper dredging on sea turtles

Channels

NMFS believes that hopper dredging activities in the southeastern United States may adversely affect the endangered Kemp's ridley and Florida green turtles and the threatened loggerhead turtle. While hawksbill turtles likely occur infrequently in ship channels, they may be present during beach nourishment activities in areas near or between hard-bottom reefs.

Past maintenance dredging in the southeastern United States has been demonstrated to adversely affect sea turtles. The biological opinion issued in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles during hopper dredging in Brunswick and Savannah channels, concluded that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. Takes of 225 sea turtles had been documented since 1980 in southeast channels, including 22 turtles that were alive when found. The COE's strict adherence to the measures included in the 1991 biological opinion, including a prohibition of hopper dredging in Canaveral and seasonal restrictions on hopper dredging from North Carolina through the Canaveral ship channel, has greatly reduced the rate of sea turtle takes by hopper dredges. Only 14 sea turtle takes have been documented in hopper dredges since 1991, including three turtles that were alive when collected.

The COE conducted a comprehensive research program, beginning in 1991, to investigate the occurrence of sea turtles in six southeast channels to determine seasonal abundance, as well as spatial distribution within the channel and within the water column. Monthly surveys were conducted in Canaveral, Kings Bay, Brunswick, Savannah, Charleston, and Morehead City channels. The

Canaveral surveys supplement surveys conducted by NMFS and the COE since 1978.

Briefly, the surveys found the following: In areas where sea turtles occur, moderate to high abundance can be expected when water temperature is greater than or equal to 21 degrees C. Lower abundances were observed when temperatures were less than 16 degrees C. Other workers have observed sea turtles in waters as low as 8 degrees C, sometimes for extended periods (Morreale, pers comm 1993). Loggerheads, primarily adults, were the most abundant turtle captured (n = 645), although some Kemp's ridleys (n = 20) and green turtles (n = 5) were also taken. Juveniles of all species were observed, although only a few juvenile loggerheads were encountered in Canaveral. As documented in previous surveys, the Canaveral ship channel supports aggregations of sea turtles during all months of the year and, particularly during cooler winter months (Henwood, 1987; Butler et al., 1987; Henwood and Ogren, 1987). North of Canaveral, turtles were seasonally abundant, with lower numbers from December through February. Recaptures of relocated sea turtles suggest some site fidelity, and the effectiveness of relocation efforts appeared to be related to the distance of relocation. Catch per unit effort (CPUE) in the surveyed channels, for all seasons cumulatively, was: Canaveral, 1.43 turtles per hour; Kings Bay, 0.571 turtles per hour; Brunswick Harbor, 0.489 turtles per hour; Charleston Harbor, 0.206 turtles per hour; and Morehead City Harbor, 0.025 turtles per hour.

As a result of observed CPUE, which were generally lower during cool water periods in the northern channels, the COE has asked NMFS to relax dredging windows to allow year-round dredging north of Pawles Island, South Carolina (which includes the ship channels at Oregon Inlet, Morehead City and Wilmington), and between November and May 31 from Tybee Island, Georgia through Pawles Island (including Charleston, Port Royal and Savannah channels). In recent years, the COE SAD has shown a willingness to cease dredging in channels in which take rates exceed those anticipated, despite the fact that the incidental take level was not approached. Given the COE's conservative record in these channels, and the great reduction in takes observed under current dredging windows, NMFS concurs that some expansion of hopper dredging windows, with requirements for observers and use of the rigid draghead deflector, may result in sea turtle takes, but is not likely to jeopardize the continued existence of any sea turtle species.

Beach Nourishment Activities

There has been increasing concern regarding the effects of hopper dredging during beach nourishment activities along the southeastern U.S. coast. Anecdotal accounts from divers and biologists suggest that sea turtles may use offshore fine sediment bottoms, as well as areas adjacent to hard bottom reefs, as internesting habitat. Limited observations have noted that at times of extreme drops in temperature, turtles have been observed buried in fine silt covering area reefs, either after beach nourishment or extreme freshwater runoff. Over 174 sea turtles have been observed on the sea surface during 16 right whale aerial surveys conducted between February 27 and March 19, 1995 along line transects within approximately 10 nm of the borrow area off of Jacksonville, Florida, suggesting an abundance of sea turtles in the vicinity of the borrow area. These turtles may be taken by hopper dredges. There has been no documented take of sea turtles during past beach nourishment activities at the borrow areas. However, due to potential impact, one hundred percent observer coverage is necessary for beach nourishment activities during the periods identified on the table. This observer coverage may be subsequently altered upon authorization from NMFS.

NMFS remains concerned that nearshore reefs, which provide foraging habitat and shelter for sea turtles, can be impacted by turbidity caused by dredging. While hopper dredges produce less turbidity than other dredge types, water quality impacts are still likely. State monitoring requirements do not relate directly to light restrictions caused by dredging, which has been shown to impact these ecosystems. Direct mechanical damage to hard bottom reefs, which may also be important turtle habitats, has also been documented (Draft Environmental Assessment prepared for the Second Periodic Nourishment of the Sunny Islands and Miami Beach Segments, Beach Erosion Control and Hurricane Protection Project, Dade County, Florida, January, 1995). The COE has proposed 1:1 mitigation of hard bottom habitat; however, replacement of biological material lost cannot be mitigated. Preventative steps should be identified within dredging contracts for borrow areas near hard-bottom reefs.

Rigid Draghead Deflector

Included within the COE's comprehensive research program, initiated in 1991, was a program to develop a mechanical solution to reduce the take of sea turtles at the dredge draghead. The COE SAD and the Waterways Experiment Station (WES) developed a rigid deflector for attachment to the draghead. This rigid draghead deflector has shown promising results during preliminary tests. The rigid device, similar in principal to the cow catchers developed for trains, is designed to deflect sea turtles encountered during hopper dredging activities. When deployed with mock turtles, the deflector draghead effectively avoided taking 95 percent of the models. According to the terms and conditions of the Incidental Take Statement issued for the 1991 biological opinion, testing of the effectiveness of the rigid deflector draghead in a channel where sea turtles occur present was necessary. NMFS recommended that the COE evaluate the new draghead in September in the Canaveral shipping channel, when juvenile turtles are present, but adults and gravid females are scarce. A supplementary biological opinion regarding the impacts of dredging using the deflector draghead in the Cape Canaveral channel for up to 15 days between September 14 and October 14, 1994 was issued in September 1994.

Although trawl sampling indicates that sea turtles were present in Canaveral at levels observed in previous years, only one sea turtle, a live green turtle, was observed entrained by the dredge. Twenty-one surface sightings of sea turtles were made in the channel, transit area, and at the disposal site. These results supported the mock turtle trials. However, despite the use of the rigid draghead deflector, two green turtle entrainments were documented in the Palm Beach Harbor entrance channel. Takes by a hopper dredge equipped with the deflector were also documented in Brazos Pass, in the Gulf of Mexico. NMFS believes that instruction of private dredge contractors is necessary to improve the performance of the rigid deflector draghead. Additionally, the effectiveness of the draghead may be dependent on the ability of the dredge operator to keep the dredging pumps disengaged when the dragheads are not firmly on the bottom to prevent impingement of sea turtles within the water column. Lastly, flexibility at the draghead is reportedly needed to improve the performance and ease of operation of this mechanical device. Additional assessment and development appears to be needed before the rigid draghead deflector can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities.

Whales

Right whale

The nearshore waters of northeast Florida and southern Georgia were formally designated as critical habitat for right whales on June 3, 1994 (28793). These waters were first identified as a likely calving and nursery area for right whales in 1984. Since that time, Kraus et al. (1993) have documented the occurrence of 74 percent of all the known mature females from the North Atlantic population in this area. While sightings off Georgia and Florida include primarily adult females and calves, juveniles have also been observed.

Twenty percent of all right whale mortalities observed between 1970 and 1989 were caused by vessel collisions/interactions with right whales. Seven percent of the population exhibit scars indicative of additional, non-lethal vessel interactions (Kraus, 1990). As a result of the potential for interactions between hopper dredges and right whales, the 1991 biological opinion required observers on board dredges operating from December through March in Georgia and northern Florida to maintain surveys for the occurrence of right whales during transit between channels and disposal areas. Continuation of aerial surveys, which had been instituted in Kings Bay, Georgia, was also required. Since January 1994, aerial surveys funded by the COE in association with dredge activities in the southeast have been amplified through the implementation of the right whale early warning surveys. These surveys, funded by COE, as well as the Navy and Coast Guard, are conducted to identify the occurrence and distribution of right whales in the vicinity of ship channels in the winter breeding area, and to notify nearby vessel operators of whales in their path. The COE has been instrumental in NMFS' communications with other federal action agencies regarding the importance of pro-active protection of right whales through a cooperative recovery plan implementation team.

Whales observed on aerial and shipboard surveys are individually identified and counted, cow/calf pairs are recorded, and the movements and distribution of the whales are noted. Dredge speeds are reduced to five knots or less during evening hours or periods of low visibility for 24 hours after sightings of right whales within 10 nm of the channel or disposal areas.

Data collected during these surveys suggest that right whales are observed off Savannah, Georgia, in December and March, and are relatively abundant between Brunswick, Georgia, south to Cape Canaveral from December through March. During early 1995, a right whale was also observed by shipboard observers off Morehead City, North Carolina (1/10/95, probable right whale).

Humpback whale

Humpback whales occur in waters under U.S. jurisdiction throughout the year. Migrations occur annually between their summer and winter ranges. The summer range for the Western North Atlantic stock includes the Gulf of Maine, Canadian Maritimes, western Greenland, and the Denmark Strait. All humpback whales feed while on the summer range.

The primary winter range includes the Lesser Antilles, the Virgin Islands, Puerto Rico, and the Dominican Republic (NMFS, 1991). In general, it is believed that calving and copulation take place on the winter range. Calves are born from December through March and are about 4 meters at birth. Sexually mature females give birth approximately every two to three years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years of age for males. Size at maturity is about 12 meters.

Until recently, humpback whales in the mid- and south Atlantic were considered transients. Few were seen during aerial surveys conducted over a decade ago (Shoop et al., 1982). However, since 1989, sightings of feeding juvenile humpbacks have increased along the coast of Virginia and North Carolina, peaking during the months of January through March in 1991 and 1992 (Swingle et al., 1993). Studies conducted by the Virginia Marine Science Museum (VMSM) indicate that these whales are feeding on, among other things, bay anchovies and menhaden. Researchers theorize that juvenile humpback whales, which are unconstrained by breeding requirements that result in the migration of adults to relatively barren Caribbean waters, may be establishing a winter foraging area in the mid-Atlantic (Mayo, pers comm, 1993). The lack of sightings south of the VMSM study area is a function of shipboard sighting effort, which was restricted to waters surrounding Virginia Beach, Virginia.

In concert with the increase in whale sightings, strandings of humpback whales have increased between New Jersey and Florida since 1985. Strandings were most frequent during the months of September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more then 11 meters in length (Wiley et al., 1995). Of the 18 humpbacks for which the cause of mortality was determined, 6 (33 percent) were killed by vessel strikes. An additional humpback had scars and bone fractures indicative of a previous vessel strike that may have contributed to its mortality.

Shipboard observations conducted during daylight hours during dredging activities in the Morehead City Harbor entrance channel during January and February 1995 documented sightings of young humpback whales on at least six days near the channel and disposal area, until the last sighting on January 22, 1995. Three humpback strandings were documented in North Carolina, one each in February, March, and April, suggesting that humpback whales remained within waters of the South Atlantic Division through April.

Impacts of hopper dredging on whales

Hopper dredging may adversely affect right and humpback whales, which occur during winter months in the vicinity of dredging projects within the SAD. While dredging itself is not likely to be a problem, the transit of hopper dredges between borrow, channel, and disposal areas is likely to result in increased vessel traffic in the vicinity of humpback and right whales, especially within right whale critical habitat. As discussed above, ship strikes are one of the primary human-caused sources of mortality for both humpback and right whales, and increased vessel traffic may increase the likelihood of whale/vessel interactions. Although whales have been observed in areas of dredge operations, as discussed below, there have been no documented collisions between dredges and whales.

Observers on dredges have documented close approaches between whales and dredges. On February 6, 1988, a right whale reacted to the approach of a hopper dredge within 100 yards by orienting itself toward the vessel in a defensive profile. On February 28, 1988, during clamshell dredging of Canaveral channel, a right whale remained in the Canaveral channel for a period of about 10 minutes. Fortunately, this took place during daylight hours and when no vessels were transiting the channel. On January 12, 1995, a humpback whale was observed within a quarter of a mile of the dredge at Wilmington channel and resurfaced near the dredge. An approaching humpback on January 13, 1995 was observed ahead of the dredge initially, but resurfaced near the stern after the vessel slowed. Dredging was stopped while the whale, and two other humpbacks nearby, approached within 100 yards, including one passage under the bow. On January 18, still within the Wilmington Harbor channel dredging area, one of a few humpbacks observed feeding surfaced and quickly dove again within 10 meters of the dredge.

NMFS believes that the cooperation of the dredge operators with endangered species observers greatly reduces the chance of whale/dredge interactions. Additional precautions that reduce the likelihood of dredge collisions with endangered whales include: aerial surveys conducted in right whale critical habitat during the breeding season, the adoption by dredge operators of necessary precautions when whales are sighted, and reduction in dredge speed during evening hours or days of limited visibility when whales have been spotted within the previous 24 hours.

CONCLUSIONS

NMFS concludes that endangered and threatened sea turtles, including the threatened loggerhead (Caretta caretta), and endangered Kemp's ridley (Lepidochelys kempii), green (Chelonia mydas) and hawksbill (Eretmochelys imbricata) sea turtles, may be adversely affected by hopper dredging of channels and during beach nourishment activities along the U.S. southeast Atlantic coast, but are not likely to be jeopardized under the terms and conditions of the attached Incidental Take Statement. Shortnose sturgeon (Acipenser brevirostrum) may be adversely affected by hopper dredging of channels, but are not likely to be jeopardized in rivers of the Southeast Region. Right whales (Eubalaena glacialis) and humpbacks (Megaptera novaeangliae) also may be adversely affected due to increased vessel traffic, but severe impacts can be avoided through continued cooperation between dredge operators and endangered species observers during the seasons whales may occur in the project area.

CONSERVATION RECOMMENDATIONS

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in reducing/eliminating adverse impacts to loggerhead, green, and Kemp's ridley turtles that result from hopper dredging in the southeastern United States. Many of these recommendations have been discussed and agreed upon at the recent COE/NMFS meeting in St. Petersburg, Florida.

1. The COE should continue to investigate possible modifications to existing dredges which might reduce or eliminate the take of sea turtles. The effectiveness of the rigid draghead deflectors should continue to be evaluated.

2. Spring and fall surveys are necessary in the Canaveral shipping channel to identify sea turtle temporal and spatial movement patterns if hopper dredging will be needed regularly for the Canaveral channel in the future. Telemetry using depth recorders may be needed to obtain information on water column use.

3. Spatial distribution of sea turtles taken in COE trawl surveys of southeast ship channels appeared to be non-random. Additional investigation into the characteristics of "preferred" sites may provide information to expand dredging windows in channel areas adjacent to these areas of greater abundance.

4. The COE should provide NMFS with a list of inshore and offshore borrow areas along the southeastern U.S. Atlantic in which hopper dredges are likely to be used. Frequency of anticipated beach nourishment activities should be identified as accurately as possible.

5. The COE should summarize information regarding borrow areas in which hopper dredges may be deployed. Information regarding the biological resources found at each borrow area

should be listed to identify the possible suitability of the area for foraging sea turtles.

6. The COE should evaluate the collective impact of all dredging projects within the Florida intracoastal waterways on Johnson's seagrass. A summary of anticipated projects and estimates of annual seagrass take levels should be developed to allow NMFS to provide a comprehensive conference or consultation.

7. NMFS, based on the recommendations of Griffen (1974), has recommended water column sediment load deposition rates of no more then 200 mg/cm²/day, averaged over a seven day period to protect coral reefs and hard bottom communities, rather than use of only state standards.

INCIDENTAL TAKE STATEMENT

Section 7(b)(4) of the Endangered Species Act (ESA) requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA, and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, be provided that are necessary to minimize such impacts. Only incidental taking resulting from the agency action, including incidental takings caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent measures, and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7 of the ESA.

Based on results of previous hopper dredging activities in southeastern U.S. channels, new information regarding Kemp's ridley and green sea turtle abundance, and expanded dredging windows and appended monitoring of beach nourishment activities in the South Atlantic Division, NMFS anticipates that future hopper dredging activities may result in the injury or mortality of loggerhead, Kemp's ridley, green, and hawksbill turtles. Therefore, a low level of incidental take, and terms and conditions necessary to minimize and monitor takes, is established. The documented incidental take, by injury or mortality, of seven (7) Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, twenty (20) loggerhead turtles, and five (5) shortnose sturgeon is set pursuant to section 7(b)(4) of the ESA. This take level represents the total authorized take per year for hopper dredging in the Atlantic projects of the South Atlantic Division (SAD).

To ensure that the specified levels of take are not exceeded early in any project, the COE should reinitiate consultation for any project in which more than one turtle is taken in any day, or once five or more turtles are taken. The Southeast Region, NMFS, will cooperate with the COE in the review of such incidents to determine the need for developing further mitigation measures or to terminate the remaining dredging activity. Formal consultation must be reinitiated when 75% of the authorized incidental take is reached. The authorization for these incidental takes expires on August 31, 2000.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take in the Atlantic Region has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of listed right whales is provided.

The reasonable and prudent measures that NMFS believes are necessary to minimize the impact of hopper dredging in the southeastern United States have been discussed with the COE. The following terms and conditions are established to implement these measures and to document the incidental take should such take occur. It is anticipated that beach nourishment will not occur year-round, due to environmental protections instituted by other agencies.

1. Regular maintenance activity in Canaveral Harbor shall not be conducted with a hopper dredge. A hopper dredge should be considered only under emergency conditions when no other type of dredge can be used to remove hazardous shoaling in an expedited timeframe. Separate, specific Section 7 consultations must be conducted for all dredging activities in the Canaveral ship channel that may require the use of a hopper dredge. These consultations will be accelerated if warranted by emergency conditions.

2. One hundred percent inflow screening is required, and 100 percent overflow screening is recommended when sea turtle observers are required on hopper dredges in areas and seasons in which sea turtles may be present (see table below). If conditions disallow 100 percent inflow screening, inflow screening can be reduced but 100 percent overflow screening is required, and an explanation must be included in the preliminary dredging report (see 6, below).

3. The sea turtle deflecting draghead is required for all hopper dredging during the months that turtles may be present, unless a waiver is granted by the COE SAD in consultation with NMFS.

4. Beach observers cannot be used in place of shipboard observers for hopper dredging of borrow areas unless the COE

can demonstrate that the volume of sand deposited on beaches will not preclude observation and identification of turtles or turtle parts.

5. To prevent impingement of sea turtles within the water column, every effort should be made to keep the dredge pumps disengaged when the dragheads are not firmly on the bottom.

6. Reporting: A preliminary report summarizing the results of the dredging and the sea turtle take must be submitted to the COE and NMFS within 30 working days of completion of any given dredging project. An annual report (based on either calendar or fiscal year) must be submitted to NMFS summarizing hopper dredging projects, documented sea turtle and sturgeon incidental takes, and whale sightings.

7. The COE's continued participation in the Right Whale Early Warning System is necessary. Dredging within right whale critical habitat from December through March must follow the protocol established within the Early Warning System.

8. NMFS requires monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31, when humpback and right whales occur in the vicinity of channels and borrow areas, north of Cape Canaveral. Monitoring will be 100% for the first year of the biological opinion, unless subsequently altered upon authorization from NMFS. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transitting between areas if whales have been spotted within 15 nm of the vessel's path within the previous 24 hours. South of Cape Canaveral, surveys for whales should be conducted by endangered species observers during the intervals between dredge spoil monitoring.

9. The seasonal observer requirements under these terms and conditions are listed on the following table. North of the St. Johns River, in Florida, endangered species observers on hopper dredges within nearshore and riverine areas must also monitor for shortnose sturgeon impingements.

RESTRICTIONS AND MONITORING
REQUIREMENTS FOR HOPPER DREDGING ACTIVITIES IN THE ATLANTIC WATERS OF THE COE SOUTH ATLANTIC DIVISION

AREA	WHALE MONITORING for beach nourishment, navigation channels, and transit	SEA TURTLE MONITORING: NAVIGATION CHANNELS		SEA TURTLE MONITORING: BEACH NOURISHMENT ACTIVITIES	
		WINDOWS	MONITORING	WINDOWS	MONITORING[1]
North Carolina to Pawles Island, SC (includes channels at Oregon Inlet, Morehead City and Wilmington)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr and 30 Nov.	Year Round	100% observer monitoring from 1 Apr - 30 Nov	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Pawles Island, SC to Tybee Island, GA (includes channels at Charleston, Port Royal and Savannah)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr - 30 Nov.	1 Nov - 31 May	100% observer monitoring from 1 Nov - 30 Nov and 1 Apr - 31 May	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Tybee Island, GA to Titusville, FL (includes channels at Brunswick, Kings Bay, Jacksonville, St. Augustine, and Ponce de Leon Inlet)	Aerial surveys in right whale critical habitat, 1 Dec thru 31 Mar. 100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar.	1 Dec - 15 Apr	100% observer monitoring from 1 Apr - 15 Apr	Year Round	100% observer monitoring from 1 Apr - 15 Dec
Titusville, FL to Key West, FL (includes channels at West Palm Beach, Miami and Key West)	Whale observations are not necessary beyond those conducted between monitoring of dredge spoil.	Year Round	100% observer monitoring year round	Year Round	100% observer monitoring year round

[1] 100% of the dredge material must be screened and 100% of the screened material must be observed.

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Table 1 Shortnose Sturgeon Population Estimates.

Locality	Time Segment	Population Segment	Marked m	Captured c	Recaptured r	Estimate Type	Population Estimate	Precision 95% CI		mc/4N	Source and Notes
St. John	1973-77	Adult	3,705	4,082	343	S-J	18,000	±30%		>1	Dadswell (1979)
Kennebec	1977-81	Adult	675	272	34	PET	6,273	3,632	8,914	8.7	Squiers et al. (1982)
	1977-81	Adult	703	272	56	SCH	7,222	5,046	10,765		Squiers et al. (1982)
Merrimack	1989	Spawning, males				CAP	5	5	20		Kynard (unpublished data)
	1988-90	Spawning, males				CAP	12	10	28		Kynard (unpublished data)
	1989-90	Total				CAP	33	18	89		Kynard (unpublished data)
Connecticut											
Upper	1992	Spawning				CAP	47	33	80		Kynard (unpublished data)
	1993	Spawning				CAP	98	58	231		Kynard (unpublished data)
	1976-77	Total	51	162	16	PET	516	317	898	>1	Taubert (1980)
	1976-78	Total	51	56	4	PET	714	280	2,856	>1	Taubert (1980)
	1977-78	Total	119	56	18	PET	370	235	623	>1	Taubert (1980)
	1976-78	Total	170	86	24	PET	297	287	618	>1	Taubert (1980)
Lower		Total				SHU	895	799	1,018		Savoy and Shake (1993)
		Total				SCH	875				
		Total				CHA	856				
Hudson	1979	Spawning	548	899	38	PET	12,669			>1	Dovel (1981)
	1980	Spawning	811	698	40	PET	13,844			>1	Dovel (1981)
	1980	Total					30,311				Dovel (1981), extrapolation
Delaware	1981-84	Partial				PET	14,080	10,079	20,378		Hastings et al. (1987)
	1981-84	Partial				SCH	12,796	10,288	16,267		Hastings et al. (1987)
	1983	Partial				S-J	6,408				Hastings et al. (1987)
Ogeechee	1993	Total	31	36	5	PET	223				Rogers and Webber (1993)
Altamaha	1991	Total	551			SPET	3,250				Rogers (unpublished data)

Estimates Type:
S-J: Seber Jolly
PET: Modified Peterson
SCH: Modified Schnabel
CAP:CAPTURE Methodology
SHU: Schumacher
CHA:Chapman
SPET:Simple Peterson

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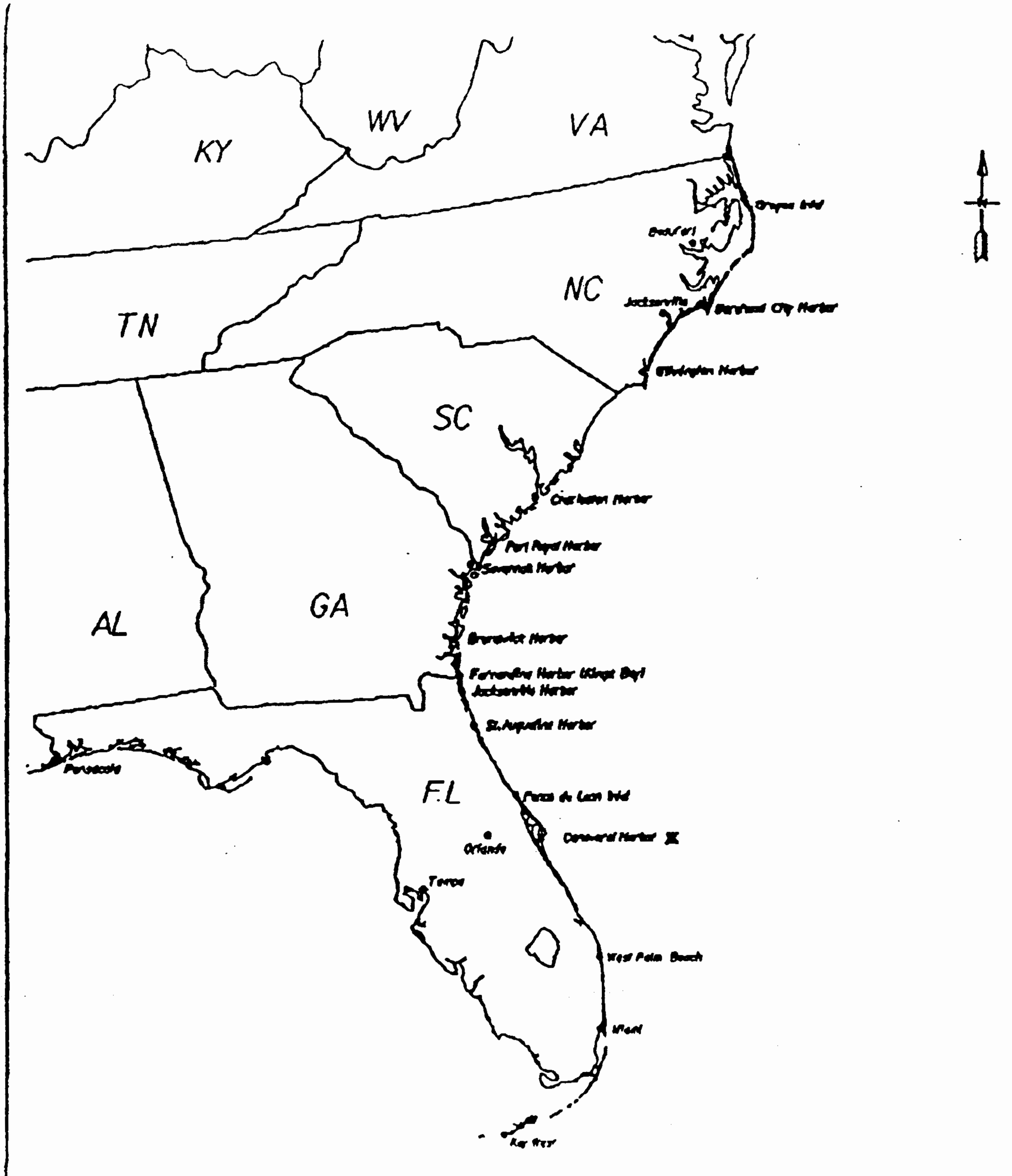


LOCATION OF SOUTHEASTERN HARBOR PROJECTS IN WHICH HOPPER DREDGES ARE USED

✱ NOTE: HOPPER DREDGING IN CANAVERAL HARBOR WAS SUSPENDED IN 1991

FIGURE 1

FIGURE 1

FIGURE 22

FLORIDA INDEX NESTING BEACH SURVEYS
Caretta caretta

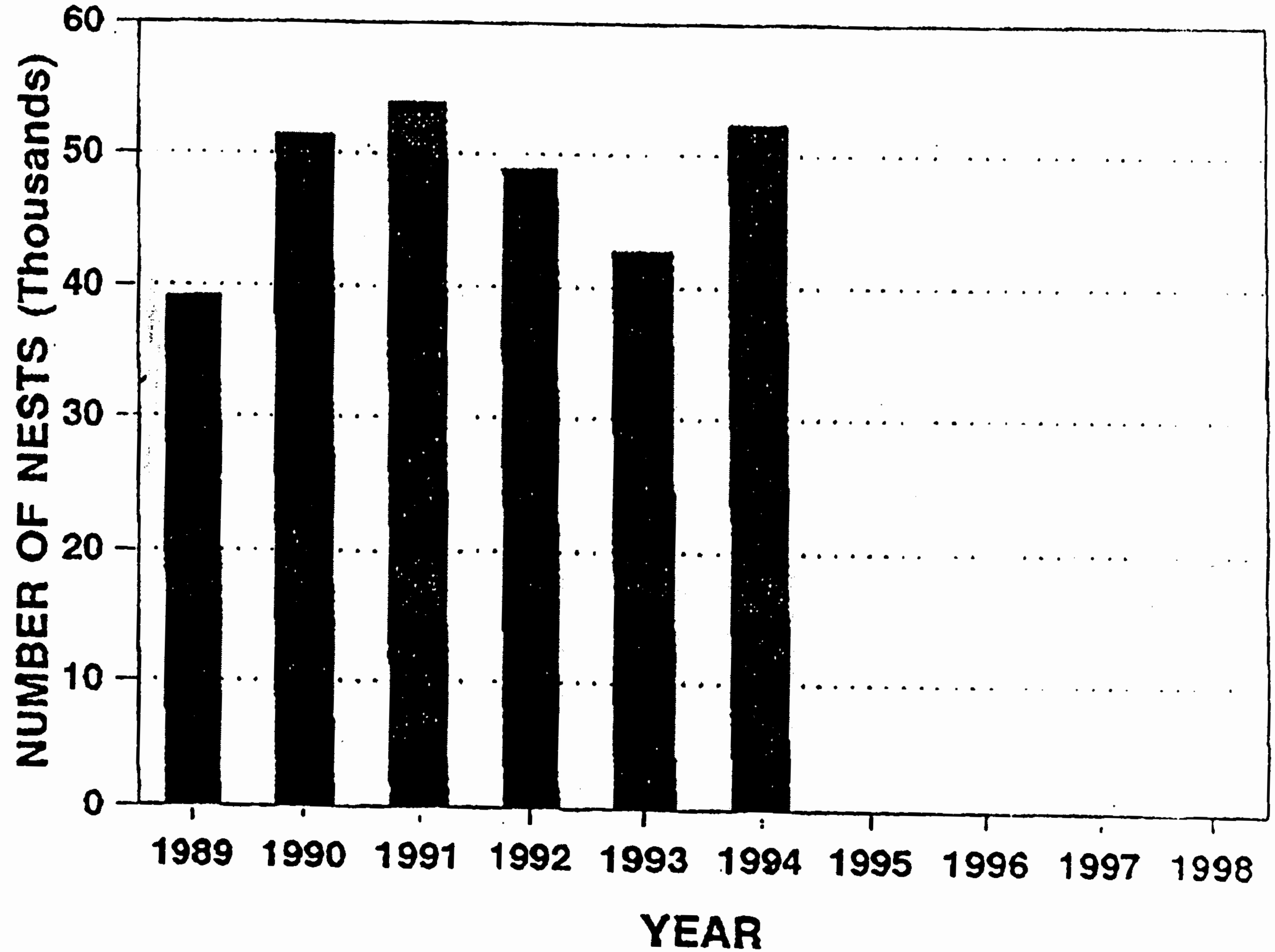


FIGURE 3

FLORIDA INDEX NESTING BEACH SURVEYS
Chelonia mydas

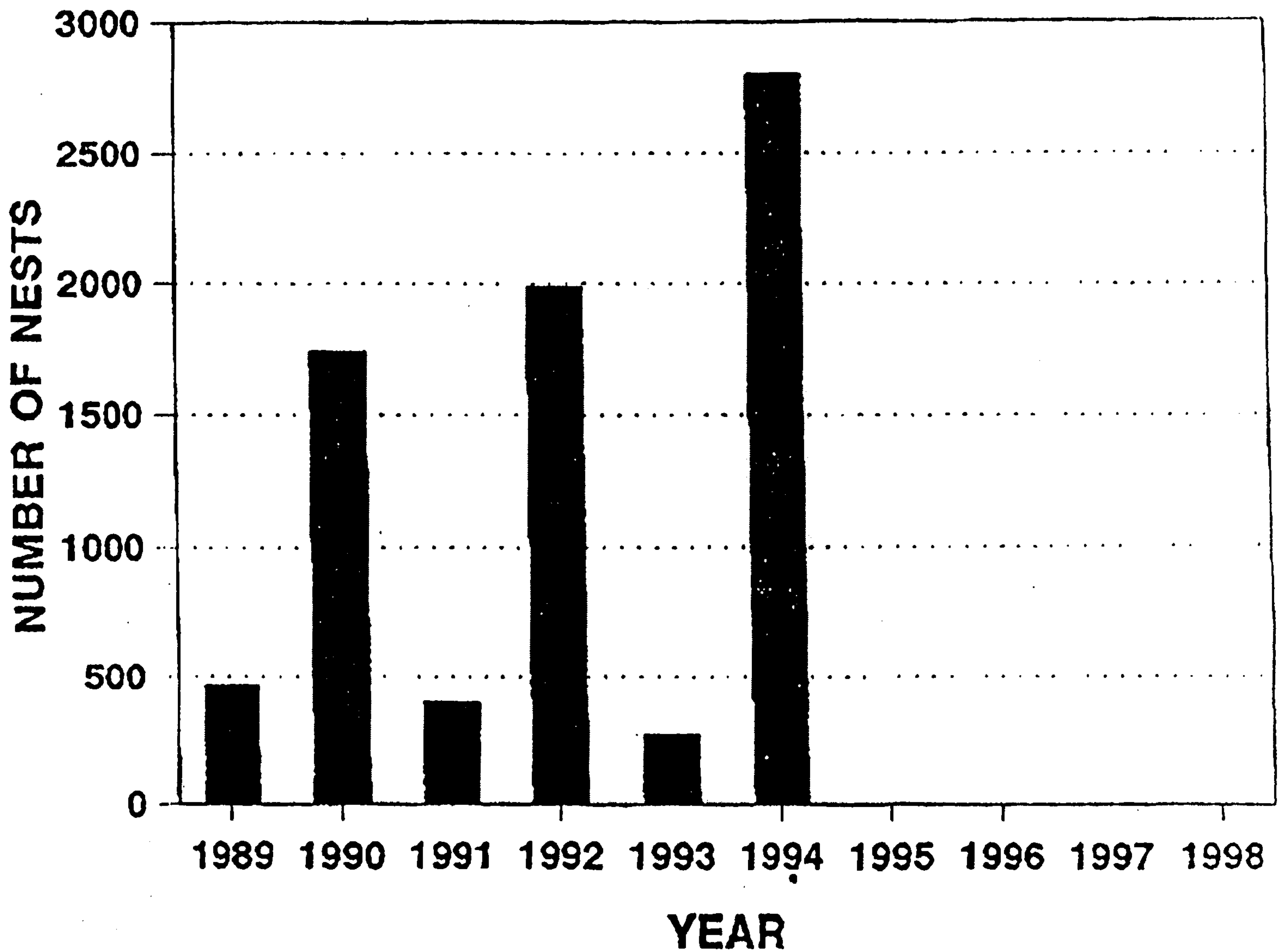


FIGURE 4

KEMP'S RIDLEY NESTS AT RANCHO NUEVO
FWS/INP DATA 1978-1994 (R BYLES 12/94)

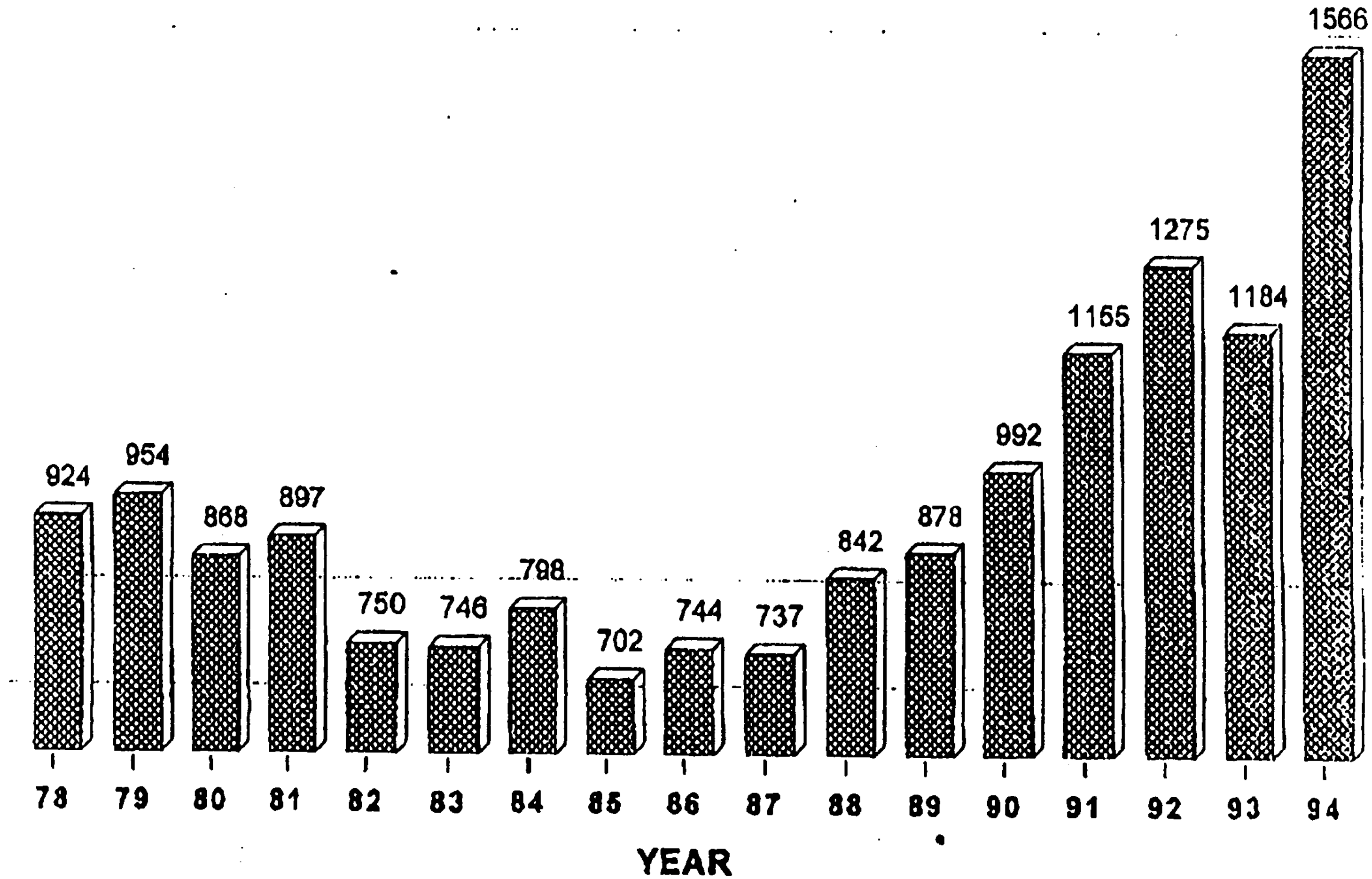
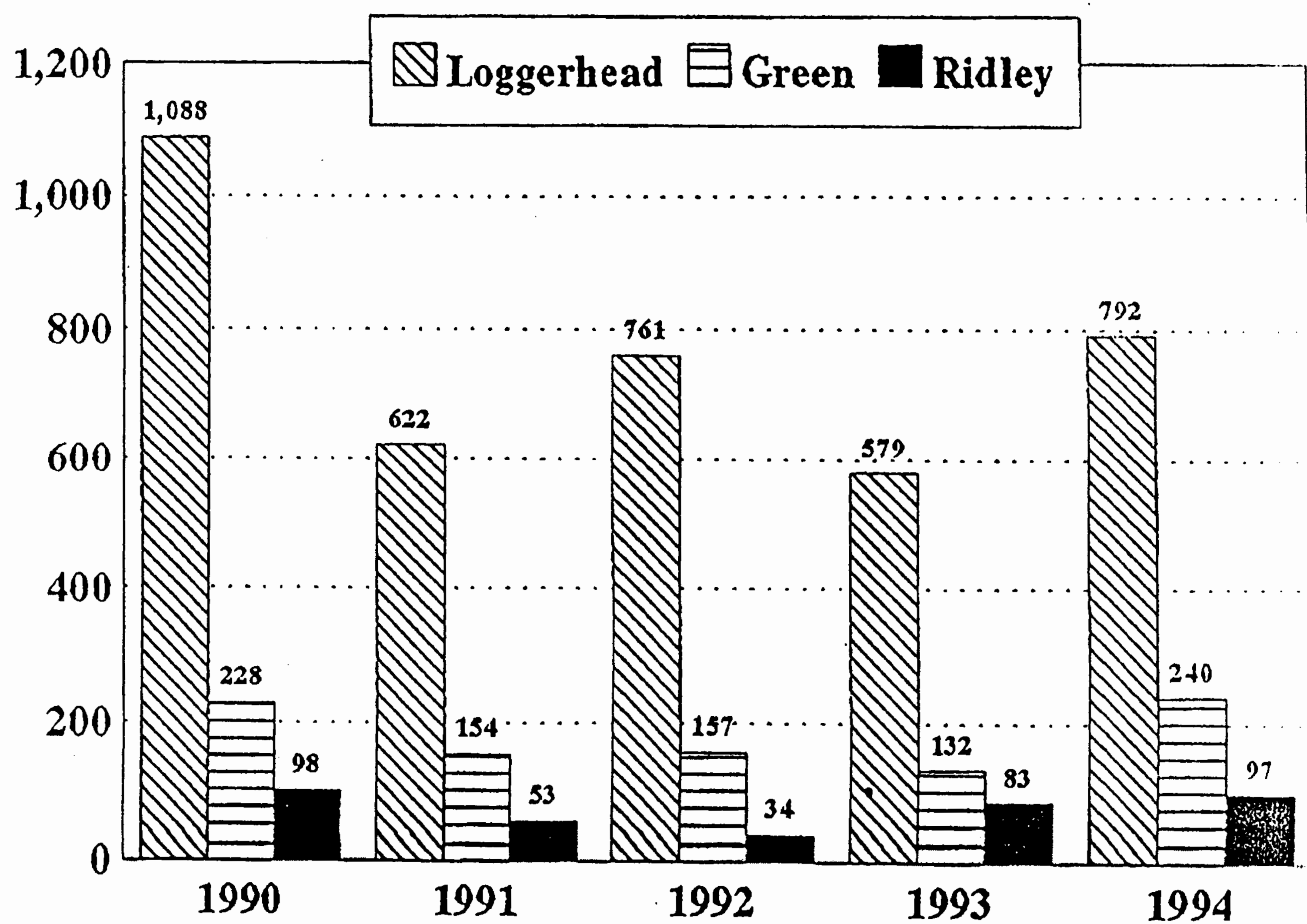


Figure 5

Southeast U.S. Atlantic Coast

Sea Turtle Strandings, 1990 - 1995



BREVARD COUNTY, FLORIDA SHORE PROTECTION PROJECT REVIEW STUDY

U.S Fish and Wildlife Service
Coordination Act Report

FINAL REPORT

Submitted to:
Department of the Army
Jacksonville District U.S. Army Corps of Engineers
Planning Division, Environmental Branch
Jacksonville, Florida

Submitted by:
Department of the Interior
U.S. Fish and Wildlife Service
Ecological Services Office
Jacksonville, Florida
December 1995

1.0 INTRODUCTION

The purpose of this study is to assess and minimize the impacts to existing fish and wildlife resources in and adjacent to the U.S. Army Corps of Engineers (USACE) beach renourishment project in Brevard County, Florida. The U.S. Fish and Wildlife Service (USFWS) has evaluated the study area and commented on project impacts, including recommendations for conservation measures. Nourishment of the Atlantic shoreline of Brevard County was authorized by the River and Harbor Act of 1968 (N.A. 1992). This study is authorized by Section 933 of the Water Resources Development Act of 1990.

This project was authorized under a resolution adopted September 23, 1982 by the Committee on Public Works and Transportation, U.S. House of Representatives. Since that time, correspondence between Brevard County and the USACE reflects the county's interest in nourishing or renourishing problem areas. The USACE posted Public Notice in January 1992, and the USFWS responded with a Planning Aid Report in March 1992. Field reconnaissance took place on June 12-15, 1995, with members of the USACE, USFWS, and Brevard County Natural Resources Management Division.

2.0 PROJECT DESCRIPTION

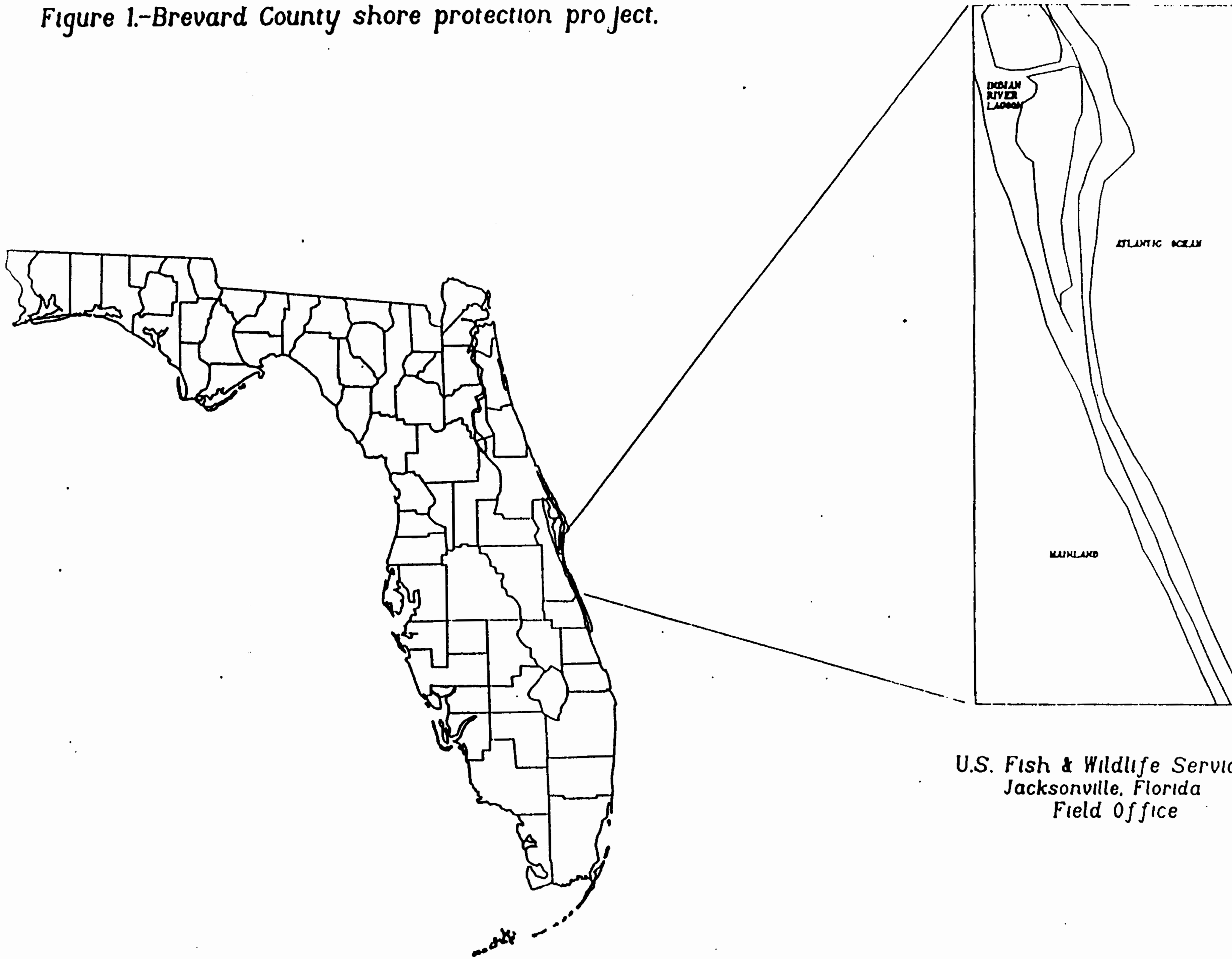
The Jacksonville District of the USACE is currently determining the feasibility of a beach renourishment project in Brevard County, Florida which would place sand dredged from offshore shoals onto twenty miles of coastline. The study area begins adjacent to Port Canaveral at Jetty Park and extends twenty miles south to the project terminus at the southern limit of Melbourne Beach (figure 1). Fill material to be used for nourishment would originate from shoals located approximately two miles from Cape Point near Cape Canaveral (figure 2), and consists of beach quality sand.

3.0 BACKGROUND

Brevard County is located on the east coast of central Florida and occupies a large inland area and extensive barrier island/estuarine lagoon system (Indian River, Banana River, and Mosquito Lagoon). The county is 72 miles long with a northwesterly to southeasterly orientation. The shoreline consists of sandy beach, vegetated dunes, barrier island strand, and maritime hammock habitat. Access to the study area is by causeway from the mainland and by coastal highway A1A.

Historically, beaches in the project area were more stable and maintained an equilibrium of sand net loss/gain. The following information is derived primarily from Olsen (1989). Natural winds and a north to south littoral drift pattern kept the process of coastline accretion and depletion balanced. Erosional shoreline loss as a result of "long term recession of the

Figure 1.-Brevard County shore protection project.



U.S. Fish & Wildlife Service
Jacksonville, Florida
Field Office

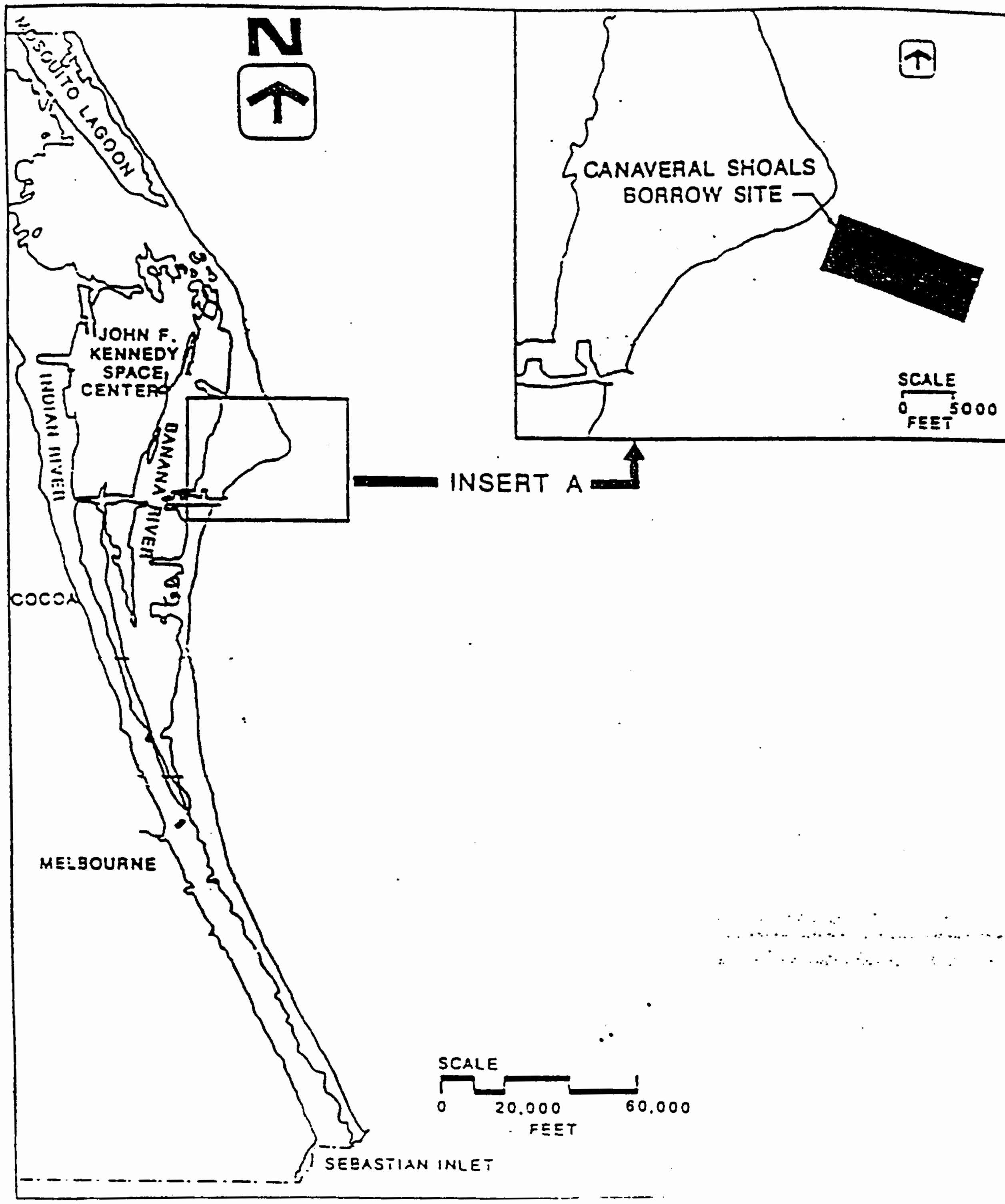


Figure 2. - Canaveral Shoals borrow site.

duneline and the general lowering of the nearshore beach profile" (USACE 1992) was a natural phenomenon over time. The addition of intense meteorological events such as "northeaster" storms in the fall and winter months, and hurricanes in the spring and summer months, act as major transporters and transformers of the beach/dune environment. Usually the dry or upper beach and bluff line are hardest hit. This reduces or eliminates the sand "reservoir" and effects the stability and longevity of the entire beach.

The creation of Port Canaveral has changed the natural littoral drift transport patterns in the immediate area and southward which exacerbates natural current reversals and drift fluctuations. This results in severe erosional "hotspots" as well as a few areas of accretion. The following areas have been included for potential renourishment: Cape Canaveral, Indialantic - Melbourne, Cocoa Beach, and Satellite - Indian Harbor Beach (USACE 1992). Current loss rates range from one foot a year at Melbourne Beach to fifteen feet a year at Cape Canaveral. In response, several beach restoration and nourishment projects have been undertaken by Brevard County and the USACOE. Strong longshore drift and reversal patterns cause these areas to naturally lose sand which accretes to the south. The USACE plan includes renourishment at varying intervals to maintain design template dimensions. Since this project will be conducted in two phases, the northern and southern reach, the Service and the Corps have agreed that each phase will require an amended Coordination Act Report from the Service, as will any new design documents forthcoming.

4.0 GENERAL DESCRIPTION OF PROJECT AREAS

4.1 Upland Dune / Dry Beach Zone

The upland dune areas of Brevard County are present throughout the project area and range from well developed in the southern portion to weakly defined in the north (See figures 3 and 4). These areas consist of dry sand beach above the mean high water level and is usually located 110-180 cm. in elevation from the mean low water level. The highest and most xeric area is characterized by a rapid loss of water and sharp temperature fluctuations. Shoreward, water is irregularly replenished through storms and high tides (Zottoli 1978). Natural processes and human impact have severely reduced the original formations. Most areas are developed with residential or commercial structures. Seawall armorment dominates the shoreline from Cocoa Beach north. Fragmented and degraded natural beach and dunes lie to the south. The natural areas are characterized as coastal strand and maritime hammock ecosystems. Typical vegetation of the coastal strand observed in the field consists of sandy, barren patches mixed with sea oats (*Uniola paniculata*), dune grass (*Ammophila breviligulata*), sea rocket (*Cakile edentula*), cacti (*Opuntia compressa*), iva (*Iva imbricata*), pennywort (*Hydrocotyle bonariensis*), croton (*Croton punctatus*), sea purslane (*Sesuvium portulacustrum*), wild bean (*Strophostyles helvola*), and morning glory (*Ipomoea purpurescens*) (Stalter 1993). The maritime hammock is composed of sea myrtle (*Baccharis halimifolia*), salt cedar (*Tamarix gallica*), wax myrtle (*Myrica cerifera*), yaupon, (*Ilex vomitoria*), senna (*Cassia fasciculata*),

Figure 3. Well developed foredune and upland dune zone in southern Brevard County

Figure 4. Weakly defined dunes in central Brevard County.

southern red cedar (*Juniperus silicicola*), muscadine (*Vitis rotundifolia*), Virginia creeper (*Parthenocissuss quinquefolia*), and greenbrier (*Smilax bona-nox*) (Stalter 1993).

Wildlife known in this area consists of raccoon (*Procyon lotor*), domesticated and feral cats (*Felis cattus*), domesticated dogs (*Canis familiaris*), the threatened southeastern beach mouse (*Peromyscus polionotus niveiventris*), threatened and endangered sea turtles, including the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*),and leatherback (*Dermochelys coriacea*); the American oystercatcher (*Haematopus palliatus*), Wilson's plover (*Charadrius wilsoni*), willet (*Catoptrophorus semipalmatus*), and laughing gull (*Larus atricilla*), gull-billed tern (*Sterna nilotica*), and Caspian tern (*Sterna caspia*) (Myers and Ewel 1990). Scrub jays (*Aphelocoma c. coerulescens*), a red-shouldered hawk (*Buteo lineatus*) and several common song birds were observed in the maritime scrub/hammock habitat throughout the study area. The ghost crab (*Ocypode quadrata*) was also observed in great numbers along the entire project area in swash, foredune and upland dune zones.

4.2 SWASH ZONE

The swash zone occupies the entire project area and is composed of quartz sand, shell hash, coquina beach rock and rubble. This zone extends 90-110 cm. in elevation from the mean low water level and is inundated by each tidal cycle. Water circulates easily through the loose-packed sand (Zottoli 1978). Sandy bottom beaches are populated by small, short-lived infauna with high species density and substantial reproductive potential and recruitment. Haustoriid amphipods constitute 50-90% of the fauna and contribute significantly to the total biomass (Nelson 1985). Decapod crustaceans, bivalves, and spionid worms complete the community. Each of these occur in relatively well-defined zones and depend to some extent on the nature of the substrate. Other species which dominate this area are *Emerita talpoida* (mole crab), *Donax* spp.(coquina), and several polychaetes (Nelson 1985, 1992). *Donax* and *Emerita* were observed in the field.

Birds known to inhabit this zone are least terns (*Sterna antillarum*), royal tern (*Sterna maxima*), sandwich tern (*Sterna sandvicensis*), black skimmer (*Rynchops niger*), and snowy plover (*Charadrius alexandrinus*) (Myers and Ewel 1990).

4.3 SURF ZONE

This ecozone also extends the length of the project area and extends from below the mean low water level to 80 cm. in elevation from the mean low water level. The sand remains saturated due to the constant submergence and inundation of the tides, allowing interstitial circulation of water throughout the sand. An increase in depth is typified by finer sediments and tightly packed sand, which inhibits water circulation (Zottoli 1978). Wave energy and exposure dictate the stability and diversity of the surf zone communities (Nelson 1985). The occupants of sandy bottom in this zone are the same as for the swash zone. Species reported to occupy the surf zone are polychaetes, gastropods, amphipods, sand dollars, portunid crabs, bivalves and small or juvenile fish. The seasonality of surf zone fish is high with few year round residents (Nelson 1985). Common species of fish in the surf zone are Engraulidae (anchovies), Clupeidae (herrings), Carangidae (jacks), Sciaenidae (kingfish, spot, croakers), silversides (*Menidia menidia)*, catfish (*Arius felis*), lizardfishes (*Synodus foetens*), sand drum (*Umbrina coroides*) and scaled sardine (*Harengula jaguana*). This zone also serves as the nursery grounds for the Florida pompano (*Trachinotus carolinus*) (Nelson 1985).

Coquina rock outcrops and scattered live worm rock reef occupy the surf zone and range from Cape Canaveral to the Florida Keys (Zale 1989). The reefs in the study area extend ten miles from the southern portion of Patrick Air Force Base south to Paradise Beach (figures 5-7). Aerial photography provided by the ASIC was inadequate due to high tide conditions which prevented accurate detection of the existing reefs. A unusually low spring tide enabled visual inspection of the reefs without snorkeling or diving. The coquina outcrops consist of Pleistocene remnants of coquina shell hash and sand lithified by a calcareous cement (Schmidt 1979) which provides substrate for the reef-building tube worm (*Phragmatopoma lapidosa*). In addition to the reefs themselves, individual nodules of worm rock were found to be growing on various places on the coquina outcrops, primarily on the undersides of ledges.

This reef system is important for two reasons: 1) it supports a stable and complex community of species, and 2) it functions as an offshore breakwater and sediment trap for suspended sediments which may act to prograde beaches (Zale 1989, Coastal and Oceanographic Engineering and Environmental Laboratory, 1973). Species reported to inhabit the reef are amphipods, isopods, decapod and stomatopod crustaceans including the porcellanid crab (*Pachycheles monilifer*), the xanthid crab (*Menippe nodifrons*), and the graspid crab (*Pachygrapsus transversus*) (Gore et al. 1978). Common fish species reported on or near the reef were striped blennies (*Chasmodes bosquianus*), porkfish (*Anisotremus virginicus*), sailor's choice (*Haemulon parrai*), spottail pinfish (*Diplodus holbrooki*), sargeant majors, amphipods, gastropods, macroalga and orange sponge (*Cliona lampa*) (Continental Shelf Associates 1989). Blennies and sargeant majors were most evident in the field. Several tidal pools created by holes in the rock hosted fish and amphipods. Several species of macroalgae were also growing on the rocks, mostly red (Rhodophyta) and brown (Bryophyta).

4.4 OFFSHORE ZONE

Offshore benthic habitats consist of sand bottoms and reefs. The sandy substrate grades slowly into a sandy-mud consistency as one nears the edge of the continental shelf. Community species found to inhabit the sandy bottom area are squid, amphipods, annelids, bivalves, gastropods, crustaceans and scallops. Reefs of lithified coquina occur in depths of water starting at 2-7 m to 110m (Continental Shelf Associates 1989), and are inhabited by several

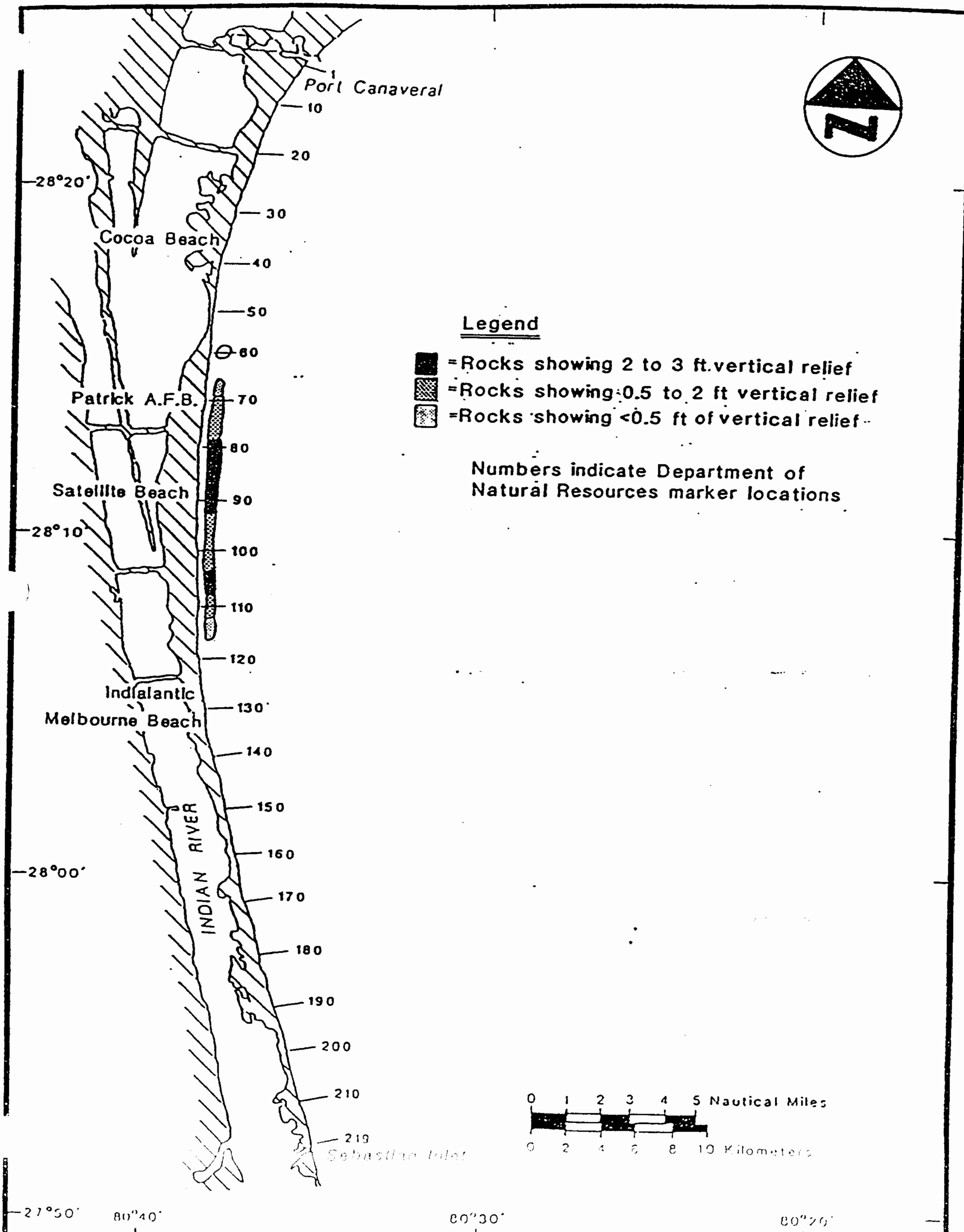


Figure 5 Location of nearshore rock outcrops along Brevard County

Figure 6. Healthy worm reef colonies and associated coquina rock outcrops.

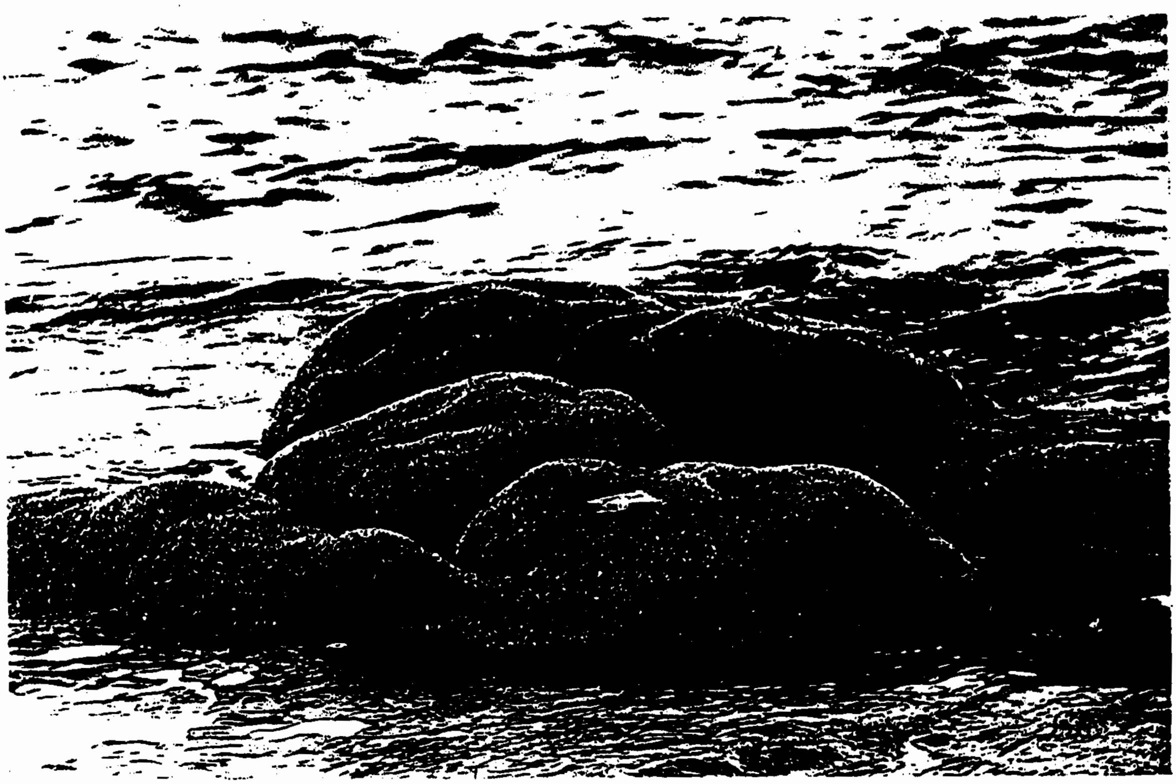


Figure 7. Live reef-building tube worm colony (Phragmatopoma lapidosa) colony in central Brevard County.

species of macroalgae. Minimal impacts from sand burial may occur on algae communities occurring nearer to shore, but should recover quickly. Dredging activity in the shoal area may create a sediment plume up to a half-mile long. The effects of this would be temporal, but may result in the mortality of a number of fish due to suffocation.

5.0 PROJECT IMPACTS

5.1 Upland Dune/ Dry Beach Zone

These areas serve as habitat for several animals including the threatened southeastern beach mouse. The current plan as proposed by the USACOE will avoid impact to the actual dunes and associated uplands but will impact the upper beach where turtles nest. Sand will be placed at the toe of the dunes and distributed by bulldozers. Additionally, the weight of earth-moving equipment is documented to create compaction and shear resistance of the substrate (Nelson and Dickerson 1988). Ghost crabs which occupy this area of the beach also risk burial. Limited information describes the crabs ability to "burrow up" to the surface if buried. If populations drop after nourishment takes place, it would be attributed to the emigration of crabs responding to a decreased food supply in the disturbed intertidal zone rather than from burial mortality (Nelson 1985).

5.2 SWASH ZONE

Information from Nelson (1985,1992) states that the mole crab is the predominant organism in the swash zone and numbers may be greatly reduced by beach nourishment activities. Mole crabs are filter feeders which rely on a high energy environment for food. They also need wet sand to burrow. Both factors place them at risk for beach fill burial. Studies indicate although they are weak swimmers, they will vacate the disturbed area by swimming or transversing the tide line. Few to none have been reported buried. Project areas recovered within two days to two months. *Donax* spp. (coquina) are the second dominant organism in the swash zone community and are most susceptible to beach nourishment activities due to decreased mobility. Nelson (1985, 1992) reports that in a North Carolina renourishment, no *Donax* were found until seven months after the project ceased and most were juveniles carried in by littoral drift. The studies indicate that mortality is due to burial, and recovery is highly dependent on the quality of beach fill used. Limited information on the effects of beach nourishment on polychaetes is inconclusive. Studies done by Nelson (1985) and Saloman and Naughton (1984), agree that beach nourishment reduces polychaete population numbers. Other studies indicate there were no significant effects to polychaetes at Sebastian Inlet, Florida. Nelson (1985) found *Scololepis squamata* to have a certain tolerance for sediment disturbance and concluded this worm could burrow itself out of 0.9 m of material provided the fill had little silt-clay content. Minimal impact is expected.

Placement of fill in the swash zone will eliminate some populations of *Donax* spp. and few polychaetes. Recovery should be rapid for both of these species. Mole crabs may avoid burial by voluntarily vacating the area. The proposed fill material is similar to native beach sand and should enhance the recovery of the existing fauna.

5.3 SURF ZONE

Anticipated impacts from beach nourishment in the surf zone will be actual fill placement (burial) and turbidity (from suspended solids). Although most organisms present in the surf zone are adapted to an increased suspended sediment load, some could be adversely affected. Nelson (1985) found that haustoriid amphipods experienced a negative impact from beach nourishment because of weak swimming capabilities which prohibit escape from sand "dump". This may be common for other organisms limited in mobility. Recovery is slow and new recruitment must come from juveniles or adults which migrate to the area. Polychaetes increase with depth in the intertidal zone and provide a food source for surf zone fishes. Although little conclusive information is available for beach nourishment effects, the burrowing action and cryptic nature of this organism point to possible mortality if emergence is restricted under too thick a layer of fill material. This occurrence could cause mortality for other species in the surf zone as well (Nelson 1985). Mobility is also severely limited for most gastropods and bivalves; therefore placing them at high risk of burial. Increased sediment load may affect the respiration of some species which could cause suffocation. Crustaceans will usually emigrate to other areas while nourishment takes place and return when activity has ceased. Maintenance of food supply and water clarity are important to maintain pre-project population numbers. If burial can be minimized, an increased sediment load should cause few mortalities. Information on surf zone fish is also limited but generally states that most fish will flee and avoid the disturbed area and will return within a few months. Nelson (1985) suggests that loss of habitat may be more harmful to fish than a suspended sediment loading which could clog their gills. Most surf zone fish may tolerate an elevated level of turbidity, but burrowing fish are at greater risk from burial. The overall impact on fishes should be minimal (Nelson 1985, 1992; Continental Shelf Associates 1989, Parkinson and Nelson 1994).

Several authors have concluded that beach nourishment projects are not damaging to existing biological communities in the long term (Gorzelany 1984, Saloman and Naughton 1984, Cutler and Mahadevan 1982, Nelson 1992). However, short term effects could include mortality (resulting from burial, suffocation or loss of habitat) and/or emigration of species to other areas which would reflect an immediate and temporal decline in individual species or species numbers. Many intertidal organisms have high reproductive potential and rapid dispersal rates, which help to enhance recovery from disturbance (Gorzelany 1984). Recovery as documented is fairly rapid depending on the quality of fill material, the seasonality, and living requirements of the species.

Sabellariid worm reefs are a major concern of this project. The reefs are formed by the reef building tube worm *Phragmatopoma lapidosa,* and occur erratically in the central portion of the work area. Reef formation is the aggregation of tubes built from platy shell fragments and sand bonded by a secreted proteinaceous cement lithified over a period of time to form extensive colonies (Coastal and Oceanic Engineering and Environmental Laboratory, 1973.) (figure 8). This species requires a firm substrate on which to attach, and a high energy intertidal surf zone for shell, sand, food, and waste removal (Zale 1989).

The reefs themselves are important landscape features which act as wave breaks and/or provide for the progradation of beach (Zale 1989). Waves break over the reefs more forcefully than over sandy bottoms carrying suspended solids up and over the reef and farther up the beach, trapping sediments on the shoreward side of the reef. The dissipation and absorption of wave energy by the reefs help to protect and prograde the beach. The reefs provide a stable substrate, shelter, and food source which supports a complex and stable marine community.

Several algal species were observed on the rock outcrops in the study area; the following were identified: *Dictyota cervicornis, Padina* spp., *Ulva* spp., *Caulerpa prolifera, Codium decorticatum, Gracillaria* spp. and *Luarencia* spp. Dr. W. Nelson (pers. comm. June 29, 1995) confirmed that the presence of *Padina* and *Caulerpa* indicate the "permanence" of the reefs (figure 9). One area appeared to support a tunicate colony (figure 10). Reef exposure depends on wave action and associated sand movement generated by storms and littoral drift. The history of the longevity and exposure of the reefs are still unknown today; however a study is planned in the near future to date the reefs (Sebastian Tax District Commission, per. comm., June 12, 1995).

The main impacts to the worm rock reefs are burial, turbidity, and hydrogen sulfide poisoning (Main 1986, Myers and Ewel 1990, Zale 1989). Burial by beach sand was tested in the laboratory by Main (1986) and Nelson (1985). Burial could be tolerated by the worms for only 24 hours in summer temperatures (28-31C), and 72 hours for temperatures of 17-23C. Turbidity experiments revealed a maximum tolerance period of 96 hours without suffering significant mortality. Zale (1989), Myers and Ewel (1990), and Main and Nelson (1985) have reported definite or possible mortality of reef-building tube worms as a result of past nourishment projects. Parkinson and Nelson (1994) allude to drifting sand from beach nourishment causing mortality and delayed worm recovery as well as poor algae re-establishment. Hydrogen sulfide may also be a problem when using fill with a high organic content. This is uncontrollable at times, as the dredge may unearth undesirable marine sediments. Research done by Dr. Nelson in 1985 revealed that the hydrogen sulfides contained in organic matter are lethal to *P. lapidosa* when mixed with deoxygenated seawater. These animals are adapted to high-energy, oxygenated environments, and cannot tolerate fine sediments such as silts and mud. If fill is placed in the surf zone, oxygen will slowly dissolve the toxic sulfides. Unless poor quality fill is used, hydrogen sulfides should not impact the worms. The literature indicates that nourishment activities create an environmental detriment to the survival of reef-building tube worms.

Figure 8. Live Phragmatopoma lapidosa worm reef nodule on coquina rock.

Figure 9. Typical species of macroalga observed on live worm/coquina reefs. Note orange sponges and nodes of worm rock.

Due to the possible loss of this valuable resource, the Service recommends that beach nourishment not take place in areas of live worm reef-coquina rock (hard bottom) habitat. Other options to avoid nourishment in these areas should be explored. The Corps has offered four different nourishment options, none of which has been tested. In an effort to select the appropriate method of nourishment, the Corps will also perform computer modeling studies for the effects of sand movement on the reefs from the existing cross-shore drift. The studies are not yet complete at this time. There is also the possibility of a new design document to be formulated by the Corps (Tom Smith, pers. comm., 1995) which would include investigative studies on the various options available for nourishment in reef areas. Lacking that information, we will address each option and make the best recommendation for the resource based on the current literature. As results of these studies become available, it is possible that these recommendations may change. The options as offered by the Corps are as follows:

1). The placement of a "stable" berm at a distance greater than 23 feet behind the worm rock reefs with interval nourishment.

2) The placement of an "active" berm at a distance less than 23 feet behind the worm reefs with interval nourishment.

3) Mitigation - "in-kind"- Implants of a hard substrate would be placed in areas of depleted worm reef-coquina rock outcrops for the reestablishment of *P. lapidosa* and other associated marine life.

4) Mitigation - "out-of-kind" - Creation and placement of an offshore reef substrate to attract displaced fish, etc.

Options one and two involve the placement of berms consisting of dredged fill material behind the reef systems. As stated in preceding paragraphs, the biological and geological importance of the reefs are significant, as these ecosystems are highly productive in terms of biomass, food web constituents, and aquatic habitat for sport fish and endangered and threatened sea turtles (Erhart 1991; pers. comm., 1995). Primary threats to the reef system consist of burial and temperature extremes (Nelson 1985). The Service is concerned that the placement of berms may threaten or destroy the health and viability of the reefs through burial and siltation. This would result in the direct or indirect demise of existing species living in, on, or near the reef through the suffocation of organisms, the depletion of the food source, the impairment of filter feeders, and the hindrance of new *P. lapidosa* settlement. Although studies by Nelson (1985) and Kreuger (1976) indicate the ability for tubeworms to survive 24-72 hours of burial, and up to 96 hours of siltation, death is certain as these time frames expire.

Option 1 includes the placement of a "stable" berm at least 23 feet behind the reef system, with additional periodic nourishment. The berm would remain somewhat stable due to its location and therefore not subjected to the turbulence shoreward. This option is agreeable to the Service at this time, due to the decreased burial and siltation impacts to the worm rock- hard

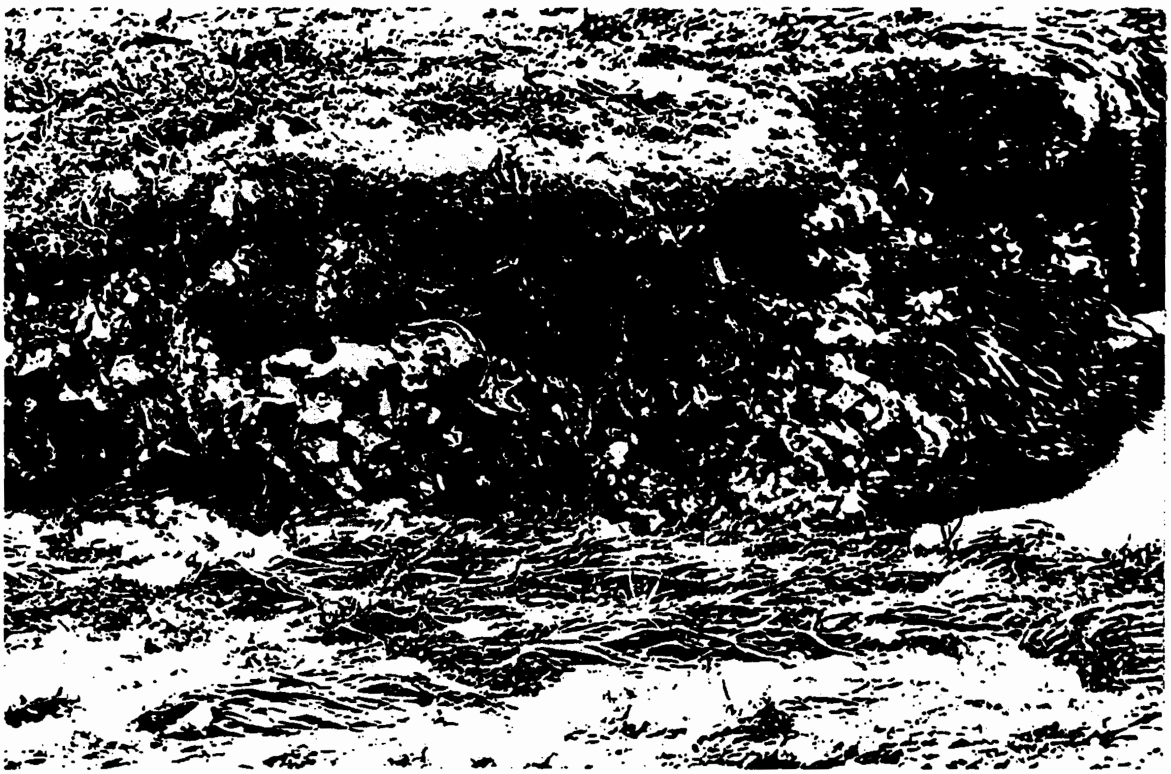


Figure 10. Tunicates and macroalga inhabiting coquina rock reef.

bottom community. We acknowledge this option is the most costly and offers the least feeder benefits; however, this is a technique that has not been tested but could be initiated without further testing. We feel the rock-reef habitats present in Brevard County are a unique biological feature of importance to the marine ecosystem and should be preserved.

Option 2, placement of an active berm with interval supplements, is also untested at this time but offers moderate feeder benefits. This technique is less reliable than option 1 in that its location increases the risk of damage or destruction to the reef. Placement of the berm would be crucial to the survival of sessile and slow-moving animals. Suspended silt particles are a related problem as they increase turbidity. The disadvantages are discussed above. The Service may agree to this method after further testing is concluded.

Options three (in-kind) and four (out-of-kind) involve mitigation as compensation for impacted reef systems in the project area. As of this writing, mitigation for worm rock has never been attempted, and the success of any future attempts would be purely speculative. Studies by Nelson (1985) and Kreuger (1976) point to the possibility of creating new worm rock formations, but only under very specific conditions which are uncertain at best. There exists one documented mitigation study (Cummings 1994) for a hard bottom community in Boca Raton, created for impacted reef resulting from a beach nourishment project. After five and one-half years, results of surveys demonstrated that the artificial reef had been suitable mitigation for the hard bottom communities lost. To measure its success, species present at Red Rock (a natural site nearby) were compared to the mitigation site, and was found to possess a majority of the species present there. Of course, this applies only to the rock outcrop communities, and not to the worm rock reefs.

As requested by the Corps, the following are recommendations as taken from a study done by Krueger (1976) for the reestablishment of *P. lapidosa* on new substrates for investigative purposes:

1. Use a live sample if possible. Reestablishment is more successful with a "catalyst".

2. Use a stable substrate located near an established adult colony. Initial settlement stimulates new growth needed to repair old reefs. For the best method, contact this office or consult Krueger 1976.

3. Locate and position substrate such that a constant supply of shell fragments and sand for food and building materials is available. Initially, establishment may occur on the calmer, shoreward side of the substrate, but growth will accelerate on the seaward side due to the availability of nutrients.

4. Supply a "catalyst" for attracting larvae to the substrate. Testing indicates that pulverized worm reef materials or adult worm cement (proteinaceous mucous) produces the best results.

5. Reapply the attractants after one month as they become water leached or consumed by bacteria.

6. Construct the new substrate with a rough surface instead of smooth, adding indentations or notches for added stability and shelter for settling larvae.

7. Rough weather will destroy new and old worm tubes. Subsequent burial and siltation prevents reestablishment. Lone formations are less stable and suffer damage more readily than group formations.

8. Even though studies reveal that larvae are present year round in the surf, settlement is sporadic at best. Time frames, intensity and extent of settlement are different at every site.

Overall, due to the uncertain nature of sand movement and mitigation success, the Service accepts option #1 and recommends that no further work be done in the area of the Brevard worm reef-hard bottom communities until further experiments or investigative work is performed by the Corps. Upon conclusive evidence as presented by the Corps, a new CAR will be prepared by the USFWS.

5.4 Offshore Zone

Little information is available for nourishment impacts in the offshore zone. Studies indicate the main concern in this zone is that of clogging the gills of resident fish by suspended solids, which may lead to suffocation (Nelson 1985). Pelagic and filter feeding fish are more affected than benthic feeders. The overall impact should be minimal because most fish will leave the work area and return only after the work is done.

This zone also includes the project borrow-site shoals. The dredging of placement material and associated disturbance of benthic sediments will most likely create a turbidity plume. Estimates from Corps personnel (Mike Dupes, pers. comm., 1995) indicate a possible plume size of one-half mile in length. Several studies by various authors on dredged borrow sites and turbidity indicate the short-term impacts to aquatic resources to be the immediate and temporary defaunation of the benthic community (Continental Shelf Associates 1989). Long-term effects observed in the study areas were a reduction in species diversity, density, and community stability. The studies also indicate that the reestablishment of the benthic community correlates directly to the recovery of the physical and chemical characteristics of site sediments. Natural shoal formation processes should help to mitigate for biological losses by replenishing and rebuilding the area. This would result in the restoration of the original physical and chemical composition of the sediments, and help to establish a more diverse and stable community.

6.0 BIOLOGICAL OPINION FWS Log No. 048D

Consultation History

On March 20 1992, the Service provided the USACE with a Planning Aid Report which addressed the reconnaissance phase of this project. Fish and wildlife resources as well as threatened and endangered species were listed and given brief comment. In March of 1992, USACE submitted a reconnaissance report listing possible impacts this project would have on the above listed species, in accordance with Section 7 of the Endangered Species Act of 1973, as amended, and determined impact to sea turtles and the southeastern beach mouse may occur.

Biological Opinion

Southeastern Beach Mouse

The southeastern beach mouse *(Peromyscus polionitus niveiventris)* historically inhabited sand dunes along the coastline from Ponce (Mosquito) Inlet, Florida (Bangs 1898, in Humphrey 1992) to Miami Beach, Florida (Layne 1974, in Humphrey 1992). Since the early 1970's most of the population from Cape Canaveral to Ft. Pierce, Florida has been lost or highly fragmented due to urbanization (see figure 11). Populations from Ft. Pierce southward may be entirely extirpated (Humphrey 1992). Loss of dune habitat from storm erosion and urban development pose the worst threats to this species' survival.

Current studies reveal healthy populations at Cape Canaveral National Seashore,Cape Canaveral proper, and Merritt Island National Wildlife Refuge. A few areas in Indian River County, including south Sebastian Inlet Park, have recently documented small numbers (Humphrey 1992). Recent trapping in south Brevard County (north Sebastian Inlet Park) indicate beach mice are no longer present (K.Owens , USFWS, pers. comm.).

Essential habitat for this species is primary and secondary dunes with a supply of sea oats *(Uniola paniculata)* and other grains, seeds and fruits. Field work in the study area revealed remnant mouse habitat and a lack of definite "sign" of mouse habitation. Future trapping activity may take place at Lori Wilson County Park and Spessard Holland State Park where optimum beach mouse habitat remains.

The USACE stated in their reconnaissance report that impact to sand dunes was unknown at that time. If dune nourishment took place, effects would be minimal pending quality of fill material. Sand was to be placed at the toe of the dune which would likely affect the mice and their habitat. Incidental take of this species would occur if beach mice were buried in their burrows during sand deposition.

Subsequently, the USACE has finalized their plans. The project no longer includes dune enhancement, therefore southeastern beach mice will not be impacted. Field reconnaissance for this species also indicated none are known to exist in the study area. However, an exception to this may exist at Lori Wilson County Park in Cocoa Beach where suitable habitat remains. Although "sign" was not noticed, mice may inhabit this area. It is the Service's Biological Opinion that this project is not likely to jeopardize the continued existence of the southeastern beach mouse.

INCIDENTAL TAKE

Section 9 of the Endangered Species Act , as amended (Act), prohibits the taking of listed species without a special exemption. Taking is defined as to mean harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt to engage in any such conduct. "Harm" and "harass" are further defined in Service regulations (50 CFR 17.3). "Harass" is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding or sheltering. "Harm" is defined as an act which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

Under the terms of Section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement. The measures described below are nondiscretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in Section 7 (o)(2) to apply.

The Federal agency has a continuing responsibility to regulate the activity that is covered by this incidental take statement. If the agency fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7 (o)(2) may lapse.

The Service has reviewed the biological information for this species, and other available information relevant to this action. Based on our review incidental take is anticipated for all southeastern beach mice that may be found at the toe of the primary dune within the project area, specifically Lori Wilson County Park in Cocoa Beach. This is the only portion of the work area where beach mice may be encountered.

When providing an incidental take statement the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with to implement the reasonable and prudent measures.

Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take:

1. The Corps shall instruct the contractor to prohibit mechanized equipment from the primary or secondary dune systems. Mechanized equipment is permitted only up to the toe of the primary dune.

2. The Corps will require the contractor to initiate a trapping program to remove southeastern beach mice that may be affected by the nourishment operation.

To implement the above reasonable and prudent measures, the Service has outlined the following terms and conditions for incidental take. In accordance with the Interagency Cooperation Regulations (50 CFR 402), these terms and conditions must be complied with to implement the reasonable and prudent measures for incidental take:

1. The Contractor shall contract with a qualified and permitted biologist to carry out the trapping program.

2. The trapping effort will be directed to only that section of beach at Lori Wilson County Park which will be impacted within a 24-hour period. The trapping program for that particular reach of beach will begin five days before material is deposited on site, and will conclude the morning of sand disposal. If there is a delay in sand disposal, trapping will continue until the work occurs.

3. Two traps will be placed at each southeastern beach mouse burrow. Captured beach mice will be held until nourishment activity in the area ceases, approximately 48 hours.

4. A report summarizing the number of trap nights and the number of beach mice captured and relocated will be submitted to the Corps and Service three weeks after project completion.

5. If a dead beach mouse is found or one dies in the trap, the specimen should be frozen and the Jacksonville Field Office contacted within 24 hours (904/232-2580).

Loggerhead, Green and Leatherback Sea Turtles

The Fish and Wildlife Service has responsibility for regulating sea turtles when they come ashore to nest. The National Marine Fisheries Service has jurisdiction over sea turtles in the marine environment. For at least two decades, several factors appear to have contributed to the decline of sea turtle populations along the Atlantic coast and in the Gulf of Mexico

(National Research Council 1990a). These factors include commercial overutilization of eggs and turtles, increased natural predation of eggs and hatchlings, incidental catches in commercial fishing operations, degradation of nesting habitat by coastal development, and marine pollution and debris.

The reproductive strategy of sea turtles involves producing large numbers of offspring to compensate for the high natural mortality through their first several years of life. However, human perturbations have drastically reduced sea turtle populations from unnatural causes of mortality. Therefore, activities that affect the behavior and/or survivability of turtles on their remaining nesting beaches, particularly the few remaining high density nesting beaches, could have serious ramifications for the continued existence of U.S. populations.

The threatened loggerhead turtle *(Caretta caretta)* was listed as a threatened species on July 28, 1978, and is the most common nesting sea turtle in Florida. Their nesting range encompasses Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and both coasts of Florida (Hopkins and Richardson 1984). Primary nesting and hatching occurs from April through October. Total estimated nesting in the Southeast is approximately 50,000 to 70,000 nests per year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). There are approximately 49,000 nests laid per year throughout Florida. South Brevard County specifically, including the project area, is second in the world for known beach nesting density (Ross 1982 in Continental Shelf Associates 1989) and accounts for 40% of statewide nesting activity (Meylan *et al.* 1995).

From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Erhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). The status of the Oman colony has not been evaluated recently, but its location in a part of the world that is vulnerable to disruptive events (e.g., political upheavals, wars, catastrophic oil spills) is cause for considerable concern (Meylan *et al.* 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties) (National Marine Fisheries and U.S. Fish and Wildlife Service).

Recent genetic analyses using restriction fragment analysis and direct sequencing of mitochondrial DNA (mtDNA) have been employed to resolve management units among loggerhead nesting cohorts of the southeastern U.S. (Bowen *et al.* 1993; B.W. Bowen, University of Florida, Gainesville, in litt., November 17, 1994, and October 26, 1995). Assays of nest samples from North Carolina to the Florida Panhandle have identified three genetically distinct nesting populations: (1) northern nesting population - Hatteras, North Carolina, to Cape Canaveral, Florida; (2) South Florida nesting population - Cape Canaveral to Naples, Florida; and (3) Florida Panhandle nesting population - Eglin Air Force Base and the beaches around Panama City, Florida. These data indicate that gene flow between the three regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting population (Bowen *et al.* 1993, B.W. Bowen, University of Florida, Gainesville, in litt., October 26, 1995).

The nesting and hatching season for the southern Florida Atlantic beaches (including Brevard through Dade Counties) extends from March 15 through November 30. Incubation ranges from about 45 to 80 days.

The area from Indialantic to Melbourne Beach may be a transition zone between the densest and more moderate nesting zones. Nest density is calculated at 140 nests per km (Ehrhart 1980 in Continental Shelf Associates 1989). Patrick Air Force Base has been documented since 1987 as a highly successful nesting site with an average of 172 nests per km (Ehrhart 1993).

The northern range of nesting activity from Cocoa Beach to Cape Canaveral is armored and little suitable nesting beach is available. Lights and human interference from urbanization limit nesting. Chief Walker of the Cocoa Beach Fire Department (pers. comm., 1995) indicated moderate nesting does occur there (evidenced by previous relocated nests from 1989-1992). Nesting data from Jetty Park at Port Canaveral (Meylan *et al.* 1995) also indicate some nesting activity occurs. Tracks and nests were observed throughout the study area.

The endangered green sea turtle (*Chelonia mydas*), was listed under the ESA on July 28, 1978 (endangered for breeding populations in Florida and along the Pacific coast of Mexico and threatened elsewhere), and is a regular nester in Florida. Nesting has been recorded in every county on the east coast of Florida except Duval, but most occurs from Volusia through Broward Counties, with greatest densities in the Archie Carr National Wildlife Refuge, Melbourne Beach, Hutchinson Island, and Jupiter Island (Meylan et al. 1995, Moler 1992). Nesting has also been documented along the Gulf Coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (Meylan, Florida Department of Environmental Protection, in litt., October 17, 1994). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpubl. data). The green turtle also nests sporadically in North Carolina, where nesting has been reported on Masonboro Island (D. Webster, University of North Carolina, pers. comm., 1993) and Onslow Beach, Camp Lejeune (R. Warren, Camp Lejeune Marine Corps Base, in litt., July 20, 1995). Nesting also occurs at Kennedy Space Center and Cape Canaveral; two nests were recorded at Jetty Park in north Brevard County from 1979 to 1992.

The nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade Counties) is May 1 through November 30. Incubation ranges from about 45 to 60 days.

Guseman and Ehrhart (1990) and Ehrhart (1992) indicate that juvenile greens, subadult loggerheads, and an occasional juvenile hawksbill may use worm reefs as "developmental habitat" or as transitional areas between the first pelagic sea year and the subsequent juvenile years spent in lagoons. It may also be a staging area when inlets to lagoons are not readily found. Because a myriad of algae is found on the reefs, the herbivorous greens possibly forage here along with other species of sea turtles which feed upon the abundant fish and crustaceans. Another important finding by Ehrhart (1990) was that turtles found to inhabit the reefs had no evidence of fibropapilloma disease, which currently affects up to 45% of the turtles in Indian River Lagoon. No explanation is known at this time. Although these studies were done in Indian River County, this could also be occurring in Brevard County. No studies exist to verify it at this time, however, Erhart has observed greens and loggerheads foraging at the reefs at the southern portion of PAFB. Additionally, a documented incident (Erhart et al. 1991) of four green turtles killed in a gill net set over the reefs occurred in 1990. Ehrhart (1992) advocates protection of the nearshore worm rock reefs to support the endangered green turtle.

The leatherback turtle (*Dermochelys coriacea*) was also classified as endangered on June 2, 1970, and regularly nests in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia. The U.S. Caribbean (Puerto Rico and the U.S. Virgin Islands) may support nesting by 150 to 200 adult females per year, representing the most significant nesting activity of this species in the U.S. In the U.S. Virgin Islands, nesting has been reported on the islands of St. Croix, St. Thomas, and St. John. In Puerto Rico, leatherbacks nest on the islands of Culebra, Vieques, and Mona. On the main island of Puerto Rico, leatherbacks nest on beaches all around the island. Leatherback nesting in Florida was once considered rare, but today the species is known to nest regularly on the south Atlantic coast of the state. Leatherback nesting is rare on the west coast of Florida. In 1974, a nest was reported on St. Vincent National Wildlife Refuge (LeBuff 1976), a false crawl (non-nesting emergence) was observed on Sanibel in July 1988 (LeBuff 1990), a false crawl and one nest were observed on St. Joseph Peninsular State Park in 1993 (Meylan *et al.* 1995), and four nests were laid on St. George Island in 1995 (T. Lewis, St.Vincent National Wildlife Refuge, pers. comm., 1995). Leatherback turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpubl. data).

The nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade Counties) is February 15 through November 15.

Nesting ranges from St. Johns County in the north to Dade County in the south, but is concentrated in St. Lucie, Martin and Palm Beach counties with Palm Beach accounting for an average of 50% of statewide nesting (Meylan et al. 1995, Moler 1992). South Brevard County is documented by Meylan et al. 1993 and Erhart (pers. comm.) to have annual nesting activity, but most occurs outside of the project area. Cape Canaveral and Kennedy Space Center also report nestings in 1992 (Meylan et al. 1993), as well as host summer concentrations of feeding leatherbacks in water of depths of 20-40m (Moler 1992).

Environmental Baseline

The project area is located along a 22-mile stretch of Atlantic Ocean shoreline in Brevard County, extending from Port Canaveral south to Melbourne Beach. Natural meteorological events as well as human-induced changes in the coastline have created a severe erosion problem in several areas. These beaches also support a large sea turtle nesting population annually. The Service is concerned that if beach nourishment is conducted during the nesting season (April through October) this activity may discourage turtles from nesting. Work performed during the nesting season may result in the inadvertent crushing or burying of nests. Escarpment formation after nourishment may also prevent nesting.

Direct effects:

Although beach nourishment may increase the potential nesting area, there are significant negative impacts to sea turtles that may result if protective measures are not incorporated during consultation. Nourishment during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of offspring from unnatural mortality and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 percent of the nests can be missed (Schroeder 1994).

Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement or for unknown biological mechanisms to be affected. Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Mortimer 1982, Nelson and Dickerson 1989). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. In a study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida, hatching success was lower for relocated nests in five of seven cases by an average of 5.01 percent, and emergence success was lower for relocated nests in all seven cases by an average of 11.67 percent (Florida Marine Research Institute unpubl. data). Finally, relocating nests may concentrate eggs in an area resulting in a greater susceptibility to catastrophic events. Hatchlings released from concentrated areas may be subject to greater predation rates from both land and marine predators.

The placement of pipelines and the use of heavy machinery on the beach during a construction project may also have adverse effects on sea turtles. Even in a construction area that has been completely eroded and is devoid of dry sand, once sand is placed on the beach, turtles will attempt to use it. As a result, pipelines and heavy machinery can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

If the sand placed on the beach is different than the existing sand on the beach, there could be adverse impacts on nest site selection, clutch viability, and emergence by hatchlings (Nelson 1988). This impact can be minimized by making sure the nourishment sand matches the existing sand in grain size, shape, structure, moisture content, temperature, color, and density.

Beach compaction and unnatural beach profiles may result from beach nourishment activities and negatively impact sea turtles regardless of the timing of projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987). Sand compaction may increase the length of time required for female sea turtles to excavate nests and thus cause increased physiological stress to the animals (Nelson and Dickerson 1988c). On hard, nourished beaches, false crawls may occur more frequently than on natural beaches (Nelson *et al.* 1987), also resulting in increased physiological stress to nesting females. These impacts can be minimized by using suitable sand and by tilling the beach after nourishment if the sand becomes compacted. Nelson and Dickerson (1988b) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites. Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments which often results in failure of nests due to tidal inundation). This impact can be minimized by leveling the beach prior to the nesting season.

Another impact to sea turtles is disorientation (loss of bearings) and misorientation (incorrect orientation) of hatchlings from artificial lighting. Visual cues are the primary sea-finding mechanism for hatchlings (Carr and Ogren 1960, Ehrenfeld and Carr 1967, Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting from buildings and street lights is a well documented cause of hatchling disorientation and misorientation on nesting beaches (Philbosian 1976; Mann 1977; Florida Department of Environmental Protection, unpubl. data). In addition, research has also documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992).

Construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, disorient females trying to return to the surf after a nesting event, interrupt loggerhead and green sea turtle mating since those species copulate in nearshore areas, and disorient and misorient emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

Indirect effects:

This project will create or improve sea turtle nesting habitat, thereby attracting turtles into new areas where they may be impacted by existing artificial lighting. The project may also make the area more attractive to new development, thereby increasing the lighting problem. Impacts from lighting can be reduced by continued implementation and enforcement of the Brevard County (or nearby municipality) beach lighting ordinance during the nesting and hatching season each year.

Future erosion of nesting beaches is a potential indirect effect of nourishment projects on sea turtles. Dredging of sand offshore from a project area has the potential to cause erosion of the newly created beach or other areas on the same or adjacent beaches, which also serve as sea turtle nesting beaches, by creating a sand sink. The remainder of the system responds to this sand sink by providing sand from the beach to attempt to reestablish equilibrium (National Research Council 1990b).

Conclusion

After reviewing the current status of the green turtle, the loggerhead turtle and the leatherback turtle, the environmental baseline for the action area , the effects of the proposed beach nourishment, and the cumulative effects, it is the Service's biological opinion that the beach nourishment, as proposed, is not likely to jeopardize the continued existence of the sea turtles listed above, and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for this species; therfore, none will be affected.

The USACE has stated that work will occur outside of the nesting season; therefore no authorization for relocation is being requested. The Service requests that cone penetrometer readings be taken on the beach immediately following renourishment. If the beach is impenetrable or the average cone index exceeds 500, the beach must be tilled to a depth of 36 inches. Brevard County has also requested that construction take place in the northern reach of the project area in the early part of the nesting season. This request was based on the lower nesting densities occurring in the north area versus the south. The Service does not endorse this request and suggests that although densities may be lower there, the numbers are still great enough when compared to other parts of Florida and the southeast that nourishment activities would be harmful to the current turtle population. If the applicant has more recent and conclusive evidence than what the Service has on record, we request it be presented for another evaluation.

The Service has reviewed the information relative to sea turtle activity in Brevard County and has evaluated the impact this project will have on nesting turtles. Based on our review, the Service believes this project is not likely to jeopardize the continued existence of the loggerhead, green, or leatherback sea turtles.

INCIDENTAL TAKE

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The U.S. Army Corps of Engineers has a continuing duty to regulate the activity covered by this incidental take statement. If the U.S. Army Corps of Engineers (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or extent of incidental take

The Service has reviewed the biological information and other information relevant to this action. Based on our review, incidental take is anticipated for all sea turtle nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the proposed project. Incidental take is also anticipated for all sea turtle nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project.

Effect of the take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and prudent measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green and leatherback turtles.

1. Only beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence shall be used on the project site.

2. Beach nourishment activities shall not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles shall be conducted. If nests are constructed in the area of beach nourishment, the eggs shall be relocated.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles shall be conducted. If nests are constructed in the area of beach nourishment, the eggs shall be relocated.

5. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, beach compaction shall be monitored and tilling shall be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the contiguous United States.

6. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, monitoring shall be conducted to determine if escarpments are present and escarpments shall be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.

7. The applicant shall ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this biological opinion.

8. During the early and late portions of the nesting season, no construction equipment shall be parked on the beach where it could hinder sea turtle nesting or hatching activities. In addition, all construction pipes shall be located to minimize impacts to sea turtles.

9. During the early and late portions of the nesting season, lighting associated with the project shall be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the U.S. Army Corps of Engineers must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. All fill material placed shall be sand that is similar to that already existing on the site in both coloration and grain size. All such fill material shall be free of construction debris, rocks, clay, or other foreign matter and shall not contain, on average, greater than 5 percent fines (passing the #200 sieve) and be free of coarse gravel or cobbles.

2. Beach nourishment shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes shall be stored on the beach.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, then daily early morning surveys for early nesting sea turtles shall be conducted within the period from March 1 through April 30 that the project is being conducted, and eggs shall be relocated per the following requirements.

3a. Nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in nest survey and egg relocation procedures. Surveyors shall have a valid Florida Department of Environmental Protection permit. Nest surveys shall be conducted daily between sunrise and 9 a.m.

3b. Only those nests that may be affected by construction activities shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days shall be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone shall be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, then daily early morning surveys for late nesting sea turtles shall be conducted 65 days prior to project initiation and continue through September 30, and eggs shall be relocated per the preceding requirements.

5. Immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years, sand compaction shall be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the state regulatory agency, and the applicant. At a minimum, the protocol provided under 5a and 5b below shall be followed. If required, the area shall be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. A report on the results of compaction monitoring shall be submitted to the Service prior to any tilling actions being taken. An annual summary of compaction and the actions taken shall be submitted to the Service. This condition shall be evaluated annually and may be modified if necessary to address sand compaction problems identified during the previous year.

5a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area); one station shall be midway between the dune line and the high water line (normal wrack line); and one station shall be located just landward of the high water line. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 27 values for each transect line, and the final 9 averaged compaction values.

5b. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

6. Visual surveys for escarpments along the project area shall be made immediately after completion of the beach nourishment project and prior to April 1 for 3 subsequent years. Results of the surveys shall be submitted to the Service prior to any action being taken. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 1. An annual summary of escarpment surveys and actions taken shall be submitted to the Service.

7. The applicant shall arrange a meeting between representatives of the contractor, the Service, the Department of Environmental Protection, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice shall be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

8. From March 1 through April 30 and November 1 through November 30, no construction equipment shall be parked on the beach where it could hinder sea turtle nesting or hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes shall be off of the beach to the maximum extent possible. Temporary storage of pipes on the beach shall be in such a manner so as to impact the least amount of nesting habitat and shall likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

9. From March 1 through April 30 and November 1 through November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Such lighting shall be shielded low pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters should be placed over vehicle headlights (i.e., bulldozers, front-end loaders). Lighting on offshore equipment shall be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

10. A report describing the actions taken to implement the terms and conditions of this biological opinion shall be submitted to the Jacksonville U.S. Fish and Wildlife Field Office within 60 days of completion of the proposed work for each year when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of hatcheries, nest survey and relocation results, and hatching success of nests.

11. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

12. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the Florida Marine Patrol at 1-800-DIAL FMP. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

13. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service believes that no more than those sea turtle nests and eggs that may be missed by a nest survey and egg relocation program, or those laid during the period when an egg relocation program is not required, will be incidentally taken. If, during the course of the action, this minimized level of incidental take is exceeded, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems, can provide technical assistance on the specifications for design and implementation.

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted.

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

This concludes formal consultation on the action(s) outlined in the Brevard County Shore Protection Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Michael M. Bentzien

Assistant Field Supervisor

December 7, 1995

Date

APPENDIX B

United States Army Corps of Engineers
Environmental Assessment
Carnaveral Shoals Borrow Area II (1998)

ENVIRONMENTAL ASSESSMENT:
CANAVERAL SHOALS BORROW AREA II

An Environmental Assessment of a Proposed Sand Borrow Area
for the Purposes of
Beach Nourishment in Brevard County, Florida

Prepared by:

U. S. Army Corps of Engineers
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December 15, 1998

ENVIRONMENTAL ASSESSMENT
CANAVERAL SHOALS BORROW AREA II

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ENVIRONMENTAL ASSESSMENT
CANAVERAL SHOALS BORROW AREA II

1.0 PURPOSE OF STUDY

This environmental assessment evaluates potential environmental effects associated with the dredging of sand from an offshore borrow site for the purposes of providing beach fill material for the Brevard County Federal Shore Protection Project. The proposed borrow site is located in federal waters at Canaveral Shoals, southeast of Cape Canaveral, Florida. The associated shore protection project includes initial placement of approximately 4 million cubic yards (Mcy) of beach fill sand along approximately 13 miles of shoreline of central Brevard County. The ambient environment and potential effects of the Brevard County Shore Protection Project are described and evaluated in an Environmental Impact Statement prepared by the U.S. Army Corps of Engineers, Jacksonville District (USACE, 1996). This document supplements that EIS for the purposes of appending to the project an additional sand borrow area.

2.0 DESCRIPTION OF PROJECT AND PROJECT NEED

The Brevard County Federal Shore Protection Project is intended to provide storm damage reduction benefits and incidental habitat reconstruction and recreational benefits along two discrete reaches of central Brevard County, Florida (**Figure 1**). The North Reach includes 9.4 miles of shoreline from Port Canaveral to Patrick Air Force Base. The South Reach includes 3.4 miles of shoreline in the vicinity of Melbourne Beach and Indialantic. The proposed project calls for the initial placement of approximately 2.5 mcy of sand along the North Reach and 1.645 mcy along the South Reach. The sand fill shall be placed in a construction berm of approximately 75 to 175 ft width at elevation +10 ft mlw with an initial seaward slope of 1:10 to 1:15. The residual, equilibrium berm width is anticipated to be approximately 40 to 80 ft wide. Periodic renourishment of approximately 516,000 cy and 601,000 cy along the North and South Reach, respectively, is anticipated every 6 years.

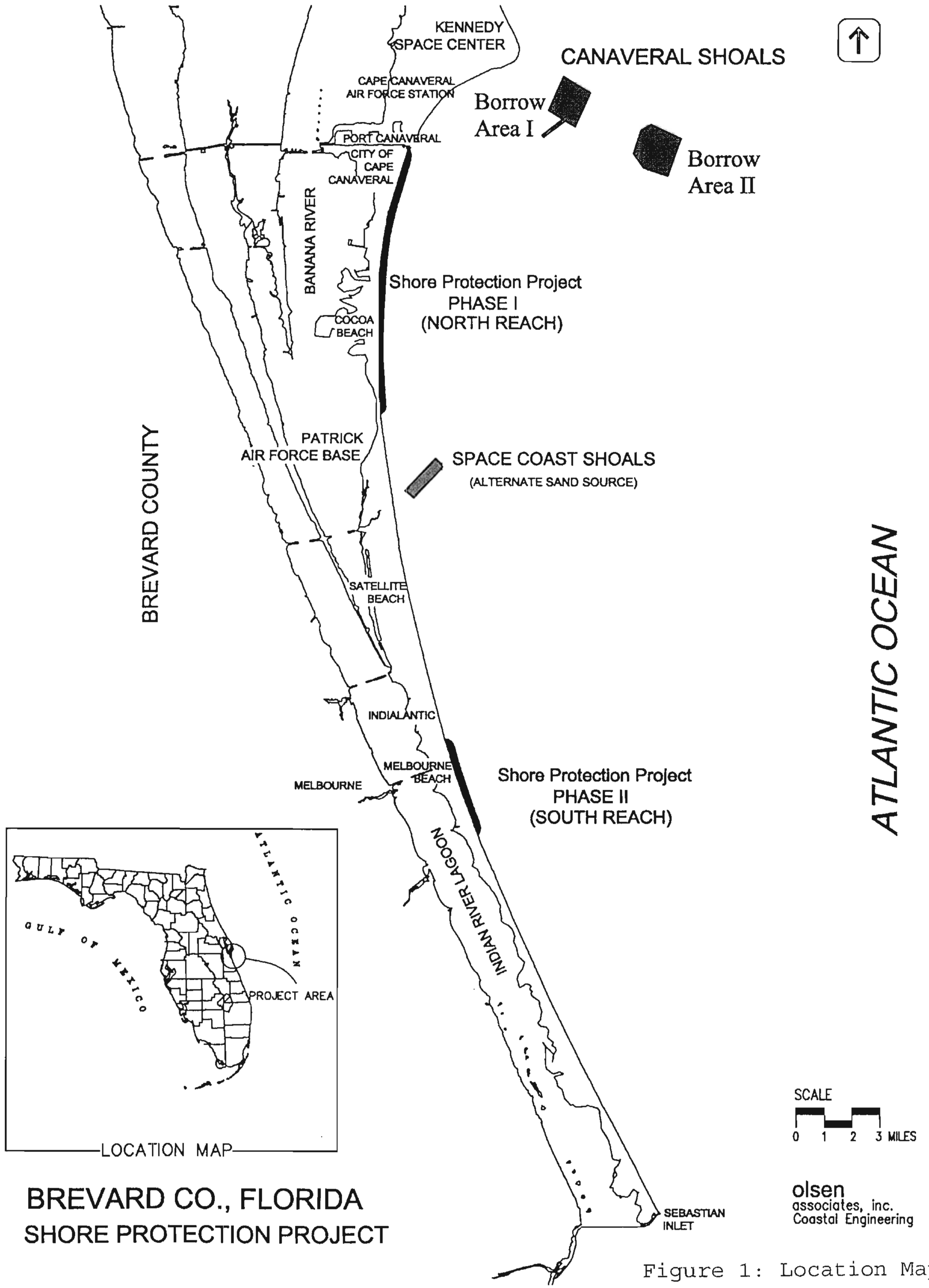

Figure 1: Location Map.

Project construction for each reach is anticipated to require 6 months. Construction activities on the beach, for each reach, are limited to November 1 through May 1 for the purposes of protecting marine turtle nesting activities. Project construction will be cost-shared by the federal government (presently estimated as approximately 53%) and the project's local Sponsor, Brevard County (approximately 47%). The latter, local cost share will be co-funded by the County and the State of Florida. As such, the project is a joint undertaking by the federal government (U.S. Army Corps of Engineers), Brevard County, and the State of Florida. The benefit-to-cost ratio for the project is 1.9:1 for the North Reach, and 1.1:1 for the South Reach. A complete description of the proposed activity is included in the project's Feasibility Study and E.I.S. (USACE, 1996).

The existing sand source for the project's beach fill is located in State of Florida waters along the northwestern bank of Canaveral Shoals, approximately 5.5 miles east-northeast of Port Canaveral Entrance (**Figure 1**). Ambient water depths at this site vary from approximately -17 to -8 ft, mlw. Sand from this borrow source would be dredged and placed upon the beach by either small hopper dredge and/or conventional hydraulic cutterhead and pipeline. This source is referred to as "Borrow Area I".

Because of the relatively shallow depths across Borrow Area I, and its considerable distance from the beach fill area, use of shallow draft (small capacity) hopper dredges and/or lengthy deployment of pipeline will be required. This will result in potentially higher costs and increased construction time. An alternate sand source at Canaveral Shoals, "Borrow Area II", was therefore identified for the purpose of decreasing the cost and time requirements of construction. This borrow area is located across ambient water depths of -25 to -45 ft, mlw, and can therefore accommodate large-capacity hopper dredges.

3.0 LOCATION AND DESCRIPTION OF PROPOSED ACTIVITY

The location of the proposed sand source, "Borrow Area II", is shown in **Figure 1** and **Figure 2**. The existing bathymetry and proposed dredging limits are shown therein. The site's coordinates are listed in **Table 1**. The borrow area is located along the eastern (seaward) edge of Canaveral Shoals, in submerged federal waters of the Atlantic Ocean.

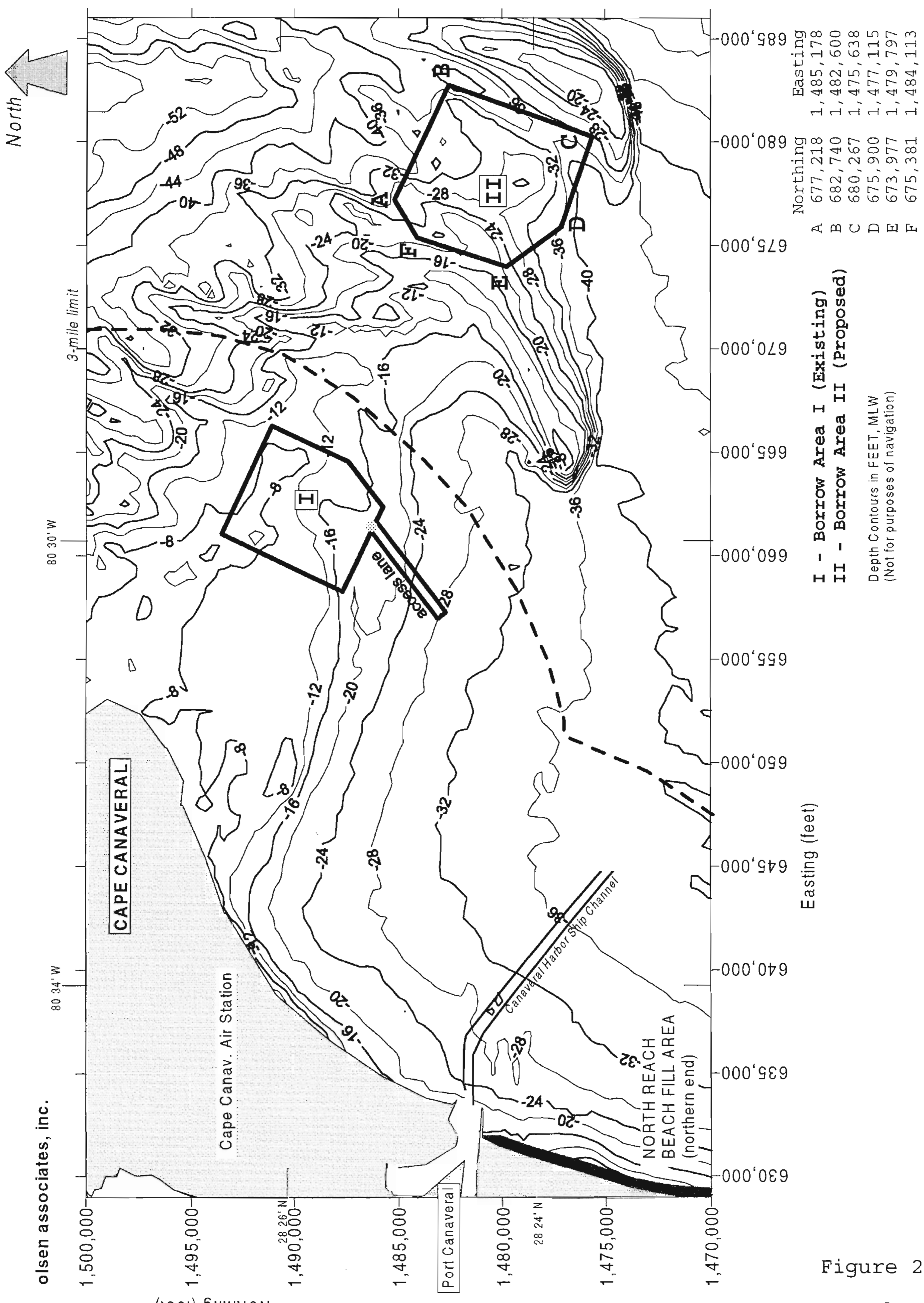

Figure 2:

Relative locations of Borrow Areas I and II.

TABLE 1. Coordinates of BORROW AREA II

	FLORIDA EAST ZONE STATE PLANE NAD 27 (FT) Easting	Northing	Geographic NAD 83 N. Latitude	W. Longitude
A	677,218.0	1,485,178.6	28 25 07.38	080 26 54.42
B	682,740.0	1,482,600.0	28 24 41.60	080 25 52.72
C	680,267.4	1,475,638.1	28 23 32.78	080 26 20.77
D	675,899.5	1,477,115.5	28 23 47.61	080 27 09.60
E	673,977.0	1,479,797.3	28 24 14.25	080 27 30.99
F	675,381.2	1,484,113.1	28 24 56.91	080 27 15.05

Use of the proposed borrow area as a sand source for initial construction of the Brevard County Shore Protection Project will involve dredging of up to about 4.5 mcy of sand from the area (estimated) and subsequent transfer and placement of the sand to the Brevard County shoreline. The 4.5 mcy estimated quantity includes the project (template) volume of approximately 4.145 mcy, plus an allowance for anticipated handling losses. About 61% (2.75 mcy) of this quantity would be used to construct the North Reach. The other 39% (1.75 mcy), approximately, would be used to construct the South Reach. Construction of each reach is anticipated to require one season; i.e., six months from November to April, inclusive. The two reaches would be likely constructed separately, in subsequent years, commencing as early as 1999.

Borrow Area II is located approximately 10.5 and 24 miles from the midpoints of the North and South Reach fill areas, respectively. These distances practically require the use of hopper dredges for the excavation and transfer of the borrow sand. One or more self-propelled, large capacity hopper dredges (c. 2,000 to 3,000 cy per load) are anticipated for use by one of more commercial marine contractors. A hopper dredge withdraws sand from the seabed by trailing ladders and hydraulic suction heads along the vessels's sides. The sand is discharged to the vessel's open hull (hopper) and most of the seawater effluent spills over the sides of the hopper.

Use of "Borrow Area II" is anticipated to include a hopper pump-out process by which the loaded hopper dredge moors to a temporary buoy and pipeline positioned ½ to 1 mile from shore. After connecting to the pipeline (24 to 36 inch diameter), the hopper dredge uses its pumps and seawater to hydraulically transfer sand from the hopper to the beach, where land-based equipment (bulldozer and front loader) spread and shape the sand. Sand dikes are pushed up to channel the pipe's discharged slurry and to promote the settling of sand upon the beach. The nearshore mooring buoy is typically moved to a new location after the beach fill has been constructed along 1 or 2 miles to either side of the offloading buoy.

The hopper dredging activity will be limited to a small area within the borrow area limits. Efficient dredging practice, and prudent design, entails dredging material in 2 to 5 ft thicknesses at a time along long, straight, adjacent runs. Dredging of the 4.5 mcy quantity estimated for the project's construction is anticipated to directly involve (impact) an area of about 8000 ft by 1500 ft.

4.0 GENERAL DESCRIPTION OF ENVIRONMENT AND RESOURCE

4.1 Oceanographic Conditions

Seawater depths across the Borrow Area II range from -20 to -40 ft, mlw. Tides are semidiurnal, with mean range of approximately 4 feet. Local vertical datums are MHW = +2.0 ft NGVD, and MLW ("Corps' Datum") = -1.9 ft NGVD.

Ocean waves are typically 1 to 1.5 m significant height, with 6 to 12 second period (8 to 10 seconds, typ.). East-northeast wave incidence is dominant (88% of annual offshore conditions), with modest southerly reversal principally in summer months. (Additional detail is provided in the Physical Oceanography section, below.)

Currents in the area are associated with tidal variations and local winds, vary in direction, with magnitudes typically less than 0.5 fps. Gulfstream currents typically occur 15 to 40 miles east of the Cape and do not directly affect the subject area.

4.2 Geology

The borrow area is located on "Southeast Shoals", a large and contiguous deposit of sand of littoral origin that extends approximately seven miles southeast of Cape Canaveral. This shoal, as well as the cuspate foreland of the Cape, is associated with modern (Recent) littoral processes, dominated by southerly directed transport and southerly migration of the shoals and ridge system at False Cape attendant to the Holocene transgression. The modern coastal region, including the shoreface and inner continental shelf, is typified by medium Holocene sands overlying marine clay, where the intervening stratum is indicated by a 3- to 6-ft transition of silty sand that dips from about -20 ft mlw at the shoreline at a slope of 1:500 and is revealed as relict seabed east of the shoreface, except as overburdened by the Cape shoals. The shoals are actively changing in configuration as evidenced by recent granular abrasion and by changes in bathymetry surveyed since 1878, and have generally broadened and thickened. Additional description of the area's geology is found in Brown et al., 1962; Uchupi, 1968; Meisburger and Duane, 1969, 1971; Meisburger and Field, 1975; Randazzo and Jones, 1997.

4.3 Proposed Borrow Area (Sediment)

Figure 3 depicts the proposed borrow area, including the maximum spatial and depth limits of dredging, and the locations of core borings. Some 30 vibracores (6 m, typ.) were collected across the area in May, 1998 to define the nature and depth of the seabed sediments. Representative samples (120 in total) from the cores were dry-sieved and analyzed for grain size and carbonate (shell) content. Previously, six core borings were collected across and/or near the borrow area in 1972. The core-boring logs, grain size analyses, and shell-content analyses, are summarized in Olsen (1998).

From the core borings and sediment analysis, the surficial beach-quality sand deposit is a minimum of 9 feet thick and is greater than 15 ft thick at 27 of the 30 cores. The total volume of beach-compatible sand available within the site is estimated to be 34 mcy. The proposed dredging activity involves only 4.5 mcy. The sand is coarse relative to the local beach sand and contains a significant shell fraction. The median grain size of the samples ranges from 0.18 mm to 0.56 mm, with an average of 0.35 mm. (See **Figure 4**.) The samples' shell content (measured as percent calcium carbonate content) ranges from 34% to 53% with an average of 43%. The material is generally coarser than both the native beach sediments for both the North and South Reaches of the project fill area, with overfill ratios of 1.0 for both.

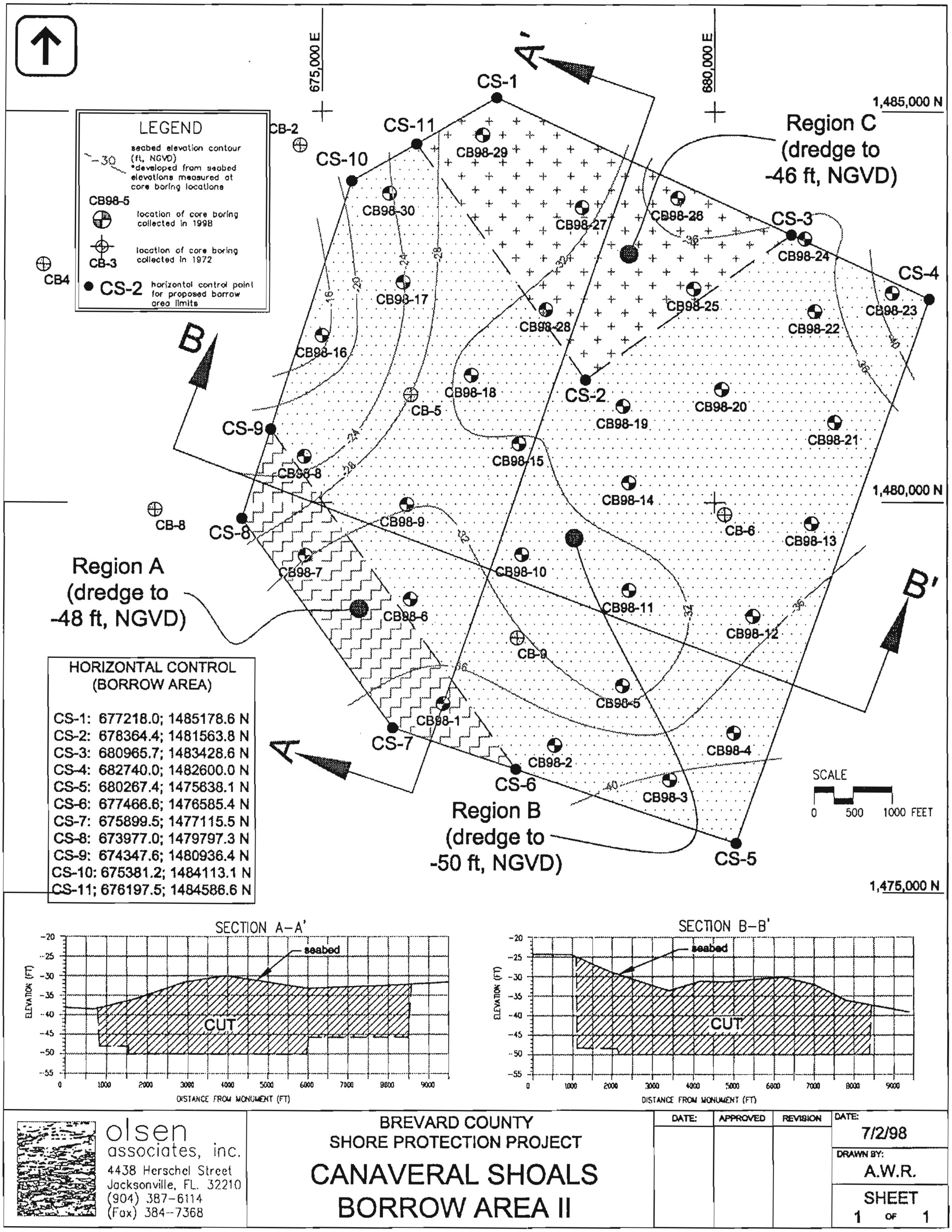

Figure 3: Location of core borings within Borrow Area II.

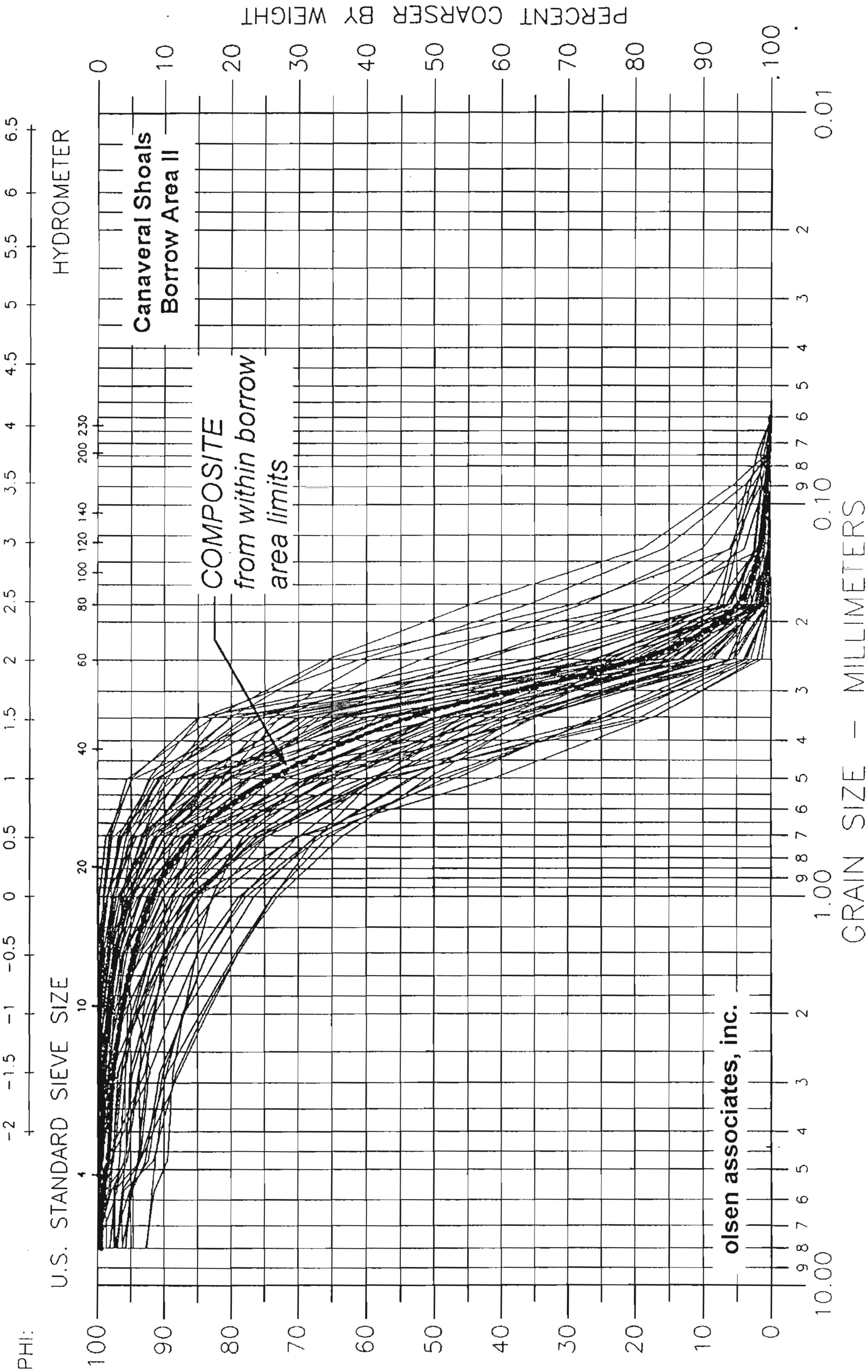

Figure 4: Grain size distribution of all sediment samples from within limits of proposed borrow area.

There is little to no trend in grain size or sorting variation with depth below the seabed, or with location across the borrow area. **Figures 5a, 5b, and 5c** depict the measured median, fine-fraction, and coarse-fraction grain size diameters as a function of the absolute elevation from which each sediment sample was obtained. The borrow source is therefore considered to be fairly uniform, or homogeneous, in sediment characteristics within the limits of the proposed borrow area.

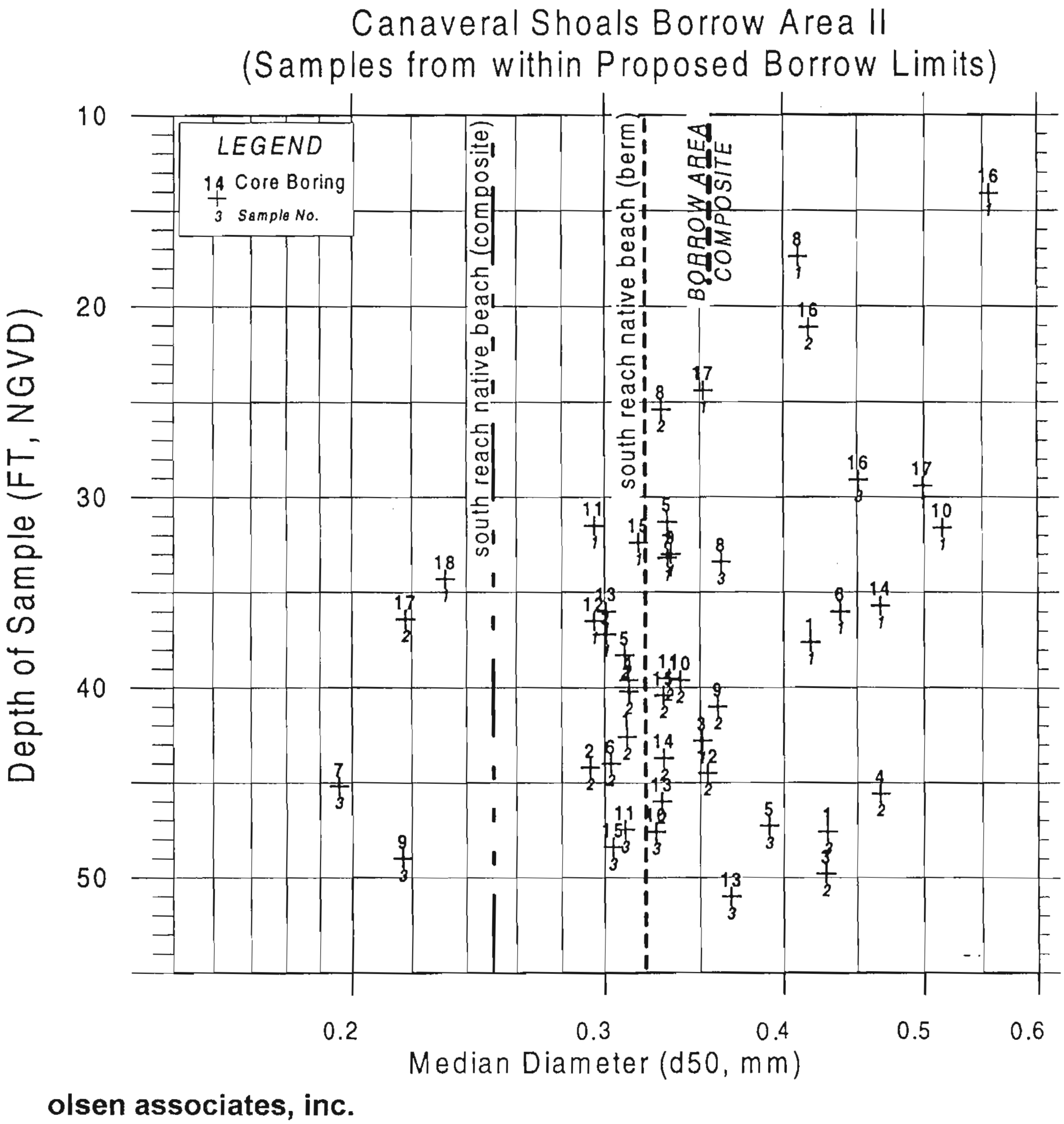

Figure 5a: Median grain size of borrow-area sediment samples as a function of sample elevation.

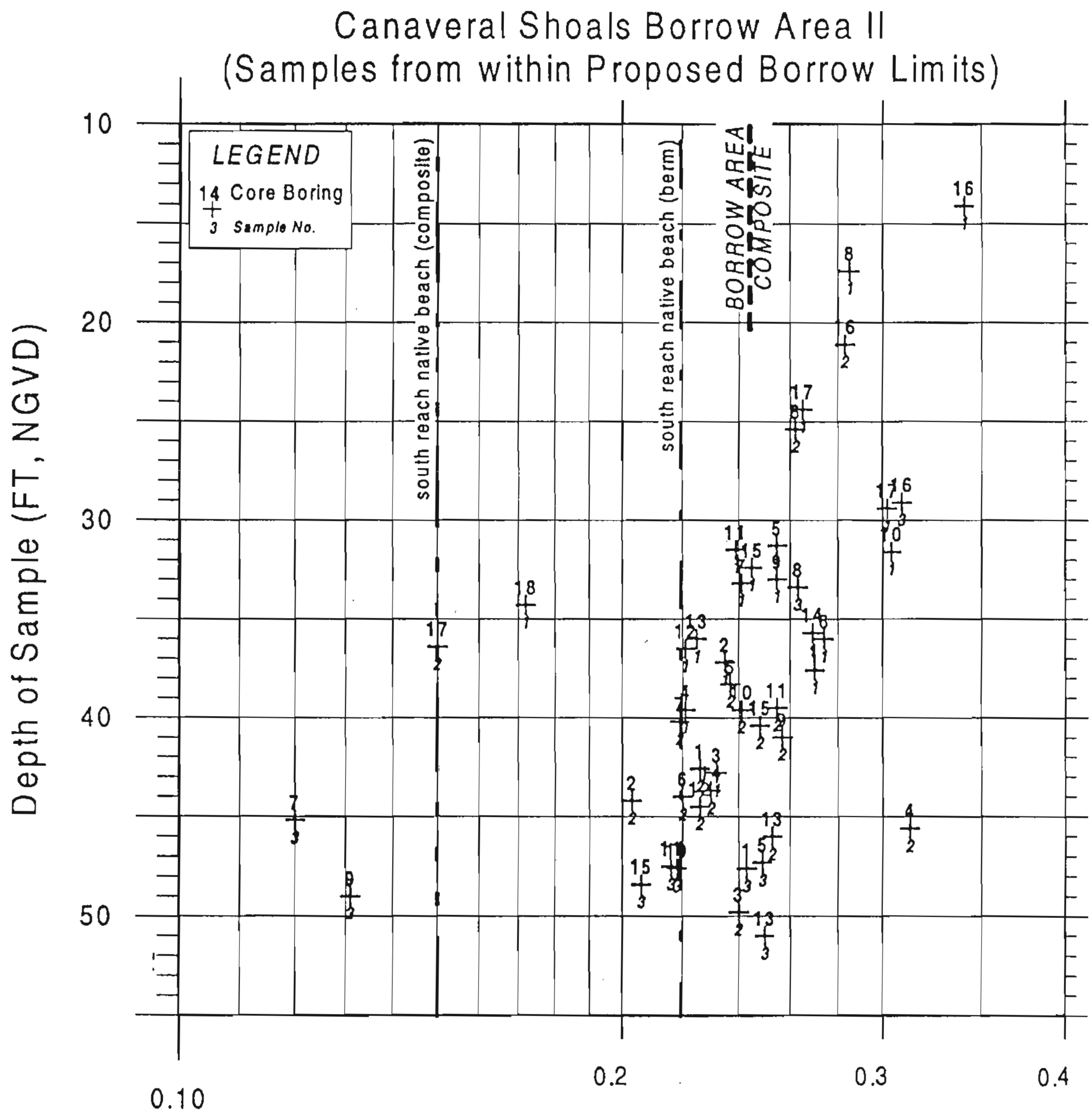

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Figure 5b: Fine-fraction grain size (d16) of borrow-area sediment samples as a function of sample elevation.

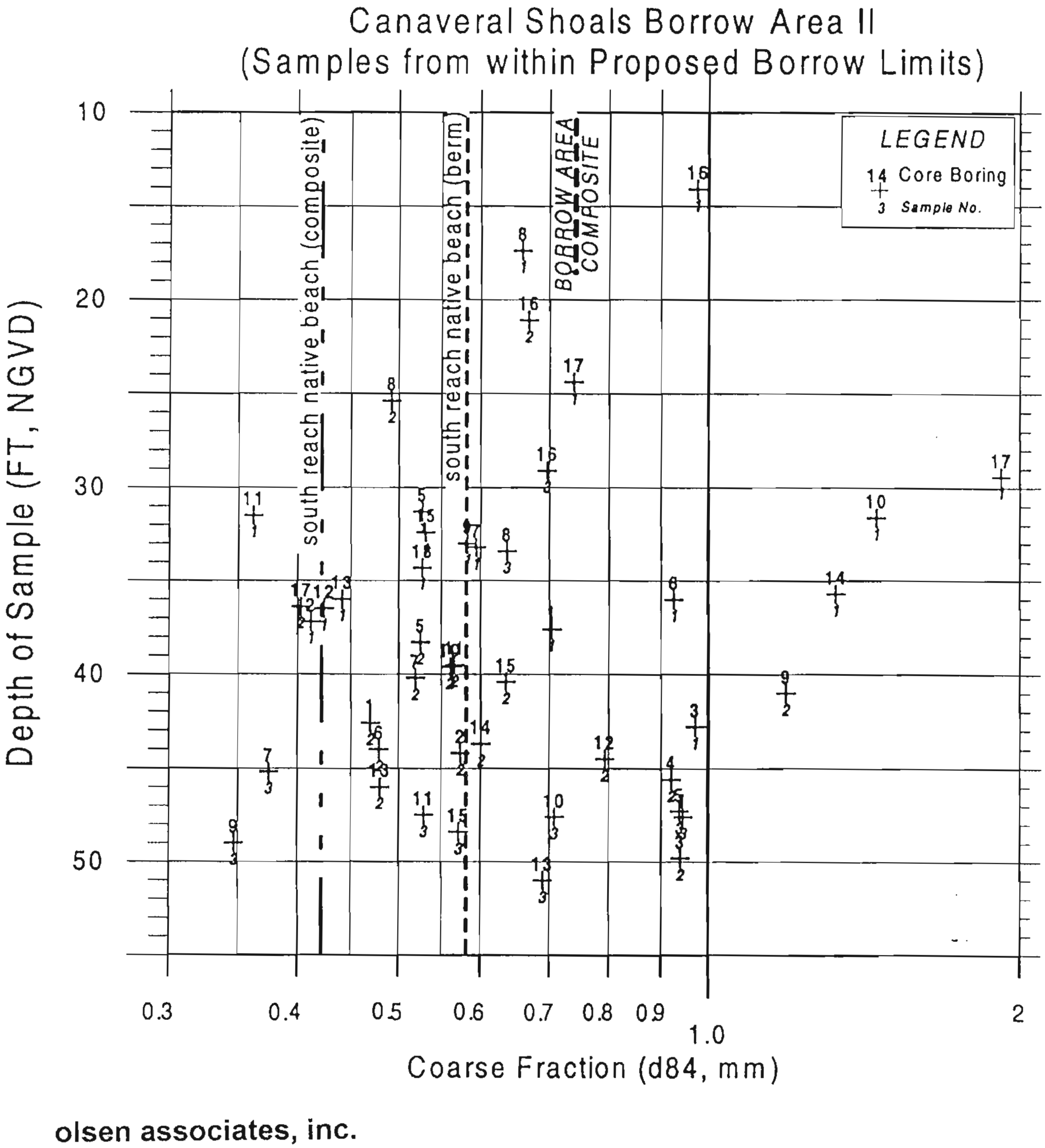

Figure 5c: Coarse-fraction grain size (d84) of borrow-area sediment samples as a function of sample elevation.

4.4 Biological Resources

Resources associated with benthic communities, endangered species (including marine turtles, whales and other marine mammals), non-threatened marine mammals, and fish resources are described in Sections 5.5 through 5.9, below.

4.5 Cultural Resources

The area of interest is a submerged portion of the seabed in waters associated with known historical vessel transit dating from the 16^{th} century. Numerous regional and site-specific studies of cultural resources, including historical shipwrecks, have been conducted in the area, including a recent sidescan sonar and magnetometer study of Borrow Area II in late 1998. Section 5.10, below, describes these resources and studies.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS - PHYSICAL RESOURCES

5.1 Air Quality

Existing air quality in the Brevard County area is better than that allowed under the national standards. In its attainment status table for Florida Ozone, the EPA lists Brevard County among those denoted as "attainment/ unclassifiable" along with all those adjacent counties, including Volusia, Orange, Indian River and Osceola Counties [ref. EPA 40 CFR Parts 52 and 81, Fed Reg. Doc. 95-4537, 2/24/95].

Air emissions associated with the project would result from operating the hopper dredge pumps and drive engines, tugs and attendant vessels, and bulldozer and loader. Emission estimates were developed in a manner analogous to that described in MMS (1997), and as described below.

Use of two 2500 cy hopper dredges was assumed with nominal loading and pump-out rates of 2500 and 1000 cy/hr, respectively, average R/T travel of 22 miles (North Reach) and 46 miles (South Reach) and assumed 20% to 25% allowance for mooring, maintenance and other idle times, for a total of 8.1 hours (North reach) and 11.2 hours (South Reach) per round trip per hopper. Construction of the North Reach (2.5 Mcy plus handling losses) would require about 1060 hopper trips, or 8586 gross hours; or, approximately 5.8 months for two vessels. Construction of the South Reach (1.6 Mcy plus losses) would require about 680 hopper trips, or 7616 gross hours; or abut 5.2 months assuming two vessels. Relocation of the nearshore mooring buoy was assumed to occur up to five times for the North Reach and once for the South reach. Beach fill grading was assumed to employ one bulldozer, one loader, and one flatbed for six months per each project reach.

Total project emissions of nitrogen oxides (No_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter (PM) are estimated in **Table 2.** The North and South Reaches would not be constructed simultaneously. Emissions estimated within State waters include 60% of those totals predicted for transit and idle, 0% for hopper dredging, and 100% for all other items.

TABLE 2. AIR EMISSION ESTIMATES					
ACTIVITY	EMISSIONS (TONS)				
	NO_x	SO_2	CO	VOC	PM
North Reach					
Hopper Dredging	81.4	8.1	21.5	2.2	8.1
Transit	134.1	13.4	35.3	3.7	13.4
Pump-Out	47.9	4.8	12.6	1.3	4.7
Idle	6.7	0.5	1.6	0.3	0.5
Relocate Mooring Buoy	16.0	1.6	3.7	0.6	1.5
Beach Grading	25.6	1.8	3.8	1.2	0.8
Sub-Total	311.7	30.2	78.5	9.3	29.0
Sub-Total w/in State Boundary	174.0	16.5	42.2	5.5	15.3
South Reach					
Hopper Dredging	51.9	5.1	13.7	1.4	5.1
Transit	180.4	18.0	47.5	4.9	18.0
Pump-Out	30.6	3.0	8.1	0.8	3.0
Idle	5.2	0.4	1.2	0.2	0.4
Relocate Mooring Buoy	3.2	0.3	0.7	0.1	0.3
Beach Grading	25.6	1.8	3.8	1.2	0.8
Sub-Total	296.9	28.6	75.0	8.6	27.6
Sub-Total w/in Stateboundary	170.8	16.1	41.8	5.2	15.1
Total (North and South Reach)	608.6	58.8	153.5	17.9	56.6
Total w/in State Boundary	344.8	32.6	84.0	10.7	30.4

Estimated emissions associated with the use of Borrow Area II to construct both reaches of the beach fill project are within the national ambient air quality standards. Total estimated emissions of No_x within State waters are predicted to average about 0.94 tons per day for both the North and South Reach. The levels of emissions predicted for the use of Borrow Area II are equivalent to those anticipated with use of the original borrow area described in the project's EIS

(USACE, 1996). Adverse air quality impacts, and/or non-conformance with standards, are not anticipated. State permits for construction of the North and South Reaches of the project beach fill have been issued by the State of Florida Department of Environmental Projection (JCP 134869-001 JC and JCP 0137212-001 JC). The Florida DEP does not otherwise regulate marine or mobile emission sources (dredge and construction equipment) within Brevard County. As the activity is located within an attainment area, EPA's General Conformity Rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity determination is not required.

5.2 Physical Oceanography (Waves, Current, Sand Transport)

Wave transformation and the associated longshore sediment transport potential along the affected shoreline were computed for existing conditions and simulated post-borrow conditions. The combined refraction/diffration model (REFDIF) was utilized for this purpose. The existing bathymetry was specified across a 123 x 191 element grid encompassing 18.0 statute miles onshore by 11.6 statute miles alongshore, assuming mid-tide conditions, with seaward boundaries sufficiently offshore to address wave transformation across the outer shoals. (See **Figures 6-7**, below.)

Twenty years of hindcast wave data (WIS Stations 18 and 19, water depths = 72 ft and 89 ft, respectively) were bin-sorted by wave incidence angle, and the average offshore height, period, angle, and occurrence were computed for each. Three cases characterize about 92% of the onshore-directed waves, and were selected as input conditions for the wave transformation analysis. (See **Table 3.**) For each wave case (and for both pre- and post-project seabed conditions), the wave height and local angle-to-shoreline were computed from the refracted wave fields, at the point of incipient breaking, for each alongshore column of the grid. The associated longshore transport potential was subsequently computed at each grid column for each of the wave cases using the CERC formula; i.e., $Q = KH_b^{5/2} \sin 2\alpha_b$ where K is a dimensional constant, and H_b and α_b are the breaking wave height and angle-to-shore, respectively. The results for each wave case were weighted by their hindcast frequency of occurrence and summed to characterize the dominant, average annual condition for pre- and post-project bathymetries.

Table 3. Offshore Wave Conditions (hindcast WIS data)				
Station	Ht, H_{sig} (m)	Pd, T (s)	Dirxn (deg from T. North)	Annual Occ. (%)
18	1.73	6.8	29.0	3.84
	1.46	11.4	59.2	27.51
	1.38	10.3	76.1	31.34
	.99	8.2	97.3	30.80
	1.35	6.0	123.0	1.86
	1.36	5.3	152.3	1.58
19	1.86	7.05	28.0	4.76
	1.49	11.56	57.6	28.04
	1.41	9.88	75.8	26.85
	1.02	8.14	99.1	32.4
	1.30	6.11	121.8	2.09
	1.48	5.44	153.8	2.08
Selected Input	1.46	11.4	59.0	31.5
	1.40	10.0	76.0	32.6
	1.00	8.2	98.0	36.0

The post-project ("borrow") bathymetry assumed a net total cut of approximately 6 mcy aligned east-west within the proposed limits of the borrow area, with a simulated dredge depth of about 10 feet below the ambient seabed and sloping sides. The simulated geometry of the dredged area is similar to that which is anticipated for project construction. The model results for alternate geometries of similar volume (not shown) were similar to those presented below.

Figures 6a-f illustrate the wave fields computed for each of the three dominant wave conditions, for pre- and post-project conditions. The length and orientation of the arrows depict the local height and azimuth of the waves.

AMBIENT (PRE-DREDGING) CONDITION
INPUT : H=4.8 FT; T=11.5 SEC; ANGLE = 31° NORTH OF EAST

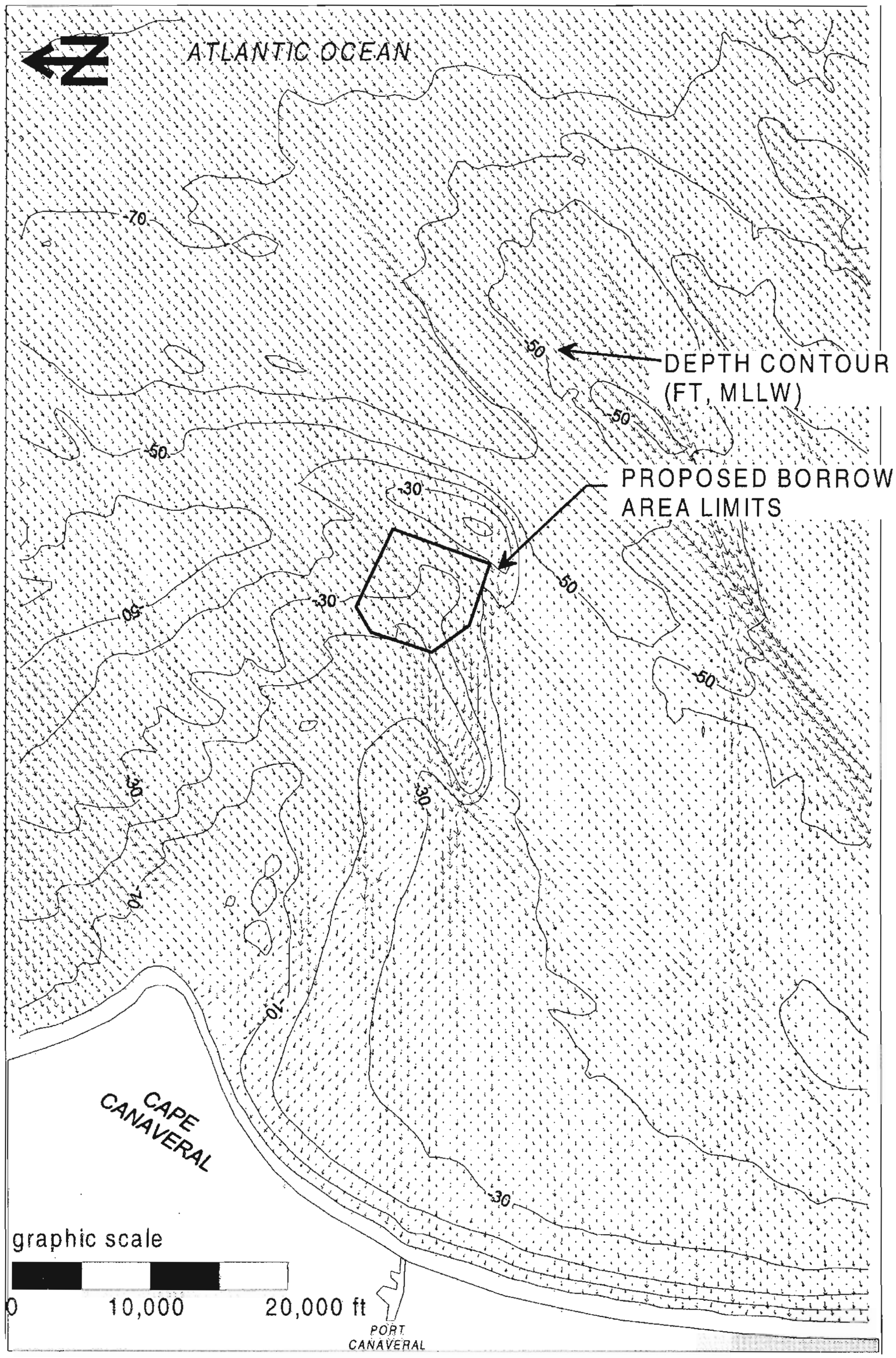

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Figure 6a: Computed wave refraction/diffraction pattern; existing conditions; northeast wave incidence.

POST-DREDGING CONDITION

INPUT : H=4.8 FT; T=11.5 SEC; ANGLE = 31°NORTH OF EAST

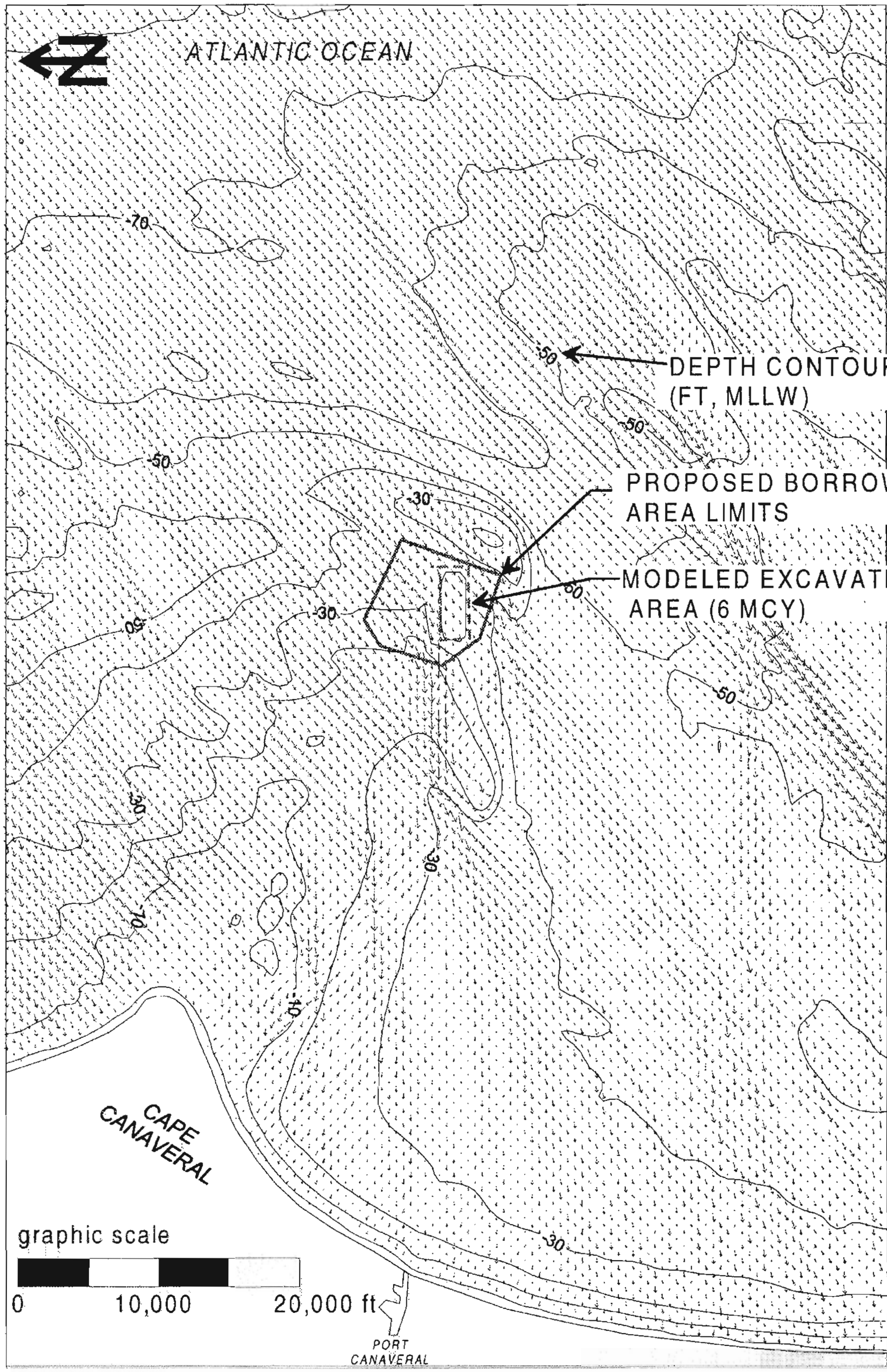

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Figure 6b: Computed wave refraction/diffraction pattern; post-dredging condition; northeast wave incidence.

AMBIENT (PRE-DREDGING) CONDITION
INPUT : H=4.6 FT; T=10.0 SEC; ANGLE = 14° NORTH OF EAST

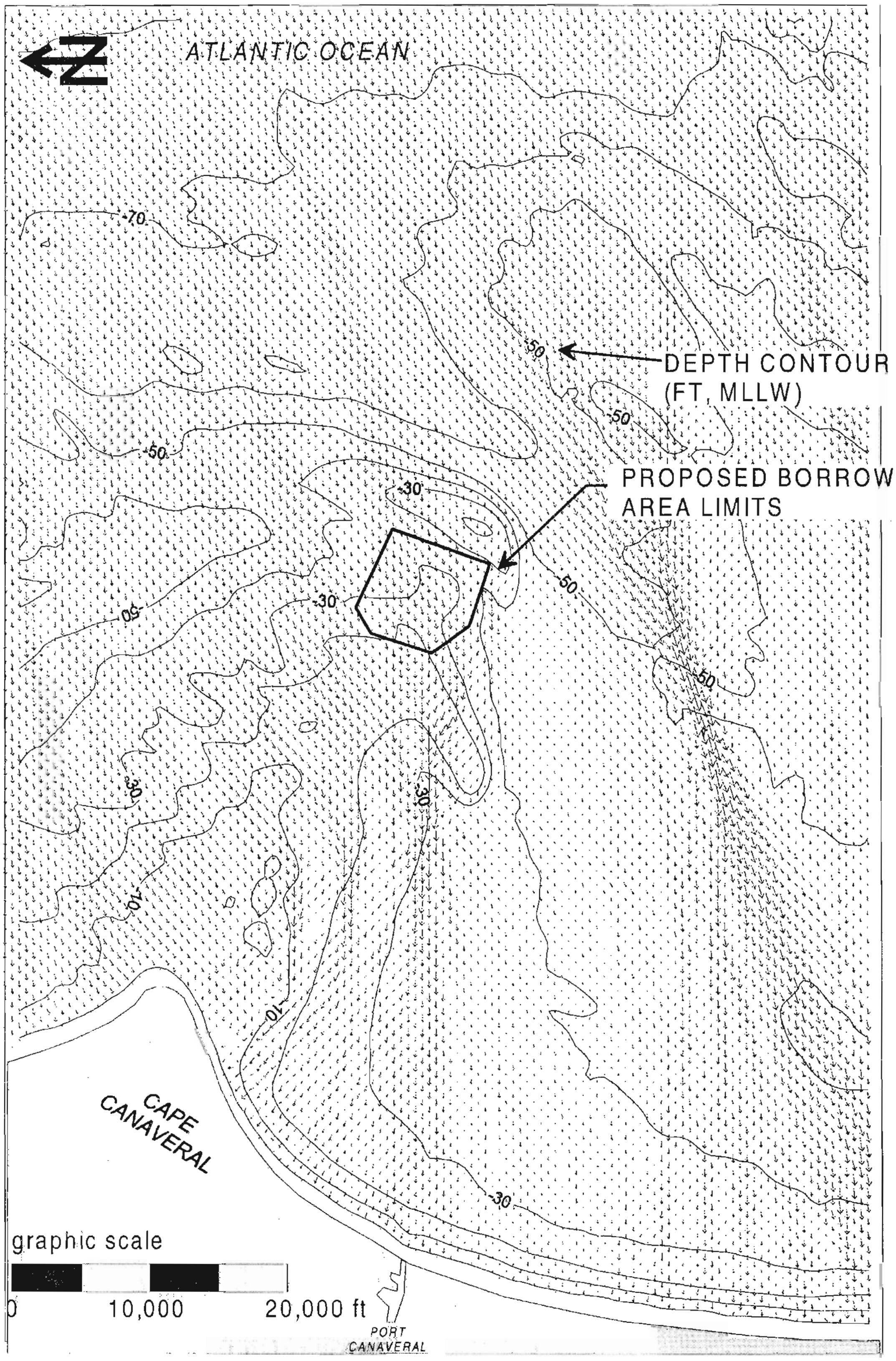

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Figure 6c: Computed wave refraction/diffraction pattern; existing conditions; east-northeast wave incidence.

POST-DREDGING CONDITION
INPUT : H=4.6 FT; T=10.0 SEC; ANGLE = 14° NORTH OF EAST

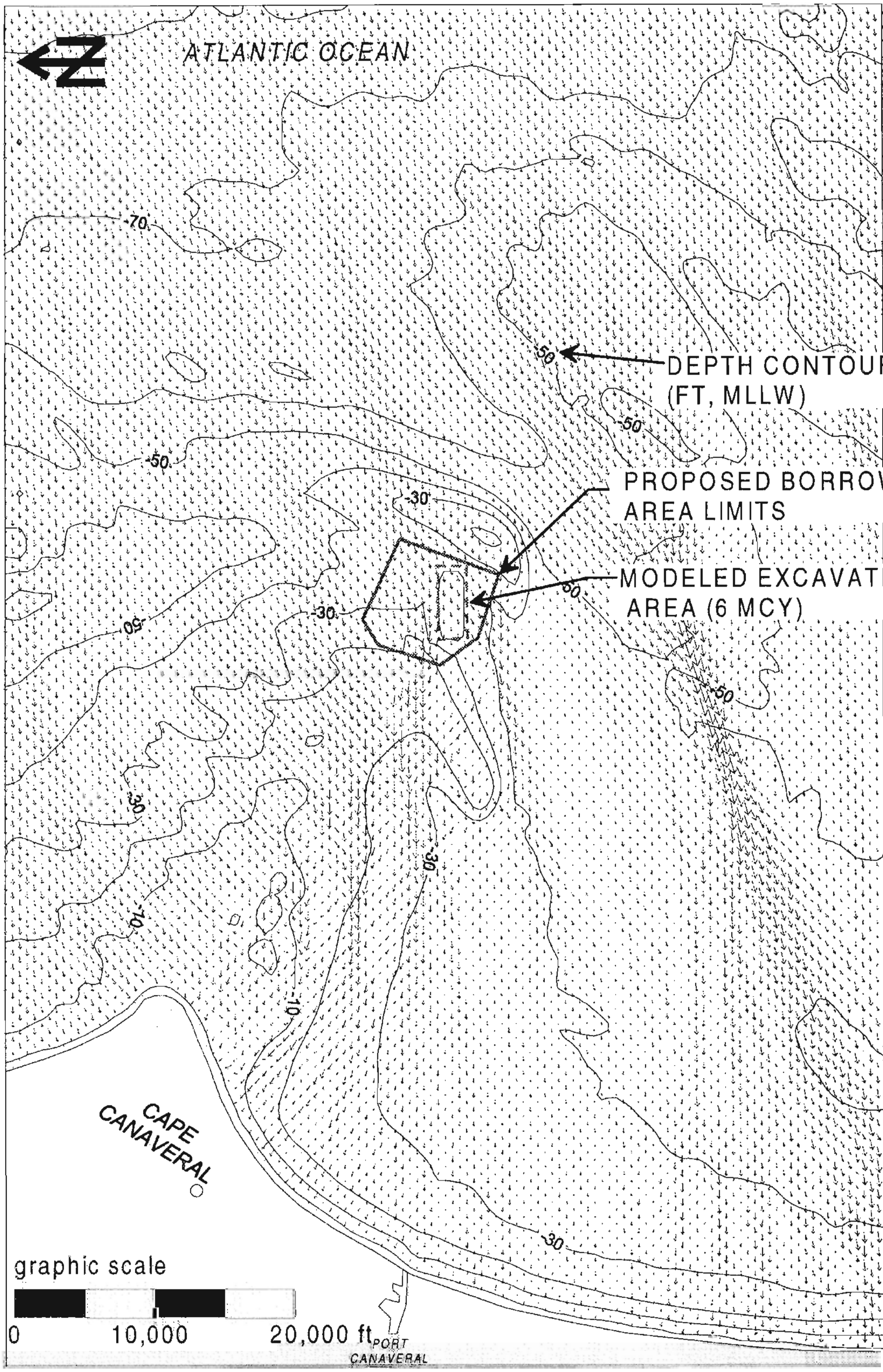

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Figure 6d: Computed wave refraction/diffraction pattern; post-dredging condition; east-northeast wave incidence.

AMBIENT (PRE-DREDGING) CONDITION
INPUT : H=3.3 FT; T=8.2 SEC; ANGLE = 8°SOUTH OF EAST

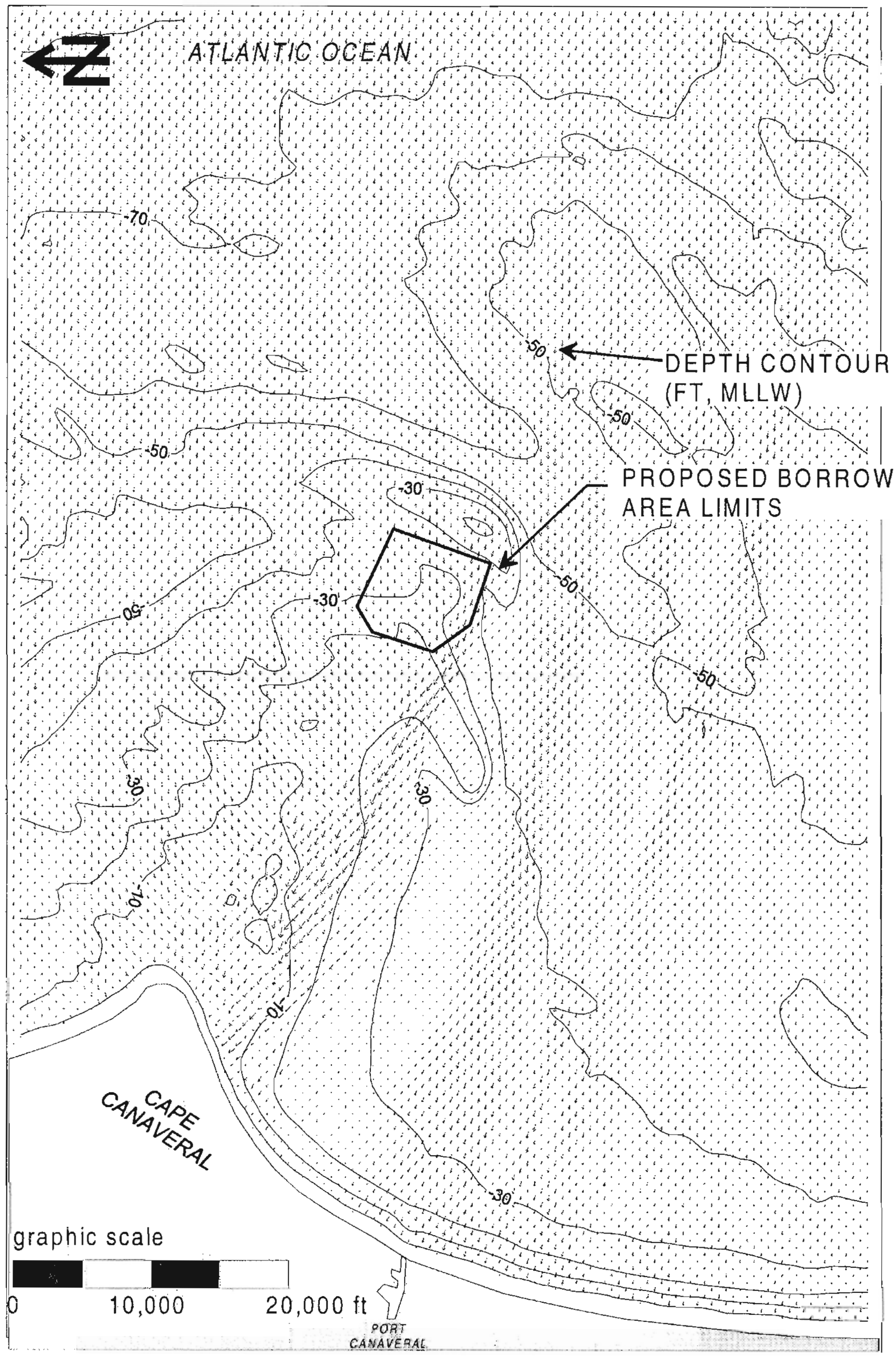

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Figure 6e: Computed wave refraction/diffraction pattern; existing conditions; east-southeast wave incidence.

POST-DREDGING CONDITION
INPUT : H=3.3 FT; T=8.2 SEC; ANGLE = 8°SOUTH OF EAST

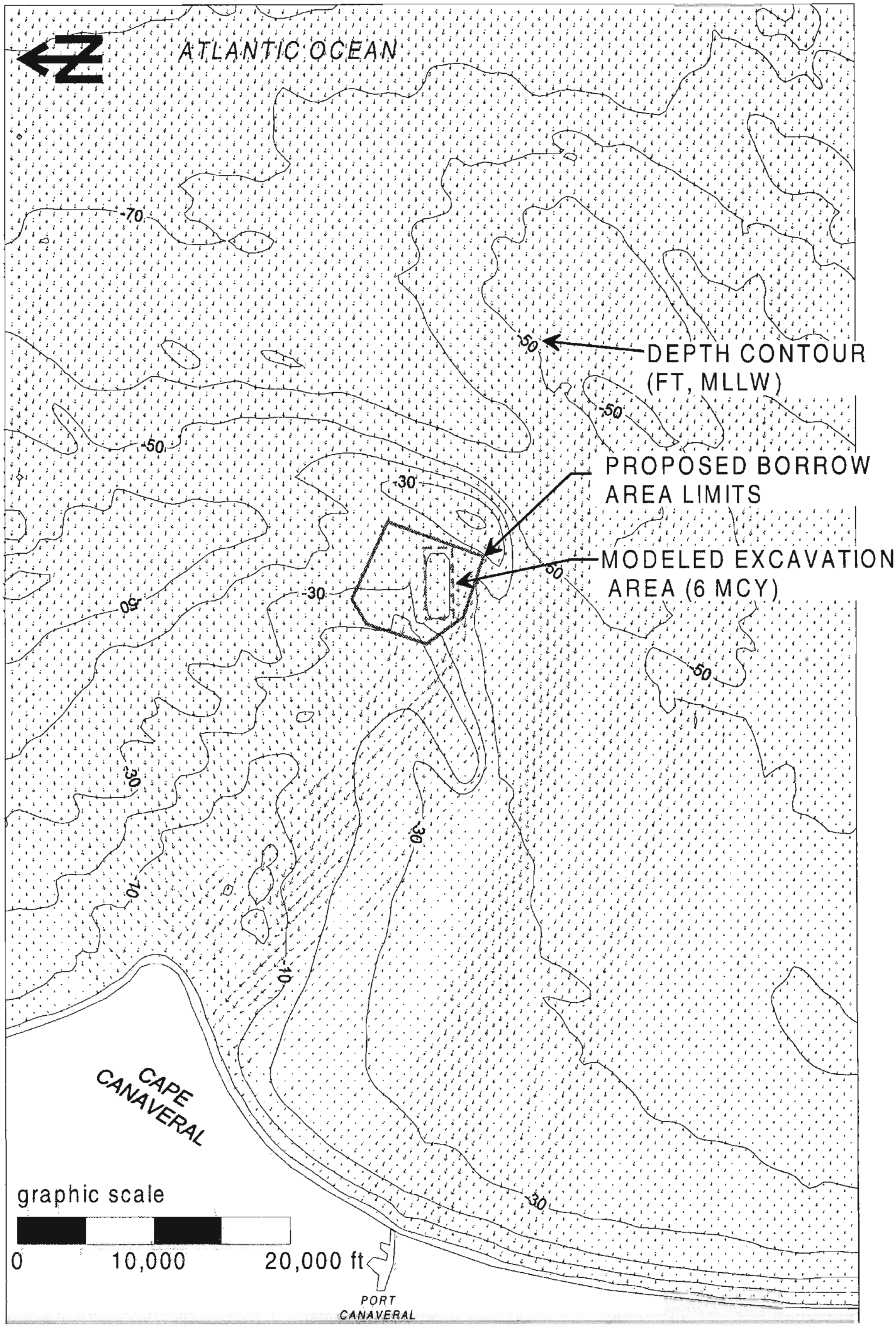

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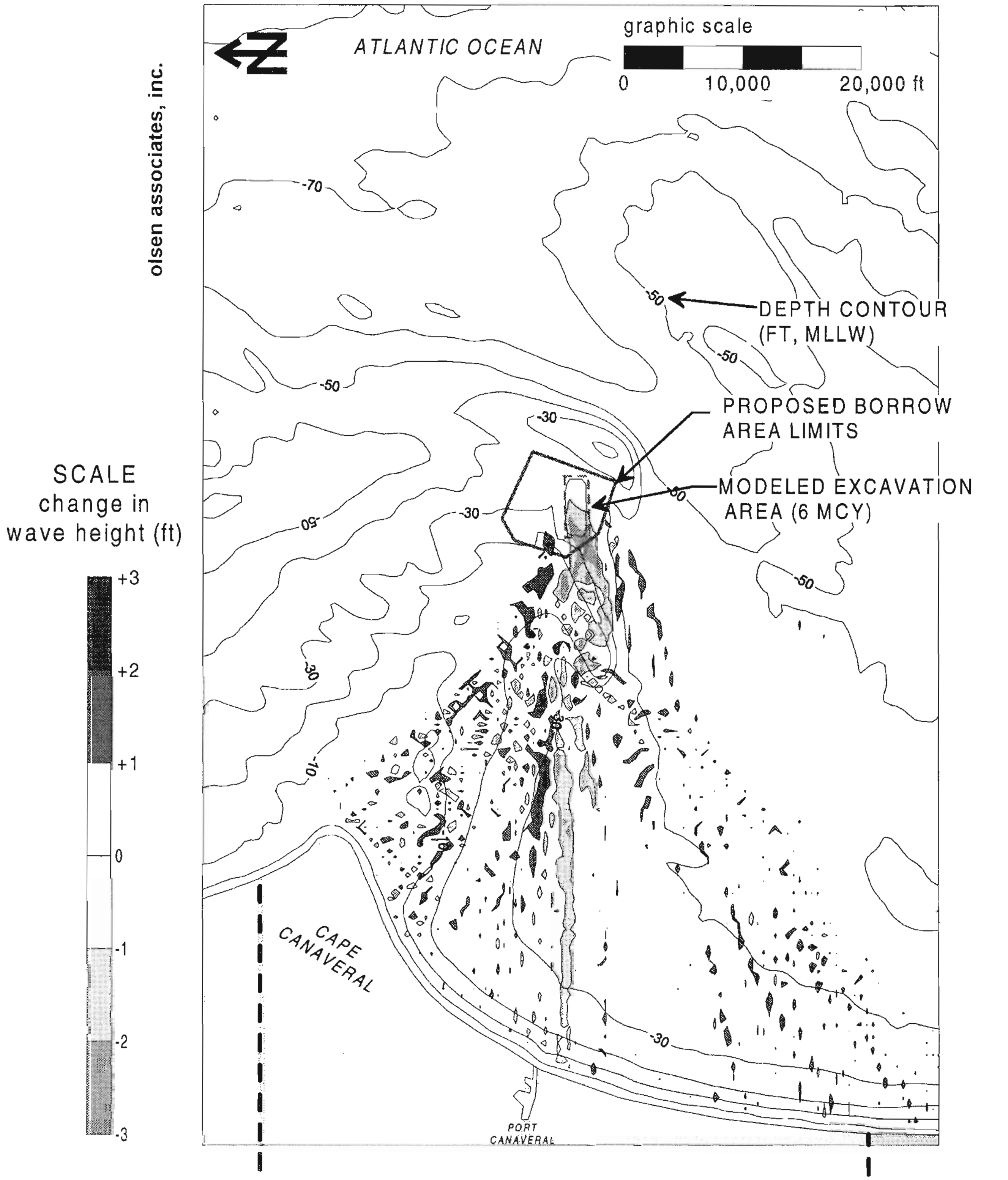
Figure 6f: Computed wave refraction/diffraction pattern; post-dredging condition; east-southeast wave incidence.

Figure 7 illustrates the predicted, average annual difference in the local wave heights between pre- and post-project ("borrow") conditions. That figure likewise depicts the computed longshore transport potential for both conditions. Differences in both the nearshore wave field and alongshore transport gradients are modest; viz., the computed differences generally represent a small percentage of the predicted, existing conditions. Accordingly, no significant effects are anticipated in the wave fields and/or transport potential subsequent to the proposed dredging activity.

The borrow area is located along the seaward (and predominant windward) edge of Southeast Shoals. Accordingly, and in light of the existing dynamic nature of these shoals (see above) it is reasonably anticipated that the excavated sideslopes will rapidly equilibrate (repose) and that the area will infill with sediment from the ambient seabed and predominant southerly drift that characterized the shoal's formative process.

AVERAGE ANNUAL WAVE AND SEDIMENT TRANSPORT CHANGES : BORROW AREA II EXCAVATION



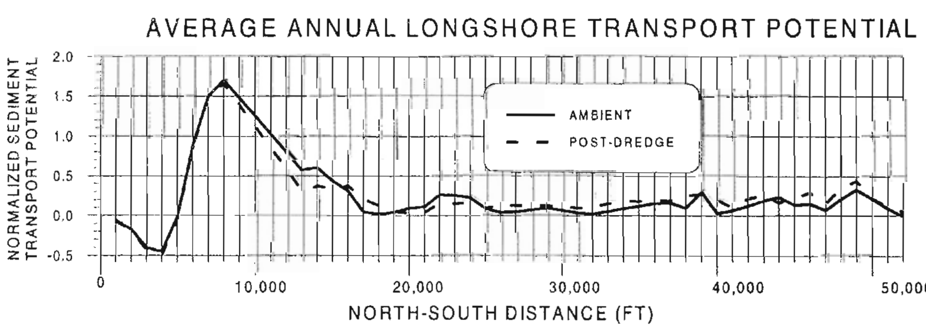


Figure 7

5.3 Turbidity and Water Quality

The waters immediately shoreward of the proposed borrow area are classified by the State of Florida as "Class III" open waters; i.e., ambient ocean. The exposed, open-water nature of the site is typified by fairly steady winds, waves and turbulence. There is no inflow, mixing, or input of upland or interior waterways within over 40 miles in any direction from the borrow area, with the exception of the Canaveral Harbor ship basins located approximately 6 miles to the southeast. Canaveral Harbor is otherwise hydraulically isolated from the interior waterways via a navigation lock. No historical reports of adverse water quality within the vicinity of the borrow area are known.

Dredging at the proposed borrow site is unlikely to result in a substantial adverse water quality impact. This is because the substrate is a clean sand being dredged in an open-water, typically dynamic, environment. The grain size distribution of the material is illustrated at the beginning of this report. It is characterized as a medium-grained sand with sampled median diameter of 0.18 mm to 0.56 mm, averaging 0.35 mm, and with moderately high shell content (34% to 53%). There is less than 2% fine sediment (silt fraction, <0.074 mm) in any of the samples withdrawn by vibracore. In light of the relatively coarse nature of the sand and minimal silt content, turbidity and/or oxygen depletion associated with dredging activity is reasonably predicted to be minimal and of no significant impact.

As the borrow site has not been associated with previous offshore dumping or disposal, and is neither adjacent to nor subject to influx of industrial activity, there is no reason to believe that there are hazardous or toxic materials associated with the substrate.

Turbidity associated with the dredging activity shall be monitored at least twice daily, at the surface and near the seabed, at both background and compliance locations. The dredging activity will adopt the State of Florida's water quality permit requirements for dredging and beach fill within State waters. In this way, background samples are measured 300 m to 500 m upcurrent of the activity, and compliance samples are measured 150 m downcurrent of the activity within the densest portion of any visible turbidity plume. Compliance turbidity values that exceed background values by more than 29 nephelometric turbidity units (NTU) require the dredging Contractor to modify or interrupt activities until the measured compliance value falls to acceptable limits.

Prior dredging of similar-to-finer sands in the general vicinity, for purposes of the Canaveral Harbor Federal Sand Bypass project, in both 1995 and 1998, resulted in no unacceptable turbidity levels; i.e., measured compliance turbidity was consistently less than 29 NTU above background.

The maximum downcurrent extent to which sedimentation may be expected to occur, as a result of sediment suspended by dredging, is shown in the Table, below. Therein, fall velocity was computed from Komar and Reimers (1978) for representative grain sizes of the borrow material. The constituent population of each grain size was noted from the borrow area composite grain size analysis. A uniform (conservative) current of 0.5 ft/sec was assumed. The particles were assumed to be suspended at the water surface, with water depth equal to 33 feet. The maximum (first-order) horizontal excursion of the grains by wave action is less than 20 feet for typical wave conditions (3.3 ft height, 8 seconds period) and is thus neglected in the results shown in the table. Based upon the average composition of the substrate, over 98% of dredged material suspended at the top of the water column are expected to settle to the seabed within about 370 feet (112 m) of the activity.

In sum, water quality impact by the proposed dredging is not expected to be significantly adverse. Cumulative effect on water quality is likewise not expected to be significant adverse, as dredging effects for each reach or phase of the project are not additive, and turbid effects to water quality recover between dredging events.

Table 4. Downrange excursion of suspended dredge sediment

Grain Size (mm)	Fraction of Composite Sed. Sample	Fall Velocity (ft/sec)	Downcurrent Excursion (ft)
0.15	> 98%	0.045	367
0.20	> 90%	0.066	251
0.27	> 70%	0.098	168
0.34	> 50%	0.115	144
0.47	> 25%	0.197	84
0.90	> 10%	0.360	46
Assumes uniform current of 0.5 ft/sec. Water depth = 33 ft.			

5.4 Compatibility with Native Beach Sands

The physical characteristics of the proposed borrow material are similar to those of the native beach fill area. The borrow material is as coarse or coarser than the native beach along both the North and South Reaches of the project. **Figure 8** contrasts the composite grain size distributions of the borrow and fill areas. The computed overfill ratio (Krumbein and James, 1965) of the sediment is 1.0 for both project reaches. No adverse impacts associated with the introduction of the borrow material to the beach fill areas are predicted.

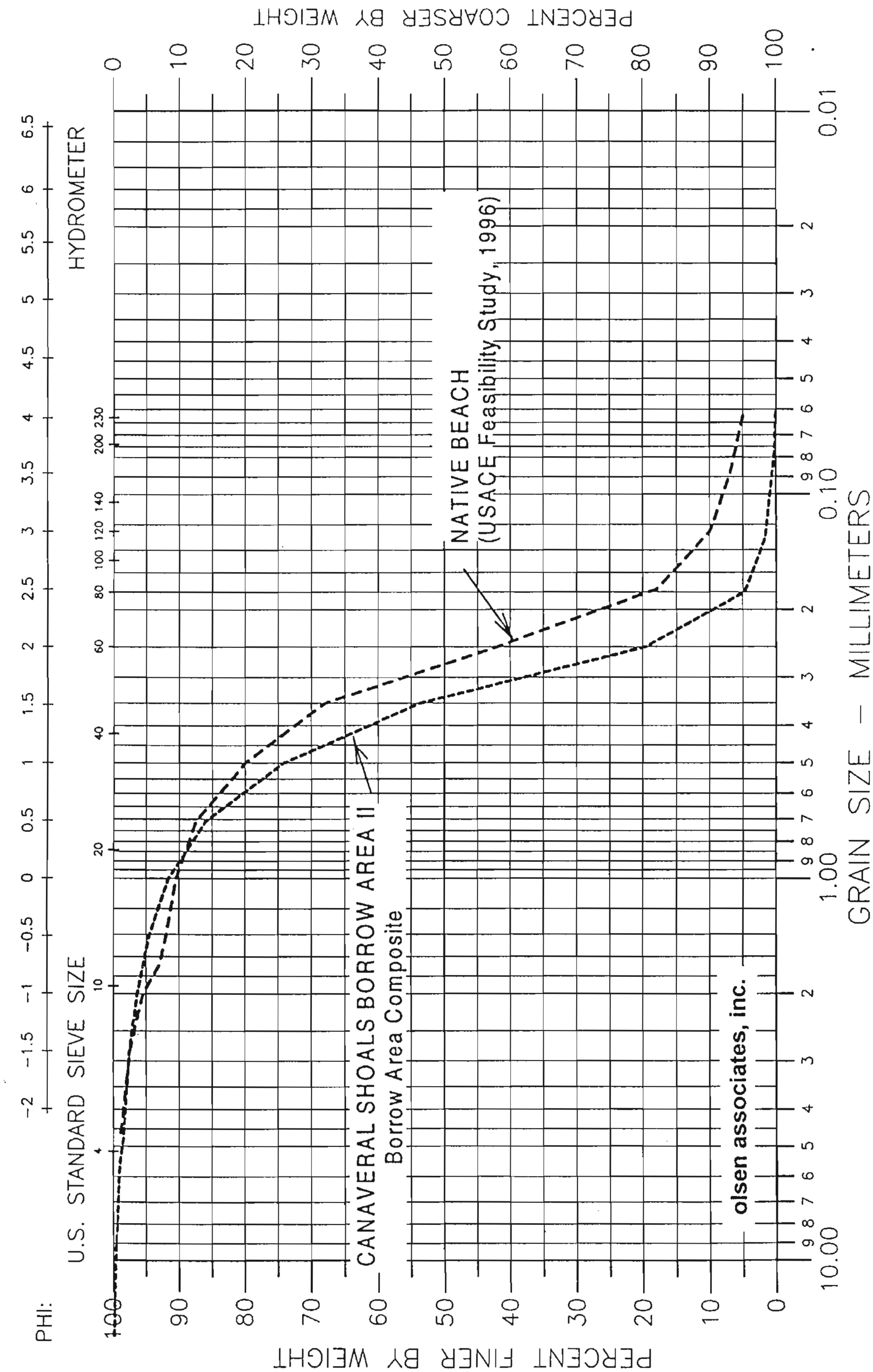


Figure 8:
Comparison of borrow area and native beach grain size distributions.

5.5 Benthic Organisms / Habitats

Description. The ambient seabed of the proposed borrow area is coarse to fine grain sand of recent origin. Field results of sidescan sonar survey of the area revealed no hardbottom, reef, or similar perturbations. Significant regional information is available concerning Borrow Area II's benthic and pelagic biological communities. These data are from sites that exhibit similar physical/chemical/geologic characteristics and from which reliable inferences can be made as to the effects offshore dredging will have on the biological communities and infrastructure associated with the proposed borrow area. Water depths of the site (25 to 45 feet) are very similar to those many nearshore sites from which considerable information on existing infauna, and dredging impacts thereto, are available in the literature.

Borrow Area II is about 5 nautical miles north-northeast of a U. S. Environmental Protection Agency approved offshore disposal site (Canaveral Ocean Dredged Material Disposal Site (ODMDS)) on which extensive physical, chemical and biological sampling occurred prior to its use as an ODMDS. Continental Shelf Associates, Inc. (1985, 1986) surveyed this site and collected bathymetry, water column, sediment, and biological data at a water depth of approximately 15 m (49 ft). (See **Figure 9**.) Six infaunal and sediment samples were likewise collected and analyzed from this vicinity (three within the ODMDS and three approximately 1 n.m. outside of the site) in 1993 (Shaul and Bodge, 1994), as well as from the Canaveral Harbor Nearshore Disposal Area (NDA). (See **Figure 10**.) Samples from the latter were collected in water depths of approximately 22 to 30 feet.

Sediment grain-size analysis from the Canaveral ODMDS and NDA sites demonstrated medium-to-fine grained sands. Annelids, bivalves, and gastropods were abundant in infaunal samples. **Table 5** summarizes the five major taxanomic groups and the percent contribution to total abundance of individuals per square meter at the Canaveral ODMDS macroinfaunal stations from the survey by CSA (1985, 1986). **Table 6** summarizes these data for the ODMDS and NDA areas from the survey by Shaul & Bodge (1994).

At the Duval County, Florida, beach erosion control borrow site, which exhibited similar grain size sediments, comparable total percentages of contribution to total abundance of individuals occurred (Lotspeich and Associates, Inc., 1997). **Table 7** summarizes the cumulative results from the borrow and control sampling stations for the Duval study.

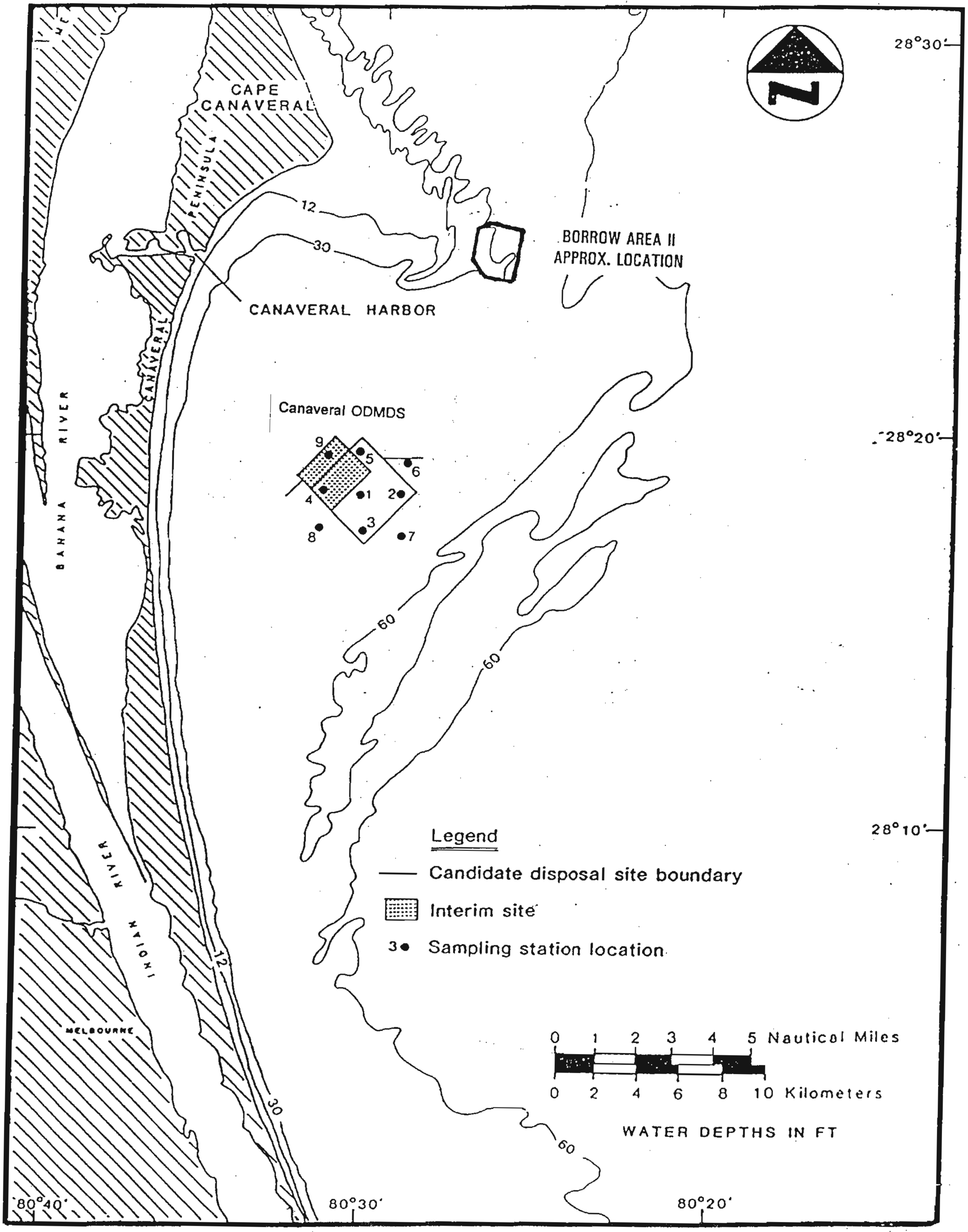


Figure 9:
Sampling stations at Canaveral ODMDS (from CSA, 1985, 1986).

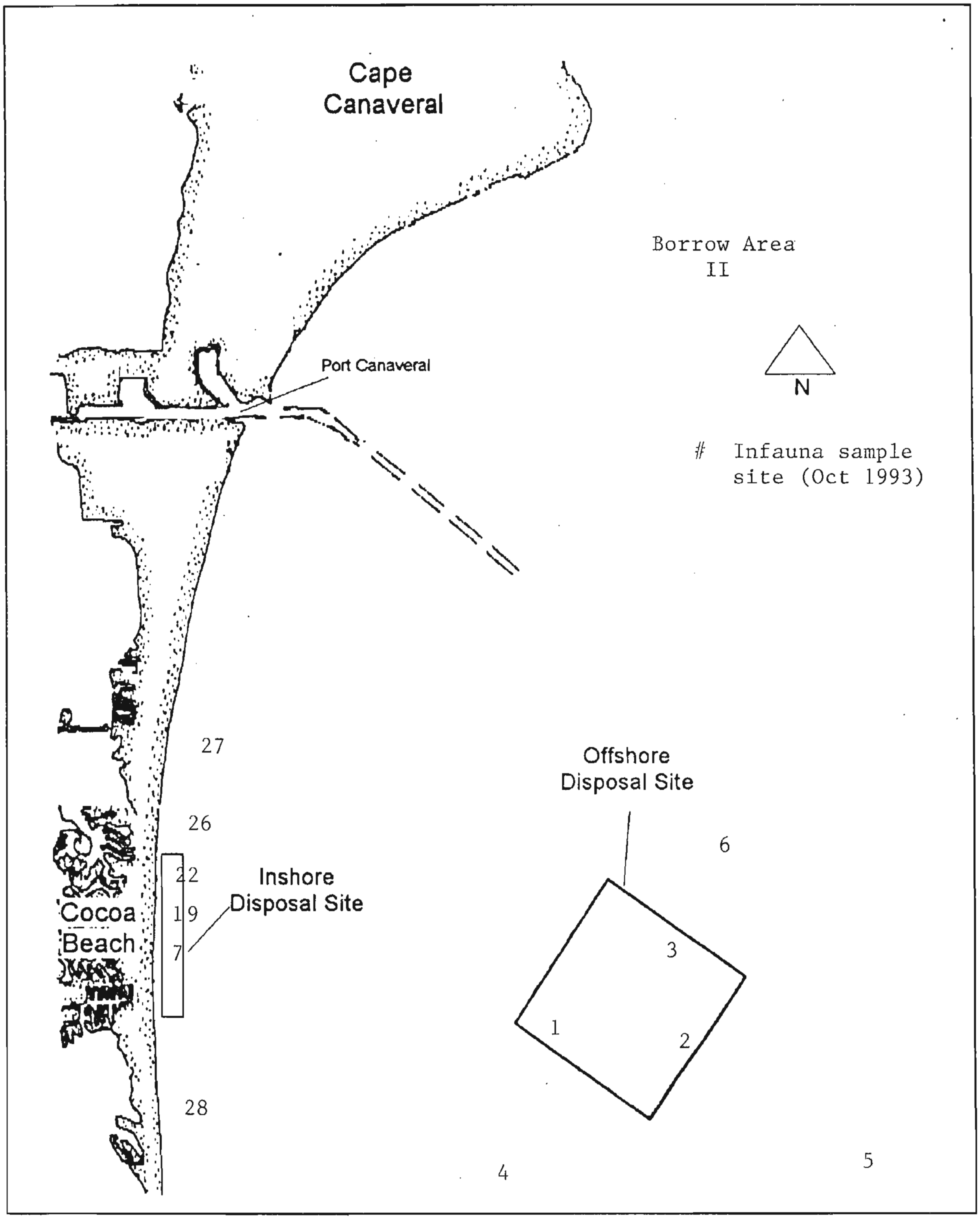


Figure 10:
Sampling stations from Canaveral ODMDS and Nearshore Disposal Area (NDA); from Shaul and Bodge, 1994.

Table 5.

Abundance of Major Taxonomic Groups (Percent Contribution to Total Abundance) in Individuals per Square Meter at the Canaveral ODMDS Macroinfaunal Stations. (From CSA, 1985, 1986).

Station	Taxon					
	Annelida	Mollusca	Arthropoda	Echinodermata	Other	Total
1	1062.4 (33.3)	1408.0 (44.2)	51.2 (1.6)	192.0 (6.0)	473.6 (14.9)	3187.2
2	1587.2 (36.7)	1740.8 (40.2)	89.6 (2.1)	563.2 (13.0)	345.6 (8.0)	4326.4
3	1843.2 (41.1)	1561.6 (34.9)	166.4 (3.7)	448.0 (10.0)	460.8 (10.3)	4480.0
4	230.4 (40.0)	230.4 (40.0)	76.8 (13.3)	0.0 (0.0)	38.4 (6.7)	576.0
5	1062.4 (49.7)	640.0 (29.9)	153.6 (7.2)	76.8 (3.6)	204.8 (9.6)	2137.6
6	1228.8 (45.9)	704.0 (26.3)	307.2 (11.5)	89.6 (3.3)	345.6 (12.9)	2675.2
7	3840.0 (52.3)	2022.4 (27.5)	243.2 (3.3)	934.4 (12.7)	307.2 (4.2)	7347.2
8	243.2 (36.5)	89.6 (13.5)	217.6 (32.7)	0.0 (0.0)	115.2 (17.3)	665.6
9	729.6 (59.4)	281.6 (22.9)	64.0 (5.2)	0.0 (0.0)	153.6 (12.5)	1228.8
Mean	1314.1 (44.4)	964.3 (32.6)	152.2 (5.1)	256.0 (8.7)	271.6 (9.2)	2958.2

Table 6.

Abundance of Major Taxanomic Groups (and Density per Square Meter) at the Canaveral ODMDS and Nearhsore Disposal Areas. (From Shaul and Bodge, 1994.)

Composition of infauna community at stations sampled in the vicinity of the nearshore disposal site off Port Canaveral.

Station	Annelida	Mollusca	Arthropoda	Miscellaneous	Echinodermata
7	60	0	33.3	6.6	0
19	61.1	16.6	16.6	5.5	0
22	80	20	0	0	0
26	41.6	16.6	25	16.6	0
27	33.3	26.6	20	13.3	6.6
28	35.7	35.7	21.4	7.1	0
Average	**51.9**	**19.3**	**19.4**	**8.2**	**1.1**

Infauna community parameters for stations located in the vicinity of the Canaveral Nearshore Dumpsite.

Station Number	Total Taxa	Mean Taxa Replicate	Total No. of Individuals	Mean Density	Standard Deviation	H'	J'	D
007	15	6.7	27	2045	455	2.43	0.90	4.25
019	18	9.3	33	2500	227	2.75	0.95	4.86
022	5	3.0	13	985	347	1.38	0.86	1.56
026	12	6.7	30	2273	394	2.16	0.87	3.23
027	15	6.0	33	2500	394	2.54	0.94	4.00
028	14	6.3	22	1667	131	2.46	0.93	4.21

H'=Shannon Wiener Diversity Index; J' Pielous Species Evennes Index; D=Margalaf's Species Richness Index

Composition of infauna communities at stations sampled in the vicinity of the offshore disposal site off Port Canaveral.

Station	Annelida	Mollusca	Arthropoda	Miscellaneous	Echinodermata
1	41.1	41.1	5.8	5.8	5.8
2	43.7	37.5	6.2	6.2	6.2
3	47.6	38.1	9.5	4.7	0
4	40.6	25	12.5	12.5	9.3
5	37.5	29.1	12.5	8.3	12.5
6	44.4	22.2	7.4	14.8	11.1
Average	**42.4**	**32.2**	**8.9**	**8.7**	**7.5**

Infauna community parameters for stations located in the vicinity of the Canaveral Offshore Dumpsite.

Station Number	Total Taxa	Mean Taxa/ Replicate	Total No. Individuals	Mean Density	Standard Deviation	H'	J'	D
001	17	7.3	30	2273	682	2.57	0.91	4.70
002	16	6.0	22	1667	347	2.63	0.95	4.85
003	21	9.0	36	2727	1136	2.89	0.95	5.58
004	32	14.3	62	4697	473	3.20	0.92	7.51
005	24	11.3	47	3561	1479	2.87	0.90	5.97
006	27	12.7	61	4621	1166	3.09	0.94	6.32

H'=Shannon Wiener Diversity Index; J' Pielous Species Evennes Index; D=Margalaf's Species Richness Index

Table 7.

Percentage of Individuals by Major Infaunal Groups for the Borrow (Brw) and Control (Ctrl) Areas for Each Sampling Date; Duval County Offshore Borrow Area. (From Lotspeich and Associates, Inc., 1997.)

Infaunal Group	Brw Jun-95	Brw Feb-96	Brw Sep-96	Brw Jun-97	Ctrl Jun-95	Ctrl Feb-96	Ctrl Sep-96	Ctrl Jun-97	Brw All Dates	Ctrl All Dates	All Areas All Dates
NEMERTEA	1.63	2.89	6.76	3.58	3.71	4.57	5.68	3.23	3.38	4.13	3.75
ANNELIDA											
-Total	38.77	80.51	41.89	22.90	37.28	67.99	38.17	20.97	40.91	39.27	40.10
Polychaeta	34.78	79.42	41.89	18.60	25.44	57.62	38.17	18.66	38.00	32.52	35.30
Oligochaeta	1.27	.00	.00	.00	.35	.00	.00	.00	.42	.12	.27
Misc. Annelids	2.72	1.08	.00	4.29	11.48	10.37	.00	2.30	2.49	6.63	4.54
MOLLUSCA											
-Total	39.86	3.97	26.01	56.71	41.87	5.79	26.18	35.48	37.11	29.97	33.58
Gastropoda	20.83	.00	6.42	44.36	24.20	3.05	16.40	22.35	22.68	17.99	20.37
Bivalvia	19.02	3.97	19.26	12.34	17.67	2.74	9.46	13.13	14.37	11.91	13.16
Misc. Molluscs	.00	.00	.34	.00	.00	.00	.32	.00	.06	.06	.06
ARTHROPODA											
-Total	9.96	8.66	21.62	14.67	14.66	19.82	26.18	38.94	13.36	24.32	18.77
Myodocopa	.18	.00	.34	.00	1.59	.00	.32	.00	.12	.61	.36
Podocopa	1.27	.00	.00	.00	.00	.00	1.58	.00	.42	.30	.36
Cirripedia	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Mysidacea	.00	.00	.68	.00	.00	.00	.00	.23	.12	.06	.09
Cumacea	.36	2.89	3.04	2.33	4.42	1.22	2.52	9.45	1.90	4.74	3.30
Tanaidacea	2.17	.00	.00	.00	.00	.00	.00	.00	.71	.00	.36
Isopoda	.54	.00	.00	.00	.53	.00	.63	.69	.18	.49	.33
Amphipoda	4.89	5.05	13.85	10.91	7.42	18.29	20.82	26.27	8.49	17.14	12.77
Decapoda	.54	.72	3.72	1.25	.18	.30	.32	.92	1.37	.43	.90
Insecta	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Misc. Arthropods	.00	.00	.00	.18	.53	.00	.00	1.38	.06	.55	.30
ECHINODERMATA	2.90	.72	1.69	.18	.71	.00	.63	.46	1.43	.49	.96
HEMICHORDATA	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
VERTEBRATA	.00	.00	.00	.18	.00	.00	.00	.00	.06	.00	.03
MISCELLANEOUS	6.88	3.25	2.03	1.79	1.77	1.83	3.15	.92	3.74	1.82	2.79
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8 compares the average abundance of the dominant taxon identified at the Duval County and Canaveral seabed sites.

Table 8.
Comparison of Average Abundance of Dominant Infaunal Groups at Canaveral and Duval Study Areas.
(Percent contribution to total.)

Infaunal Group	Canaveral Off-shore Disposal Area		Canaveral Nearshore Disposal Area	Duval County*	
	1985-86	1993		June 1995	All Dates
Annelida	44.4	42.4	51.9	38.0	40.1
Mollusca	32.6	32.2	19.3	40.9	33.6
Arthopods	5.1	8.9	19.4	12.3	18.8
Echinodermata	8.7	7.5	1.1	1.8	1.0
Nemertea**	--	--	--	2.7	3.8
Other/Misc	9.2	8.7	8.2	4.3	2.7

* Average of all borrow and control areas.
** May be included in other/misc. category

Potential Impacts. From Table 8, the relative abundance of the leading infaunal groups are similar between the sampled sites, each of which are morphologically similar to the proposed area of dredging activity. Potential impacts to, and recolonization of, the benthic community is thereby reasonably anticipated to be similar to that observed at other offshore dredging areas, including that of the Duval County, Florida, study area. In this regard, and with respect to the sum of existing knowledge of impacts to, and recolonization of, benthos within sand areas dredged for beach nourishment (noted below), pre- and/or post-infaunal sampling of proposed borrow areas within adjacent, State of Florida waters is not routinely required by the Florida Dept. Of Environmental Protection or the U. S. Army Corps of Engineers.

The hopper dredging activity will be limited to a small area within the borrow area limits. Efficient dredging practice, and prudent design, entails dredging material in 2 to 5-ft thicknesses at a time along long, straight, adjacent runs. Dredging of the approx. 4.5 mcy quantity estimated for the project's construction is anticipated to directly involve (impact) an area of about 8000 ft by 1500 ft. Initial dredging of the area, required for the project's North Reach (2.5 mcy, more or less), is anticipated to involve about 60% of that area.

Where the direct effects of dredging occur, nonmotile invertebrates would succumb. However, as dredging will be limited to a relatively small area, species inhabiting bottom areas adjacent to dredged furrows will provide a local recruitment stock. As these organisms are very fecund, the dredged site is expected to quickly recolonize. In addition to the Lotspeich (1997) study noted above, other studies indicate relatively rapid recovery of the benthic community, particularly when water depths where dredging occurs are less than 40 feet, and the area and depth to which the bottom is dredged is minimized. Other studies in Florida (Marsh et al., 1980; Marsh and Turbeville, 1982; Cutler and Mahadevan, 1982; Gorzelany, 1983; Saloman et al., 1982; Nelson, 1985; Continental Shelf Associates, Inc., 1987b; Gorzelany and Nelson, 1987; Bowen and Marsh, 1988; Shaul and Bodge, 1994; Blake et al., 1995; among others) investigated the impact of dredging and/or filling on benthic communities in borrow and fill areas. These studies suggest that the site conditions which characterize Borrow Area II are reasonably expected to result in analogous and successful recovery of the biological community. The immediate impact at the dredged (borrow) site is a temporary defaunation of the benthic community. Re-establishment of the benthic community at the borrow site appears to coincide with the recovery of the site to pre-dredging physical and chemical conditions. This may require the natural refilling of the dredged area with sediment of a grain-size composition that is similar to that which existed prior to dredging. This physical recovery is reasonably expected as a result of the area's natural dynamic setting that is characterized by abundant, ambient sand shoals and an energetic wave and current climate.

Previous studies have specifically investigated the recovery of the benthic community after the use of an offshore borrow site. Marsh et al. (1980) found no continuing impacts at the borrow site offshore of Hallandale Beach, Broward County, FL, surveyed seven years after a beach restoration project. Marsh and Turbeville (1981) found no long-term effects on many benthic community parameters in a borrow area offshore of Hillsboro Beach, Broward County, FL, five years after use of the site; however, qualitative changes in species composition were noted. Culter and Mahadevan (1982) found similar results offshore of Panama City Beach, Bay County, FL, three to four years after dredging for a beach restoration project. There, Saloman et al. (1982) found that benthic community characteristics such as faunal abundance, species diversity, equitability, and species composition were equivalent to those of surrounding communities within 3 months of the sediment disturbance. Post-dredging samples at a borrow area near Egmont Key, FL, demonstrated that dredged- and control-area benthos underwent different temporal patterns in community composition. The two dredged stations responded quite differently from one another while the control station showed less temporal variability. It was not possible to tie differences in benthic community composition between dredged and control stations solely to dredging (Blake et al., 1995).

Potential sublethal effects on filter feeding benthos, associated with suspended sediment plumes, include gill abrasion/clogging and respiration impairment. These effects are not anticipated to be significant as the substrate is a clean sand being dredged in an energetic, open-water, typically dynamic environment. In light of the relatively coarse nature of the sand and minimal silt content (see Section 5.3, above), turbidity and/or oxygen depletion associated with dredging is reasonably predicted to be minimal and of no significant impact.

5.6 Endangered and Threatened Marine Turtles

Environmental consequences on endangered and threatened marine turtles are addressed in detail in the project E.I.S. (USACE, 1996). Use of Borrow Area II as a sand source for the project presents identical consequences as are presented in the E.I.S., and its potential effect to marine turtles is likewise covered therein. The most recent National Marine Fisheries Service (NMFS) Regional Biological Opinion (BO), describing potential impacts to marine turtles and recommended and required measures to minimize such impacts, as well as the Biological Opinion for the project prepared by the U.S. Fish & Wildlife Service, are included in **Appendix A** of the present document. Provisions of this most recent BO will be applied to all work associated with the project, including that associated with dredging of Borrow Area II. These provisions are identically required in the project's State permit requirements (viz., Florida Dept. Of Env. Protection, Permit 0134869-001JC (North Reach) and 0137212-001JC (South Reach)).

5.7 Endangered and Threatened Marine Mammals

Resource. Of the whale species listed in the EIS (USACE, 1996), the NMFS has determined that only the right whale and the humpback whale may be adversely impacted by dredging operations associated with beach nourishment projects (NMFS, Biological Opinion, August 25, 1995; see **Appendix A**).

Northern right whales (*Eubalaena glacialis*) range from Iceland to eastern Florida with occasional sightings in the Gulf of Mexico. This is the rarest of the world's baleen whales, with a current North Atlantic population between 325 and 350 individuals (Kraus et al., 1993). Coastal waters of the southeastern United States (off Georgia and northeast Florida) are important wintering and calving areas for northern right whales, while the waters around Cape Cod and Great South Channel are used for feeding, nursery, and mating during summer (Kraus et al., Schaeff et al., 1993). From June to September, most animals are found feeding north of Cape Cod. Northern right whale mating probably occurs during late summer; gestation lasts 12 to 16 months, and claves are suckled for about one year (Knowlton and Kraus, 1989). Southward migration occurs offshore from mid-October to early January, although northern right whales may arrive off the Florida coast as early as November and may stay into late March (Kraus et al., 1993). This species usually occurs shoreward of the 200-m contour linet. Preferred water depths during recent surveys off the Florida coast range from 3 to 73 m with a mean of 12.6 m (Kraus et al., 1993).

Designated critical habitat for the northern right whale includes portions of Cape Cod Bay and Stellwagen Bank and the Great South Channel (off Massachusetts) and waters adjacent to the coasts of Georgia and northeast Florida. The southernmost critical habitat (**Figure 11**) extends from the mouth of Altamaha River in Georgia to Sebastian Inlet in Florida, which includes the coastal waters of the project area.

Humpback whales (*Megaptera novaeangliae*) range from the Arctic to the West Indies, including the Gulf of Mexico. They are found in middle Atlantic shallow coastal waters during spring and in waters around Cape Cod to Iceland during late spring to fall. During summer there are at least five geographically distinct feeding aggregations in the northern Atlantic. Generally, their distribution has been largely correlated to prey species and abundance (Blaylock et al., 1995). It is thought that migration south to the Caribbean

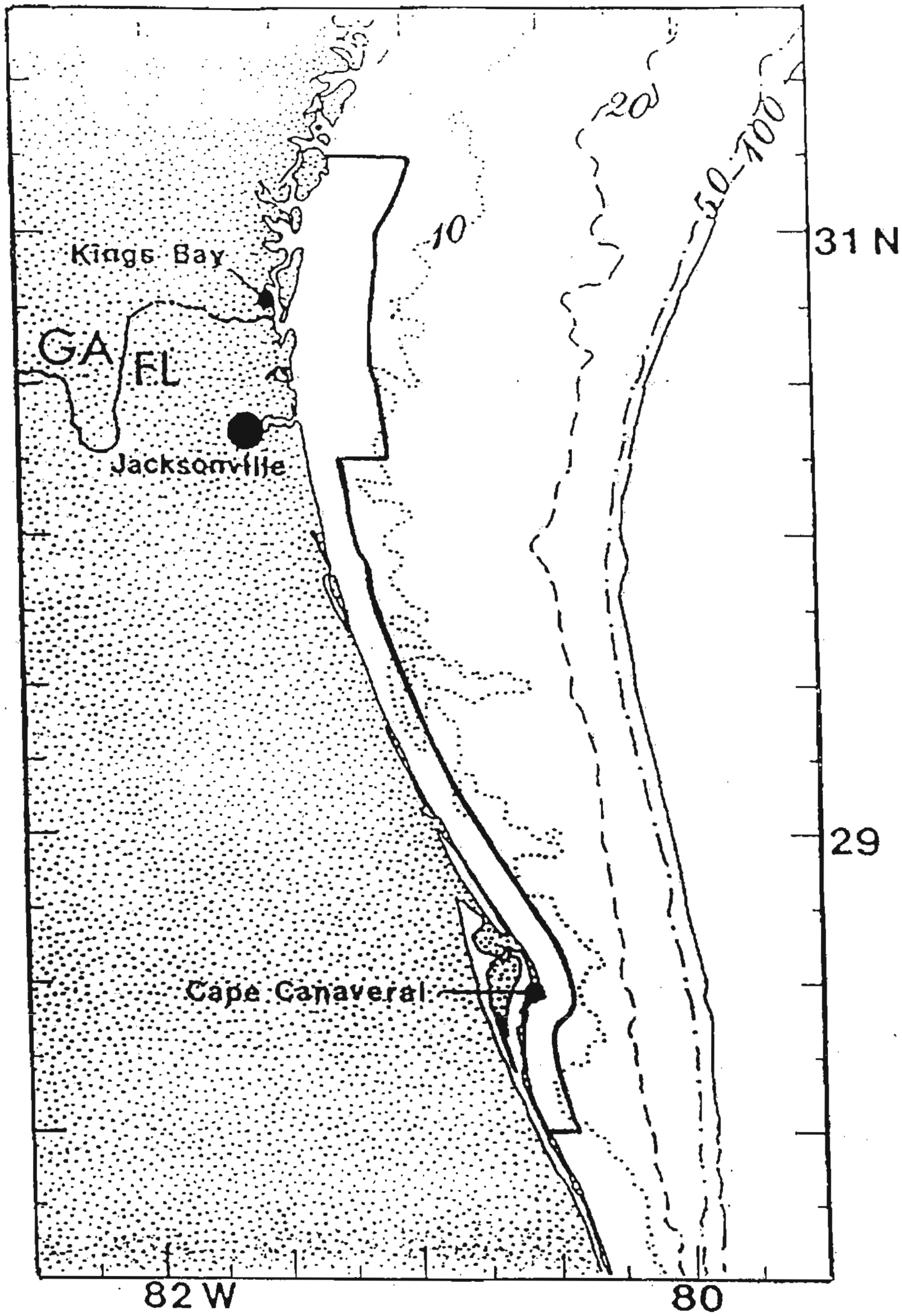


Figure 11. The area designated as critical habitat for the right whale in the southeastern U.S. includes waters between 31°15'N (approximately located at the mouth of the Altamaha River, GA) and 30°15'N (approximately Jacskonville, FL) from the shoreline out to 15 nautical miles offshore, and the waters between 30°15'N and 28°0'N (approx. Sebastian Inlet, FL) from the shoreline out to 5 nautical miles).

occurs during fall. This species feeds largely on euphausids and small fish such as herring, capelin, and sand lance. Calving and breeding occurs in the Caribbean from January to March. Gestation lasts 10 months and calves are suckled for about 11 months. Critical habitats have been identified in the western Gulf of Maine and the Great South Channel (Massachusetts). The minimum population estimate for the North Atlantic range of the humpback whale is 4,865 individuals (Blaylock et al., 1995).

Potential Impacts. The data on the effects of vessel disturbance to right whales are inconclusive (MMS, 1997), but the whales response to vessels appears to depend upon their activity. Dredging impacts on marine mammals may result from underwater noise and vessel collisions. Green (1987) analyzed underwater noise levels received from cutterhead suction and hopper dredges in the Beaufort Sea. The hopper dredge was at least as noisy as the cutterhead suction dredge, with the strongest sounds generally coming from the lower frequencies. Generally sounds from these dredges dropped below ambient noise at ranges greater than 25 km. There are little empirical data available on the effects of dredging operations on marine mammals with the exception of a bowhead whale study in the Beaufort Sea (Richardson et at., 1990) and ongoing work observing dredging operations in nearshore waters of Georgia and Florida. It appears that right whales like bowhead whales may be somewhat tolerant of this noise, with closer whales exhibiting a more conspicuous avoidance than more distant whales.

One of the primary human caused sources of injury and mortality for the right and humpback whales is collisions with vessels. Right whales are particularly susceptible due to their surface resting and slow swimming habits in their southern critical habitat. Hopper dredges would be used in Borrow Area II operations which will likely result in increased vessel traffic. This increased vessel traffic may increase the possibility of whale/vessel interactions. In this regard, the Corps has committed to have NMFS-approved observers onboard to monitor for the presence of endangered species including marine mammals; and, to assure that all precautions are taken to minimize and/or avoid any vessel interaction / disturbance to endangered whale populations.

5.8 Non-Threatened Marine Mammals

Resource. In their preparation of the Environmental Impact Statement for the shock testing of the seawolf submarine, the US Navy monitored non-threatened marine mammals along Florida's east coast. The species described below were indicated as potentially occurring in the vicinity of the northeast and central east coast Florida waters based upon historical sightings, strandings, and aerial surveys from Cape Canaveral to South Carolina.

Dwarf and Pygmy Sperm Whales. The pygmy sperm whale (*Kogia breviceps*) and the dwarf sperm whale (*Kogia sinius*) appear to be distributed worldwide in temperate to tropical waters along the continental shelf edge and continental slope (Blaylock et al., 1995). As in the case of beaked whales, pygmy sperm whales and dwarf sperm whales are difficult to distinguish and are typically categorized as Kogia spp. There is no information on Atlantic stock differentiation and population size for these species (Blaylock et al., 1995). However, results cited by Hansen and Blaylock (1994) for a 1992 survey in the South Atlantic indicated a Kogia spp. population (i.e., *K. breviceps*, and dwarf sperm whales [*K. Simus*]) of 420 individuals. Estimates of abundance were derived from 1992 winter observations using line-transect techniques between Cape Hatteras, North carolina and Miami, Florida. Kogia are rarely seen alive at sea, but they are among the most frequently stranded small whales in some areas (Jefferson et al., 1993), including the southeastern U.S.

Dolphins and Porpoises. The family Edlphidae is taxonomically diverse and includes dolphins, killer whales, false killer whales, pygmy killer whales, Risso's dolphins (or grampus), pilot whales, and melon-headed whales.

Atlantic spotted dolphins (*Stenella frontalis*) range from New Jersey to Venezuela, including waters of the gulf of Mexico. This species is found in warm temperate and tropical waters. The Atlantic spotted dolphin inhabits the continental shelf and slope, though southern populations occasionally come into shallow coastal waters. Favored prey include herrings, anchovies, and carangid fish. Mating has been observed in July, with calves born offshore. Atlantic spotted dolphins often occur in groups of up to 50 individuals. Stock structure in the western North Atlantic is unknown. The minimum population estimate of 4,896 individuals was determined by the NMFS (in Blaylock et al, 1995).

The bottlenose dolphin (*Tursiops truncatus*) ranges from Florida through New England. In the southern portion of its range (south of North Carolina), the bottlenose dolphin tends to be coastal. In the northern distribution, it spreads further offshore over the continental shelf (CETAP, 1982). The Mid-Atlantic Coastal Migratory Bottlenose Dolphin, a group of inshore dolphins that migrate from southern New England south throughout eastern Florida along the Atlantic coast, is designated as depleted under the Marine Mammal Protection Act (MMPA). Depleted means that the population has fallen below its optimum sustainable level - number of animals which will result in the maximum productivity of the population considering the optimum carrying capacity of the habitat and the health of the ecosystem in which they live. Once a species is designated as depleted, a conservation plan is developed to restore the health of the species by guiding research and management actions.

Pantropical spotted dolphins (*Stenella attenuata*) range from Massachusetts to the Lesser Antilles, including waters of the eastern Gulf of Mexico. They are distributed worldwide in subtropical and tropical oceans. They appear to prefer waters of the continental slope (Blaylock et al, 1995). It is believed that this species feeds on squid, fish and shrimp. This species is often found in association with schools of tuna. Pantropical spotted dolphins occur in groups of 5 to 30 individuals. Little is known about the life history of this species and no information exists on stock differentiation and current population estimates for the Atlantic population (Blaylock et al., 1995).

Risso's dolphins (*Grampus griseus*) range from eastern Newfoundland to the Lesser Antilles and Gulf of Mexico. This species is distributed world-wide in tropical to temperate waters. It is believed that Risso's dolphins undergo north-south, summer-winter migrations. Off the northeast U.S. coast, Risso's dolphins are distributed along the shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and fall (CETAP, 1982; Payne et al, 1984). In winter, this species ranges further offshore (Blaylock et al, 1995). Typically, this species occupies the continental shelf edge year-round. This species feeds mainly on squid. Risso's dolphins are found in groups of 3 to 30 individuals, although groups of up to several hundred individuals have been reported. Total numbers of Risso's dolphins off the eastern U.S. coast are unknown. DETAP (1982) survey results indicated a population estimate of 4,980 individuals. Current data are insufficient to determine stock differentiation and population trends in the Atlantic. This species is considered a "strategic stock" under the Marine Mammal Protection Act (Blaylock et al., 1995).

Rough-toothed dolphins (*Steno bredanensis*) are distributed worldwide in tropical to warm temperate waters (Blaylock et al, 1995). Within the western Atlantic they range from Virginia and North Carolina to northeastern South America, including eastern and a northwestern Gulf of Mexico waters (Leatherwood and Reeves, 1983). This species is pelagic and usually found seaward of the continental slope edge. Little is known about the life history of this species and no information exists on stock differentiation and population levels in the Atlantic (Blaylock et al., 1995).

Spinner dolphins (*Stenella longirostris*) range from North Carolina to southern Brazil, including Gulf of Mexico waters. Though presumably an offshore, deep-water species, they occur in both oceanic and coastal tropical waters. Two reproductive peaks in spring and fall have been suggested. Stock structure and population estimates of spinner dolphins in the western North Atlantic is unknown (Blaylock et al., 1995).

Potential Impact. Dolphins often tolerate or even approach vessels and their reactions depend on their activity. Resting dolphins tend to avoid boats, foraging dolphins ignore them, and socializing dolphins may approach them (Richardson, et al., 1995). During the 1996 Navy dredging project Dam Neck Beach, the NMFS observer reported a total of 22 sightings of bottlenose dolphins. When sighted, the dolphins were generally playing in the surf near the beach or traveling north or south between the pump out station and the beach. It appears there was no impact on the bottlenose dolphin during the Navy's dredging operation. It is likewise reasonably anticipated that there should be no significant impacts associated with the proposed dredging activity at Borrow Area II.

5.9 Fish Resources

Brevard County commercial fisheries include a variety of finfish and invertebrates taken from both inshore and offshore waters. During 1997, commercial landings (finfish and shellfish) from Florida's east coast totaled 29,481,000 lb values at $46,545,000 (NMFS, 1997). Brevard County total landings in 1997 were 11,127,835 lb values at $9,908,877 (FDEP, 1995-97) which represents 38% and 21% of Florida's east coast fishery catch and value, respectively. Invertebrates, especially blue crabs, calico scallop, and rock shrimp represented 48% of the total weight landed in Brevard County. Calico scallops and rock shrimp are fished over the continental shelf while blue crabs come from the Indian River Lagoon.

Appendix B lists fisheries landings for the years 1995-97, summarized below in **Table 9**. The significant relative increase in total pounds landed in 1996 is attributed to a signficant shrimp harvest in that year. Shrimp reproduction is closely associated with estuarine water quality attributes, which in turn are dependent upon climatological patterns.

Table 9. Fisheries Catch.

Year	Brevard County	
1995	11,985,000 lbs	$11,252,800
1996	22,680,000 lbs	$17,652,000
1997	11,128,000 lbs	$ 9,909,000
	Florida East Coast Fisheries	
1995	36,983,000 lbs	$37,964,000
1996	42,523,000 lbs	$36,613,000
1997	29,481,000 lbs	$46,545,000

Potential Impacts. Fishes are generally believed to flee the active dredging site while operations are in progress. Courtenay et al. (1974) claimed that fish and motile invertebrates seem to vacate borrow sites during dredging activities but will return after operations have ceased. Anecdotal information from fishermen suggests that fish assemblage and catch may increase in the vicinity of a dredged, sand borrow area in response to seabed (morphology) variations to which some species are apparently attracted. Negative impacts to populations of fossorial (burrowing) fishes such as eels, jawfish, and gobies are anticipated to occur; however, with a reasonably anticipated rapid benthic recovery, these impacts are expected to be temporary.

5.10 Cultural Resources

The east coast of Florida lies adjacent to the Gulf Stream, one of the most important arteries of navigation on the southeastern Atlantic seaboard. It has been an important factor for mariners since the second half of the sixteenth century and forms the main shipping route from the Gulf of Mexico to the Atlantic. Cape Canaveral was used as an important landmark for vessels traveling to Europe, but it also represented a serious threat to navigation. Historical records confirm that many vessels have been lost in the vicinity of Cape Canaveral (Lonsdale & Kaplan, 1964; Singer, 1992; Tubby, 1995; Baer, 1996; Watts, 1997; among others). The remains of such vessels provide valuable opportunities to examine and reconstruct important aspects of our maritime heritage that frequently have not survived in the written historical record. In order to determine the effects of the proposed Brevard County Shore Protection Project on significant underwater cultural resources, a systematic magnetometer and side scan sonar survey was performed to locate, identify, and assess the significance of any underwater cultural resources in the proposed borrow areas. The remote sensing surveys were designed to satisfy obligations identified in State and Federal legislation and regulations, specifically the National Historic Preservation Act of 1966 (Public Law 890665), the Archeological and Historic Preservation Act of 1979 (Public Law 93-291) and the Abandoned Shipwreck Act of 1987.

The areas investigated by the remote sensing surveys included Borrow Areas I and II, the Space Coast Shoals, and a proposed Sand Rehandling area. The surveys were principally conducted in October - November, 1998. Each of these sites is located in State of Florida waters, with the exception of Borrow Area II. Investigations for the Space Coast Shoals and the Sand Rehandling areas did not locate any magnetic or acoustic targets. Investigations in Borrow Area I located nine targets, eight of which required diver identification. Diver investigations concluded that all eight targets were modern debris, and therefore not historically significant.

Remote sensing investigations in Borrow II have located sixteen targets. Several of these targets will need diver investigations. At the time of this writing (December, 1998), data analysis and coordination is ongoing to determine which of the sixteen targets require diver identification and documentation. The initial areas in Borrow I, the Space Coast Shoals and the Sand Rehandling area have been coordinated with the Florida State Historic Preservation Officer. Further coordination with Mineral Management Service will continue for Borrow Area II. Should diver investigation of any of these targets within the proposed borrow area reveal the presence of culturally or historically significant resources, then a dredging exclusion (buffer) area shall be designated within a specified radius of the target.

5.11 Recreation / Tourism

Beyond shore protection, economic impacts of the proposed activity are principally associated with benefits accruing to those industries associated with recreation and tourism along and adjacent to the project fill areas. In addition, public recreation benefits will accrue as all of the project shoreline is within 1/4 mile of a public beach access, most of which include dedicated public beach parking. The beach nourishment project is located amidst Florida's "Space Coast", so-named because of its intimate identity with the nation's space launch and support facility. The beach project area is adjacent to these launch facilities, commencing south of Port Canaveral. It is also the beach that is principally — or most readily — utilized by residents of, and visitors to, central Florida, including Orlando. Beach use by both Florida residents and U.S. and international tourists is therefore very significant, particularly as the project beach features extensive and well-developed public access, and is proximate to both the Kennedy Space Center and central Florida's popular attractions. Olsen Associates (1989) and USACE (1996) describe the economic and public-access provisions of the project in detail.

USACE (1996) concludes that average annual economic benefits associated with recreation benefits equate to $984,000/yr and $122,000/yr for the North and South project reaches, respectively; or, about 15% of total estimated project benefits. These estimates are conservative (low), as they are based upon the Travel Cost Method in which the value of each beach visit is estimated as $1.87 (USACE, 1996).

Olsen Associates (1989) conclude that total annual demand for beach recreation within the project vicinity is about 9.5 million uses per year. For beach visitation values of $3/day (resident) and \$50/day (tourist), direct beach-related expenditures for 1990 were projected as \$277,000,000/yr along the project beaches, with total revenues (including indirect) estimated as about \$406,000,000/yr. Over a 50-year horizon, total recreation revenue is projected to increase only half as fast as recreation demand because of predicted shortfalls and losses in local beach capacity. The value of the revenue "lost" due to local shortfalls in beach capacity relative to demand is predicted to increase by about 16% to 19% per year. Alternately considered, the quality of the average beach use across the study area is predicted to decline by about 16% to 19% per year.

The recreation and tourism benefits associated with use of the proposed Borrow Area II sand source are essentially identical to those predicted for alternate borrow areas, including "Borrow Area I" as originally identified and described for the project in USACE (1996).

6.0 ALTERNATIVES TO PROPOSED ACTIVITY

Project alternatives for the Brevard County Shore Protection Project are described and assessed in USACE (1996). Alternatives to the proposed use of Borrow Area II as a sand source for the project include use of upland sand sources or an alternative offshore borrow area. The former (upland sources) is neither physically nor economically feasible given the large volume of requisite sand fill. The latter (offshore sources) is the de-facto alternative; that is, use of another offshore borrow area at Canaveral Shoals, "Borrow Area I" in State waters, has been previously identified for the project. As described in Section 2, above, that borrow area is located in ambient water depths that limit the size of the dredging vessels that can access the site. This, in turn, increases both the cost and time-requirements for project construction. Accordingly, Borrow Area II, in deeper water, is considered a preferable borrow area relative to Borrow Area I. A third sand borrow area, "Space Coast Shoals", in State waters, has additionally been developed for use as a potential borrow area for the project. That source, however, contains a limited resource volume (3 to 4 mcy); and, is presently being considered as a potential sand source only for the South Reach, given its proximity to that reach relative to both Borrow Areas I or II.

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APPENDIX A

Related Correspondence

Endangered Species Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive South
Suite 310
Jacksonville, Florida 32216-0912

IN REPLY REFER TO:
FWS/R4/ES-JAFL

AUG 11 1998

Mr. George M. Strain
Acting Chief, Planning Division
Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Strain:

This responds to your letter of July 22, 1998, requesting our review and comments on the modifications in the Brevard County, Shore Protection Project, Review Study (September 1996).

The modifications involve an off-shore dredged material rehandling site, Borrow Area II, the Space Coast Shoal and an access channel into Borrow Area I. The new borrow areas are comprised entirely of beach compatible siliceous and carbonate sand and fine shell material. The rehandling, borrow areas and channel are comprised entirely of sand and no hardgrounds occur in or adjacent to any of these added sites.

Dredging would occur during the summer and the material placed at the rehandling site at a depth sufficient to preclude sand migration. The sand would later be rehandled and placed on only those portions of the beach designated in the September 1996 report.

We do not believe these modifications to the project will adversely affect federally listed threatened and endangered species under our jurisdiction, or other fish and wildlife resources.

We appreciate the opportunity to provide our comments, and for further coordination on this project, please contact Don Palmer in this office.

Sincerely yours,

For Michael M. Bentzien
Assistant Field Supervisor

DEPARTMENT OF THE ARMY
SOUTH ATLANTIC DIVISION, CORPS OF ENGINEERS
ROOM 313, 77 FORSYTH ST., S.W.
ATLANTA, GEORGIA 30335-6801

REPLY TO
ATTENTION OF:

CESAD-ET-PR (1105-2-10b) 29 OCT 1997

MEMORANDUM FOR

COMMANDER, CHARLESTON DISTRICT
COMMANDER, JACKSONVILLE DISTRICT
COMMANDER, SAVANNAH DISTRICT
COMMANDER, WILMINGTON DISTRICT

Subject: National Marine Fisheries Service, Regional Biological Opinion on Hopper Dredging along the South Atlantic Coast

1. Reference the Endangered Species Act Section 7 Consultation, Biological Opinion for The Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States, National Marine Fisheries Service (NMFS) 25 September 1997 (Encl 1).

2. The referenced document was sent to your District Sea Turtle Coordinator by electronic mail on 29 September 1997, without the signed NMFS transmittal letter. The purpose of this memorandum is to transmit copies of the complete document to you, and to provide some guidance on its implementation.

3. During the spring of 1997 we experienced an unanticipated high level of sea turtle entrainments in our hopper dredges along the Atlantic coast. Within a month of starting work, we were approaching our incidental take limit for loggerheads, despite having taken all sea turtle protection measures we had available to us. Our commitment to protect sea turtles while maintaining safe navigation channels for defense and commerce, forced us to make some very hard choices. The result was that from March until the new Regional Biological Opinion (RBO) went into effect on 1 October 1997, we had taken 29 loggerhead sea turtles, completed work at six projects and terminated the remaining six projects with less than about half of the work being completed. Fortunately we did not take any of the endangered species of sea turtles and we were able to complete most of the critical work, or critical project reaches, during that period.

4. The Corps of Engineers has a commitment to protect sea turtles, as was exemplified by our willingness to terminate Corps projects and the NMFS reciprocated by being very cooperative during the Section 7 Consultation process.

CESAD-ET-PR 29 OCT 1997
Subject: National Marine Fisheries Service, Regional Biological Opinion on Hopper Dredging along the South Atlantic Coast

We received an Interim Biological Opinion which extended our incidental take of loggerhead sea turtles from 20 to 35, enabling us to resume our necessary hopper dredging after just a brief delay. We must continue to do everything we can to maintain this excellent working relationship with the NMFS.

5. In implementing the new 1997 RBO, we again renew our commitment to maintaining a balance between reducing sea turtle entrainments to the lowest levels we can achieve while performing necessary dredging for navigation. The Hopper Dredging Protocol for Atlantic Coast (Encl 2) is our guidance for helping achieve this objective. The Protocol is a living document and will be revised by CESAD as appropriate. Your input into improving the Protocol is welcomed at any time, as are any suggestions you may have on how we can further reduce sea turtle takes. I also encourage you to share your views and ideas on this through our Internet newsgroup, usace.sad.turtles.

6. Should you have any questions or would like additional information, you may contact John DeVeaux, CESAD-ET-CO, at (404) 331-6742 or Rudy Nyc, CESAD-ET-PR, at (404) 331-4619 or by e-mail which is preferred.

I know you all are working this hard... your thoughts/suggestions are welcome –

R. L. Vanantwerp

2 Encls
as

R. L. VANANTWERP
Brigadier General, USA
Commanding

CF (w/encls):
COMMANDER, MOBILE DISTRICT

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

SEP 25 1997

R. L. VanAntwerp
Brigadier General, U.S. Army
Division Engineer
South Atlantic Division, Corps of Engineers
Room 313, 77 Forshyth St., S.W.
Atlanta, Georgia 30355-6801

Dear Brigadier General VanAntwerp;

Enclosed is the regional biological opinion concerning the use of hopper dredges in channels and borrow areas along the Southeast U.S. Atlantic coast. This biological opinion amends the regional opinion conducted in 1995, and supersedes the interim biological opinion issued on April 9, 1997. The opinion recognizes the efforts of the Corps of Engineer's (COE) South Atlantic Division (SAD) to minimize sea turtle takes through application of new technology such as draghead deflectors, seasonal dredging windows, termination of projects in which high rates of turtle takes are observed, and elevated staff effort to identify and resolve site-specific problems. Despite these major efforts and continuing plans by the COE to improve the effectiveness of the rigid draghead deflector and to resolve dredging schedules to reduce the likelihood of sea turtle interactions, NMFS believes that further sea turtle takes are likely in future years. However, we believe that these takes are not likely to jeopardize the continued existence of any species. An annual incidental take, by injury or mortality of 35 loggerheads 7 Kemp's ridleys, 7 green turtles, 2 hawksbills, and 5 shortnose sturgeon is listed in the incidental take statement appended to the enclosed opinion. This annual take level can be monitored over fiscal years to be consistent with project contracts.

I appreciate your continued commitment to reduce sea turtle takes associated with dredging in your Division. COE Division and District staff have facilitated the excellent working relationship that exists between our offices within the SAD. We look forward to continuing these cooperative efforts in sea turtle conservation.

Sincerely,

for Montanio
Hilda Diaz-Soltero
Office Director
Office of Protected Resources

Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency: U.S. Army Corps of Engineers, South Atlantic Division

Activity: The continued hopper dredging of channels and borrow areas in the southeastern United States

Consultation Conducted By: National Marine Fisheries Service, Southeast Regional Office

Date Issued: September 25, 97

Background

Hopper dredging in channels and borrow areas along the southeastern coast of the United States during the spring of 1997 resulted in an unanticipated high rate of loggerhead turtle take. The number of takes quickly approached the incidental take level established in the regional biological opinion (BO) issued to the Army Corps of Engineers (COE) on August 25, 1995. A formal consultation considering the take rates as well as the dredging locations and conditions was conducted and an interim biological opinion (IBO) was issued on April 9, 1997 and is incorporated herein by reference. The IBO concluded that continued hopper dredging during the 1997 fiscal year was likely to take additional sea turtles but was not likely to jeopardize the continued existence of any species. The incidental take, by injury or mortality, of seven (7) documented Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, sixteen (16) loggerhead turtles, and five (5) shortnose sturgeon was set pursuant in the IBO. This modification added 15 loggerheads to the annual incidental take level, bringing the 1997 fiscal year total incidental take level to 35 loggerheads.

The history of Endangered Species Act (ESA) Section 7 consultations on the deployment of hopper dredges to maintain the depths of southeastern channels is discussed in the August 25, 1995 BO and is incorporated herein by reference. Although no endangered sea turtles have been taken in any channel dredging projects during the 1997 fiscal year, 28 loggerheads have been taken, including 9 loggerheads taken subsequent to the issuance of the IBO (Table 1).

During 1997, the COE responded to high rates of sea turtle takes by assessing each dredging project, modifying draghead deflectors when apparently necessary, conducting relative abundance surveys and relocation trawling, and ultimately ending a number of projects prior to completion (Kings Bay, Brunswick Harbor, Savannah Harbor, Morehead City).

1991 Biological Opinion

Two hundred twenty-five sea turtle takes, including 22 live turtles, were documented between 1980 and 1990 in the Southeast channels despite limited observer coverage in most channels throughout most of that decade (Table 2a.). Seventy-one of these turtles were taken in four months of dredging in the Canaveral ship channel in 1980, the first year in which observers were required. Twenty-one were observed in over two years of dredging in the Kings Bay Channel in 1987-1989, after observers were first deployed on dredges in that channel. Observers were required on most hopper dredges after 1989. Documented takes of turtles on dredges in Brunswick and other Southeast U.S. channels indicated that sea turtles were vulnerable to hopper dredges in all southeastern channels during warmer months. These observations resulted in the Section 7 consultation that concluded with a BO issued on November 25, 1991.

The November 1991 BO was the first cumulative area consultation between NMFS and COE's South Atlantic Division (SAD) regarding hopper dredging. The BO considered hopper dredging in channels from the Canaveral in Florida through Oregon Inlet, North Carolina. The 1991 BO concluded that continued unrestricted hopper dredging in Southeast U.S. channels could jeopardize the continued existence of listed sea turtles. The Opinion established a reasonable and prudent alternative to unrestricted hopper dredging which prohibited the use of a hopper dredge in the Canaveral ship channel, and from April 1 through November 30 in other southeastern channels north of Canaveral. An incidental take level was established based on assumptions that takes would be significantly reduced due to limited dredging windows, but that water temperatures in some years would result in turtle presence in channels during December and March. Observers were required on dredges equipped with outflow and/or inflow screening in March and December. The presence or absence of turtles in December would determine the further need for observer coverage into January. The documented incidental take of a total of five (5) Kemp's ridley, green, hawksbill or leatherback turtle mortalities in any combination of which no more than two (2) are Kemp's ridley, or fifty (50) loggerhead turtle mortalities was set. The Opinion anticipated that seasonal restrictions on hopper dredging would be adjusted on a channel-by-channel basis as better information on turtle occurrence was collected.

Additionally, the development and testing of a draghead deflector was promoted.

1995 Biological Opinion

Between 1992 and 1995, only 16 sea turtle takes were documented (Table 2b.), including three that were alive when collected during dredging operations in the SAD under the dredging windows established in the November 1991 BO (see above). During that period COE developed a rigid draghead deflector that appeared to be effective during videotaped dredging trials using mock turtles, as well as during experimental dredging associated with trawling in the Canaveral Channel. COE also completed a study of six Southeast channels to determine seasonal abundance and spatial distribution of these turtles. A discussion of the findings can be found in the COE report entitled "Assessment of Sea Turtle Abundance in Six South Atlantic U.S. Channels" (Dickerson et al. 1994), summarized in the 1995 BO. Based on the new information, COE requested expanded dredging windows and observer requirements. NMFS considered their request and developed alternative dredging windows and observer requirements and added requirements for the use of hopper dredges in borrow areas along the east coast.

After 1995, COE districts within the SAD generally required observers in some channels, such as Kings Bay, throughout the winter, beyond the new monitoring windows. SAD hopper dredge projects were initially conducted in the middle of the dredging windows, when nearshore waters were cool. During 1996, only nine sea turtle takes, including one green turtle and eight loggerheads, were documented (Table 2c.). No more than three takes occurred in any project. The new dredging windows and draghead deflector requirements appeared to provide good protection to sea turtles.

Hopper dredging operations contracted for the 1997 fiscal year were planned for early in the calendar year, however a number of operations were not begun until late winter. Beginning on March 2, 1997, loggerhead takes occurred in Kings Bay at rates higher than previously observed. Six turtles were taken in four days of dredging. While consulting with NMFS regarding this unprecedented rate of loggerhead takes, a COE specialist from the Waterways Experiment Station proposed some modifications to the draghead with the potential to reduce sea turtle takes. Relocation trawling was also initiated, beginning March 9,1997; however, as can be seen on Table 2, these efforts did not preclude further sea turtle takes in Kings Bay. Dredging was terminated on March 12, 1997, with only 53 percent of the project completed.

Table 1 lists the sea turtle takes observed in hopper dredges throughout the SAD during 1997, as well as the steps taken by COE to reduce the likelihood of takes. Deflector dragheads were re-engineered to fit specific dredges wherever possible and relocation trawling was initiated. Dredging was terminated prior to completion of projects in Kings Bay, Brunswick Harbor, Savannah Harbor and Charleston Harbor. Consultation was reinitiated to consider the effects of the remaining hopper dredging projects anticipated for the 1997 fiscal year. In addition to those specific projects listed in the resulting April 1997 IBO, dredging at Reach II of the Myrtle Beach dredge disposal area is likely to begin before the fiscal year ends. Despite ongoing dredging at the Oregon Inlet, no sea turtle takes have been documented since May 15.

Proposed Activity

This consultation addresses the use of hopper dredges in channels and borrow areas along the Atlantic portion of COE's SAD within the existing dredging windows (Table 3). Channels dredged by hopper dredges include: Oregon Inlet, Morehead and Wilmington Harbors, Charleston, Port Royal and Savannah harbors, Brunswick, Kings Bay, Jacksonville, St. Augustine and Ponce de Leon inlets, West Palm Beach, Miami and Key west channels. Borrow areas that may be dredged by hopper dredges include areas off of Dade County Florida and Myrtle Beach South Carolina.

Draghead deflectors will be used on all projects and observers will be required at least during those periods identified in Table 3. Year-round observer coverage will likely be required by the COE for most channels, particularly those with histories of high sea turtle catch rates such as Kings Bay. Within the South Atlantic Division, the COE will try to schedule dredging of the highest risk areas (Canaveral, Brunswick, Savannah, and Kings Bay) during periods when nearshore waters are coolest -- after December 15 but well before March. Priority for winter dredging will also be given to areas that have substrates that reduce the efficiency of the deflector (Wilmington Harbor channel, Reach 1 of Myrtle Beach). Completion of all projects during the cold-water months will be attempted when possible.

Listed Species and Critical Habitat

Listed species under the jurisdiction of the NMFS that may occur in channels along the southeastern United States and which may be affected by dredging include:

THREATENED:
(1) the threatened loggerhead turtle - _Caretta caretta_

ENDANGERED:

(1) the endangered right whale - _Eubalaena glacialis_
(2) the humpback whale - _Megaptera novaeangliae_
(3) the endangered/threatened green turtle - _Chelonia mydas_
(4) the endangered Kemp's ridley turtle - _Lepidochelys kempii_
(5) the endangered hawksbill turtle - _Eretmochelys imbricata_
(6) the endangered shortnose sturgeon - _Acipenser brevirostrum_

Green turtles in U.S. waters are listed as threatened, except for the Florida breeding population which is listed as endangered.

Additional endangered species which are known to occur along the Atlantic coast include the finback (_Balaenoptera physalus_), the sei (_Balaenoptera borealis_), and sperm (_Physeter macrocephalus_) whales and the leatherback sea turtle (_Dermochelys coriacea_). NMFS has determined that these species are unlikely to be adversely affected by hopper dredging activities.

Information on the biology and distribution of sea turtles can be found in the 1991 and 1995 BOs, which are incorporated by reference. Channel specific information has been collected by COE for channels at Morehead City, Charleston, Savannah, Brunswick, Fernandina and Canaveral, and is presented in detail in COE summary report entitled "Assessment of Sea Turtle Abundance in Six South Atlantic US Channels" (Dickerson _et al_., 1994) and in the COE Biological Assessment.

There is no significant new information regarding the status of these species that has not been discussed in the BOs that have been incorporated by reference (March 12, 1997 and August 25, 1995).

Assessment of Impacts

The Biological Opinion issued in 1991 contained strict dredging windows that appeared to be very effective at limiting the number of sea turtles taken by hopper dredges during channel maintenance dredging in the Southeast U.S. along the Atlantic coast. Between 1991 and 1995, no more than 8 turtles were taken in any year, and many of those taken were released alive. Studies conducted by the COE (Dickerson _et al_., 1994) documented turtle distribution and abundance in six channels that suggesting the existing windows were accurate. However, the COE requested expansion of existing windows to lessen the burden of maintenance dredging while testing and further developing a rigid draghead deflector design. The deflector was effective at pushing aside mock turtles when tested during 1994, and preliminary field trials in the Canaveral shipping channel had encouraging results. NMFS considered this new information, presented by the COE in a biological assessment forwarded to NMFS in November 1994. The resulting BO, issued August 25 1995 expanded dredging windows and modified observer requirements.

Only 9 sea turtle takes were documented in 1996, suggesting that the expanded dredging windows and the deflector requirements provided protection to sea turtles that was similar to the previously more-restrictive windows. However, the COE's internal policy resulted in conduct of most of the hopper dredging projects during months when coastal waters were still cold, consistent with the previous dredging. The increased rate of take observed during 1997 and discussed below suggests that the restriction of hopper dredging to months when nearshore waters are cold remains the best method for minimizing sea turtle takes.

Unfortunately, a number of dredging projects contracted for early 1997 in the SAD but not restricted to mid-winter months, were delayed into the Spring. This delay coincided with a unseasonably warm winter, when the waters of Kings Bay reached 60°F in early March. The incidental take of nine loggerheads in Kings Bay over only 11 days of dredging indicated that the nearshore abundance of loggerheads was high, apparently higher than during the late 1980's when observers were first deployed on hopper dredges in Kings Bay.

There were other indicators of high nearshore sea turtle abundance along the Southeast U.S. Atlantic coast during 1997. Commercial shrimp trawling conducted without the use of turtle excluder devices (TEDs) offshore of South Carolina and Georgia between May 15 and July 15 resulted in sea turtle catch rates higher than previously documented. Sixty nine sea turtles were taken in 29 days of shrimping off of South Carolina, including 65 loggerheads, 3 ridleys and 1 leatherback. Forty-six sea turtles were taken in 17 days of towing off of Georgia. The sea turtle catch per unit effort (CPUE) for this operation is about 0.35 turtles per hour of trawling, standardized to 100 feet (30.5 m) of total headrope length fished. The CPUE (same units) for commercial shrimp trawling in the 1970s and 1980s reported by Henwood and Stuntz (1987a) was only 0.0487. Loggerhead turtles were the predominant species reported by Henwood and Stuntz and have also been predominantly observed in this study. They account for most of the increase in overall CPUE. The CPUE for loggerheads alone has been greater than 0.30 turtles per hour, while the value reported in Henwood and Stuntz was 0.0456 turtles per hour. The rates of taking for leatherback and Kemp's ridley turtles in the Atlantic study area have also been higher than anticipated.

The high relative density of sea turtles during 1997 may be due to an unseasonably warm winter or other factors contributing to annual variations in abundance, due to an actual increase in the abundance of benthic immature sea turtles in the loggerhead population, or due to a combination of these factors. Trends in the status of loggerheads are generally identified at the nesting beach, when the most accessible life stage, adult nesting females, can be counted. Because they mature at 20 to 30 years of age, increases or decreases in the abundance of benthic immature loggerheads as determined by incidental captures in nearshore waters would not be observed for decades. While nesting beach surveys suggest that the South Florida population of loggerheads increased and now appears to be stable, increases have not been apparent on nesting beaches of Georgia and South Carolina. Further work on the development of multi-year in-water sampling sites is needed to identify trends in multiple age-classes of the loggerhead population.

The COE noted that 14 of the 28 takes that occurred during 1997 were on the same dredge, the Eagle. The high rate of takes, particularly on this dredge, suggested that the deflecting draghead was not installed properly or was not being operated properly. Takes occurred in a number of the 1997 dredge projects during clean-up. Ridges left behind after the initial dredging are leveled during clean-up, but the draghead passes over troughs. Takes occurring during clean-up may be difficult to avoid since the draghead deflector must remain hard on the bottom to be effective.

The COE has been conducting meetings between districts within the SAD to discuss the results of assessments of channel conditions and dredge inspections. They have determined that the draghead deflector has not been working properly due to poor education of the dredge operators on its proper use, and due to poor tailoring of the deflector to specific dragheads. Increased efforts to educate dredge operators are planned. Additionally, since fewer than 10 private hopper dredges operate within SAD, engineers that have designed the conceptual deflector will be sent to the dredges to insure that the deflectors are adapted to each draghead and that the operators understand how to use the deflector effectively.

CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal actions, that are reasonably certain to occur within the action area of the Federal action subject to consultation. These are discussed in detail in the biological opinions incorporated by reference.

Conclusion:

NMFS believes that the elevated rate of observed sea turtle takes by dredges in the southeastern United States during March of 1997 was likely due to increased abundance of loggerheads in nearshore waters due to an unseasonably warm winter. There is no way to predict whether similar conditions will be encountered in upcoming seasons. Over the past six years, the COE's SAD has continuously expressed a commitment to minimize sea turtle takes, and has conducted research and taken repeated steps to further this goal. Repeated termination of dredging operations due to high sea turtle takes during 1997 confirms their commitment to avoid sea turtle takes. Further efforts to educate the dredging industry and recruit their interest and involvement in avoiding sea turtle takes are necessary and are planned by the COE. Additionally, the COE has committed to additional efforts to improve the effectiveness of the deflecting draghead. The sea turtle deflector should be tailored to each hopper dredge draghead and the dredge operators should be fully trained in the operation of the draghead to ensure proper use and improve effectiveness. Improvements in operator and deflector performance are necessary prior to reliance on the draghead as a mechanism for reducing sea turtle takes.

NMFS anticipates that the COE's interest in improving the performance of the deflector, their commitment to limit the use of hopper dredges in channels of high sea turtle abundance during periods when nearshore waters are likely to be cold, and their overall goal of further reducing sea turtle takes during hopper dredge activities will minimize the interactions of hopper dredges with sea turtles. However, annual variation in the abundance of sea turtles in some channels and borrow areas make it likely that sea turtle takes will still occur. Additionally, overall increases in loggerhead and Kemp's ridley populations are anticipated due to TED requirements that have reduced the mortality rates of benthic lifestages of these species. Lastly, in some years high levels of hopper dredging activity may be necessary. For example, termination of projects prior to completion during FY 1997 may result in an increase in the number and length of hopper dredging projects necessary for channel maintenance during FY 1998. Therefore, NMFS believes that up to 35 loggerheads may be taken by injury or mortality, as well as 7 Kemp's ridleys, 7 green turtles, 2 hawksbills, and 5 shortnose sturgeon. These takes are not likely to jeopardize the continued existence of these species and the ongoing commitment by the COE to further minimize takes may reduce the likelihood of sea turtle takes in the future even if nearshore sea turtle abundances increase.

Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, conservation recommendations are made to assist COE in reducing or eliminating adverse impacts to loggerhead, green, and Kemp's ridley turtles that result from hopper dredging in the southeastern United States. The recommendations made in the 1995 BO are pertinent to this consultation as well, and therefore remain valid. Further recommendations are given below.

- Because of the possibility of annual variation in water temperatures, sea turtle abundance, and hopper dredging demand, NMFS has retained the dredging windows established in the 1995 BO. However, the COE has expressed a commitment to deploy hopper dredges during cold-water periods in channels with high sea turtle abundance or with substrates that render the deflector ineffective. NMFS appreciates the COE's commitment to do this, and recommends that the SAD priority list be finalized and distributed to the Districts and NMFS prior to the initiation of dredging during FY 1998.

- The COE should work with the dredging industry to insure their understanding of the importance of sea turtle conservation and to increase the industry's interest in minimizing sea turtle takes.

- Greater than 50% of the loggerheads taken in North Carolina may be from the northern nesting assemblage of loggerheads. While recent loggerhead nesting beach surveys did not identify a decline in the number of nesting females on beaches north of Cape Canaveral, increases observed in the south Florida nesting assemblage have not been noted. High sea turtle catch rates during only the early weeks of the wood debris clean-up conducted by COE off Cape Fear during 1997, as well as preliminary work conducted in North Carolina, suggest that turtles may be abundant in North Carolina channels primarily during migration into and emigration out of North Carolina inshore waters. The COE should work with the NMFS Beaufort Laboratory and the North Carolina Division of Marine Fisheries to document the movements of sea turtles off North Carolina during spring and fall months. Results from these studies may provide insights into further safe dredging windows to minimize the likelihood of takes of loggerheads from the more vulnerable northern nesting assemblage. Summer windows would reduce the pressure to complete all SAD hopper dredging during cold-water periods.

- The COE should investigate further modifications of the draghead to minimize the need for clean-up. Some method to level the peaks and valleys created by dredging would reduce the amount of time dragheads are removed from the bottom sediments.

Incidental Take Statement

Section 7(b)(4) of the Endangered Species Act (ESA) requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA, and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, be provided that are necessary to minimize such impacts. Only incidental taking resulting from the agency action, including incidental takings caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent alternatives, and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7 of the ESA.

Based on the high rate of sea turtle takes observed during of 1997, increases in the Kemp's ridley population, possible increases in the benthic lifestages of loggerhead populations, annual variation in nearshore abundance of sea turtles and hopper dredge demands, the NMFS anticipates that hopper dredging in the Southeast U.S. Atlantic area of the SAD may result in the injury or mortality of sea turtles and shortnose sturgeon. Therefore, a low level of incidental take, and terms and conditions necessary to minimize and monitor takes, are established. The annual (by fiscal year) documented incidental take, by injury or mortality, of seven (7) Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, thirty-five (35) loggerhead turtles, and five (5) shortnose sturgeon is set pursuant to section 7(b)(4) of the ESA.

To ensure that the specified levels of take are not exceeded early in any project, COE should reinitiate consultation for any project in which more than one turtle is taken within 24 hours, or once five or more turtles are taken. The Southeast Region, NMFS, will cooperate with COE in the review of such incidents to determine the need for developing further mitigation measures or to terminate the remaining dredging activity.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take in the Atlantic Region has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered right whales is provided.

The reasonable and prudent measures that the NMFS believes are necessary to minimize the impact of hopper dredging in channels and borrow areas in the southeastern United States have been discussed with COE. The following terms and conditions are established, in addition to those identified in the 1995 BO, to implement these measures and to document the incidental take should such take occur.

1. The COE's draghead deflector engineer that assistant in this design design should inspect the rigid draghead deflector annually to ensure that the deflector has been tailored appropriately to each draghead. Additionally, the inspector should assess whether the dredge operator appears to be familiar with the operation of the draghead deflector and provide necessary training where appropriate.

2. If the rigid draghead deflector appears to be ineffective in Wilmington Harbor and slows the dredging project such that the amount of time the hopper dredge will be deployed is increased, the deflector should be removed from the draghead for that channel.

3. The COE should develop an educational/training program for dredge operators to increase their understanding of how the draghead deflector works and why it is necessary.

SOUTH ATLANTIC COAST HOPPER
DREDGING (Calendar Year 97)

Project	Dredge Period	Approximate Amount of Work Completed	Turtle Takes	Mitigative Measures Taken	Remarks
Kings Bay	3/1/97 to 3/12/97	Removed 437,000 out of 821,000 CY Approximately 53% completed.	L 3/2/97 L 3/4/97 L 3/5/97 L 3/6/97 L 3/6/97 L 3/6/97 L 3/8/97 L 3/8/97 L 3/12/97	Sea turtle deflecting draghead used. Jacksonville Dist. specialist inspected deflector on 3/6/97. Relocation trawling started 3/9/97. Extensive, ongoing consultation with NMFS as takes occurred. All work terminated 3/12/97 due to high take levels even though relocation trawling had become operational.	Water temp. 57 to 58 F. Dredge Eagle 1. Two takes in on batch on 3/6/97 and 3/8/97. Contract required removal o relatively small veneer of material. Most takes occurre through starboard dragarm. Rapidity of takes was a surprise to all concerned.
Brunswick Harbor	2/6/97 to 3/19/97	Removed 975,400 CY. Work stopped at 50% completion.	L 3/9/97	Sea turtle deflecting draghead used. Sea turtle abundance, based on visual observations, prompted termination of work because of potential for unacceptable levels of entrainment.	Water temp 63 F. Dredge RN Weeks. Historic abundance sea turtles and high levels of entrainment in 1991 was par the reason for termination of work.
Savannah Harbor	3/4/97 to 3/22/97	Removed about 545,500 CY, or about 52% of what could have been dredged.	L 3/14/97 L 3/22/97 L 3/22/97	Sea turtle deflecting draghead used. Dredging terminated so as not to take any more sea turtles.	Water temp. 63 F. Numerous sea turtles sighted. Dredg Ouachita was 'skimming' high areas to bring depth to acceptable levels quickly before leaving for urgent work Mississippi River.
Charleston Harbor	3/14/97 to 3/26/97	Bid qty 900,000 CY Req. qty 408,000 CY Removed qty 350,000 CY. About 39% completed.	L 3/19/97 L 3/20/97 L 3/21/97 L 3/25/97 L 3/26/97	WES expert / developer of sea turtle deflecting draghead system, conducted onboard inspection and made recommendations. Some changes to draghead and dredging operation made. Relocation trawling performed.	Water temp. 61 F. Dredge Eagle 1.
Myrtle Beach borrow area (Phase 1)	9/15/96 to 5/13/97	Bid qty 2.5 million CY. Work completed.	L 4/15/97 L 5/04/97 L 5/09/97	Sea turtle deflecting draghead used. Relative abundance trawling on 3/28-29/97, with 12 hours of "nets in water", yielded one loggerhead. Trawling on 5/8 thru 5/13/97 yielded no sea turtles.	This is one of 3 phases / reaches of total project. Part o work in all phases is by pipeline dredge. Total quantity c material to be dredged is about 6 million CY
Morehead City Harbor	4/25/97 to 5/16/97)	About 120,000 CY removed out of about 1,720,000 CY. About 7% of work completed.	L 4/27/97 L 4/30/97 L 5/01/97 L 5/02/97 L 5/15/97 L 5/15/97	Sea turtle deflecting draghead. Relocation trawling began 5/8/97 and continued until termination of dredging. One loggerhead captured on 5/9/97. Nighttime trawling performed 5/10 & 5/11 with no turtles captured. Because of concern over extensive takes, dredging terminated with only 7 % of work done.	Dredge Manhatten Island
Wilmington Harbor (Interior Channels)	2/14/97 to 3/13/97	About 217,300 CY removed. Work completed.	No takes		Dredge McFarland
MOTSU	3/14/97 to 4/3/97	About 60,000 CY. removed. Work completed.	No takes		Dredge McFarland
Wilmington Harbor (Ocean Bar)	4/3/97 to 4/30/97	About 300,000 CY Work completed.	L 4/07/97	Sea turtle deflecting draghead.	Dredge RN Weeks
Dade County Beach (Miami Reach)	3/30/97 7/20/97 (estimate)	About 380,00 of 475,000 CY completed as of 6/6/97.	No takes	Based on past dredging and anecdotal information about sea turtlesin area, takes are not anticipated.	

L = Loggerhead CY = Cubic Yards

Table 2a. Sea turtle takes (includes live, injured and killed) observed on hopper dredges prior to the regional consultation. Observers were not required on all projects until 1989, after which extensive monitoring was required.

Year	Project	Turtle Takes
1980 Total = 71	Canaveral	50 Cc, 3 Cm, 18 Unidentified
1981 Total = 6	Canaveral	3 Cc, 1 Cm, 2 Unidentified
1984/1985 Total = 12	Canaveral	1 Cc, 11 Unidentified
1986 Total = 9	Canaveral	5 Cc
	Kings Bay	1 Cc, 3 Cm
1987 Total = 5	Kings Bay	3 Cc, 1 Cm, 1 Unidentified
1988 Total = 46	Brunswick	1 Cc
	Canaveral	13 Cc, 3 Cm, 18 Unidentified
	Kings Bay	6 Cc, 3 Lk, 2 Cm
1989 Total = 21	Canaveral	9 Cm, 2 Unidentified
	Kings Bay	8 Cc, 1 Cm
	Savannah	1 Cc
1990 Total = 12	Canaveral	3 Cc, 5 Cm
	Kings Bay	4 Cc
1991 Total = 43	Brunswick	20 Cc, 1 Lk, 1 Unidentified
	Charleston	3 Cc
	Kings Bay	1 Cc
	Savannah	17 Cc

Cc = *Caretta caretta*, Loggerhead ; Cm = *Chelonia mydas*, Green turtle; Lk = *Lepidochelys kempi*, Kemp's ridley turtle

Table 2b. Sea turtle takes (includes live, injured and killed) observed on hopper dredges between the November 1991 and the August 1995 Regional Biological Opinion

Year	Project	Turtle Takes
1992 Total = 2	Port Royal, SC	2 Cc
1994 Total = 8	Canaveral	1 Cm
	Morehead City	1 Cc
	Kings Bay	2 Cc
	Savannah	3 Cc, 1 Lk
1995 Total = 6	Canaveral	1 Cc
	Palm Beach	3 Cc, 2 Cm

Cc = *Caretta caretta*, Loggerhead ; Cm = *Chelonia mydas*, Green turtle; Lk = *Lepidochelys kempi*, Kemp's ridley turtle

Table 2c. Sea turtle takes (includes live, injured and killed) observed on hopper dredges after the August 25, 1995 Biological Opinion

Year	Project	Turtle Takes
1996 Total = 9	Morehead City Harbor	1 Cc
	Myrtle Beach (Borrow Area Reach I)	2 Cc
	Kings Bay	1 Cc
	Palm Beach	1 Cc, 1 Cm
	Wilmington Harbor	3 Cc
1997 Total = 28	Brunswick Harbor	1 Cc
	Charleston Harbor	5 Cc
	Kings Bay	9 Cc
	Morehead City Harbor	6 Cc
	Myrtle Beach (Borrow Area Reach 1)	3 Cc
	Savannah Harbor	3 Cc
	Wilmington Harbor (Ocean Bar)	1 Cc

TABLE 3: Current requirements for dredging windows, observer requirements and use of hopper dredges in borrow areas along the east coast established in the August 1995 BO.

AREA		SEA TURTLE MONITORING: NAVIGATION CHANNELS		SEA TURTLE MONITORING: BORROW AREAS	
	WHALE MONITORING	WINDOWS	MONITORING	WINDOWS	MONITORING
North Carolina to Pawleys Island, SC (includes channels at Oregon Inlet, Morehead City and Wilmington)	One observer (daytime coverage) between 1 Dec and 31 Mar. Monitoring by dredge operator and sea turtle observer between 1 Apr and 30 Nov.	Year Round	Two observers (100% monitoring) 1 Apr - 30 Nov	Year Round	One observer (50% monitoring) 1 Apr - 30 Nov
Pawleys Island, SC to Tybee Island, GA (includes channels at Charleston, Port Royal and Savannah)	One observer (daytime coverage) between 1 Dec and 31 Mar. Monitoring by dredge operator and sea turtle observer between 1 Apr and 30 Nov.	1 Nov - 31 May	Two observers (100% monitoring) 1 Nov - 30 Nov and 1 Apr - 31 May	Year Round	One observer (50% monitoring) 1 Apr - 30 Nov
Tybee Island, GA to Titusville, FL (includes channels at Brunswick, Kings Bay, Jacksonville, St. Augustine, and Ponce de Leon Inlet)	Aerial surveys in right whale critical habitat, 1 Dec thru 31 Mar. One observer (daytime coverage) between 1 Dec and 31 Mar.	1 Dec - 15 Apr	Two observers (100% monitoring) 1 Apr - 15 Apr	Year Round	One observer (50% monitoring) 1 Apr - 15 Dec
Titusville, FL to Key West, FL (includes channels at West Palm Beach, Miami and Key West)	Whale observations are not necessary beyond those conducted between monitoring of dredge spoil.	Year Round	Two observers (100% monitoring) year round	Year Round	One observer (50% monitoring) year round

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency: U.S. Army Corps of Engineers, South Atlantic Division

Activity: Hopper dredging of channels and beach nourishment activities in the Southeastern United States from North Carolina through Florida East Coast

Consultation Conducted By: National Marine Fisheries Service, Southeast Regional Office

Date Issued: August 25, 1995

BACKGROUND

The U.S. Army Corps of Engineers (COE) has primary responsibility for maintaining navigational channels in U.S. waters. To accomplish this task, dredging is periodically required. A variety of dredge types and techniques are employed on a channel-specific basis, dependent upon the characteristics of channels, availability of disposal sites, local environmental regulations, types of material to be removed, proposed timing of the dredging, etc. In the southeastern United States, at least three types of dredges (hopper dredges, clamshell dredges, and pipeline dredges) are commonly used.

In addition, Congress has mandated that the COE provide periodic beach nourishment to certain beaches in the southeastern U.S. that suffer severe erosion rates. Nourishment activities consist of dredging coarse high-quality sand from offshore borrow areas then pumping the material onshore.

A formal consultation conducted on dredging and beach nourishment operations from North Carolina through Cape Canaveral, Florida, in 1991, and incorporated by reference, concluded that clamshell and pipeline dredges were not likely to adversely affect listed species. There is no new information to change the basis for that finding. Lethal takes of sea turtles by hopper dredges have been documented, however, and consultations on takes have been conducted since 1980.

Previous Consultations

Consultation on the effects of hopper dredging in the Canaveral ship channel was initiated in August 1978, after NMFS trawl surveys verified reports of high turtle abundance in the channel. On March 30, 1979, NMFS issued a biological opinion based on a threshold examination of the situation. This opinion concluded that insufficient information existed to determine whether or not dredging was likely to jeopardize the continued existence of sea turtles. Through agreement with the COE and the U.S. Navy, trawl surveys were implemented to further assess turtle abundance and distribution in the channel.

On January 22, 1980, the National Marine Fisheries Service (NMFS) issued a biological opinion concluding that "dredging may result in the loss of large numbers of loggerhead sea turtles but is not likely to result in jeopardizing either the loggerhead or Atlantic ridley sea turtle stocks." This opinion recommended that NMFS-approved observers be placed aboard hopper dredges in the Canaveral channel to monitor turtle take, and that dredging be restricted to the period of August 1 through November 1. No evidence of turtle take by hopper dredges existed at this point, but the potential for take was recognized.

A total of 71 turtle takes by hopper dredges were documented in the Canaveral channel over the period of July 11 through November 13, 1980. These takes were considered minimum estimates of mortality due to restrictions inherent in observing turtles within the dredged material. From 1980 through 1986, NMFS, the COE, and the U.S. Navy continued efforts to reduce or eliminate turtle take by hopper dredges in the Canaveral entrance channel. Efforts included attempts to scare turtles out of the channel, detect and capture turtles, remove and relocate turtles, and deflect turtles from the draghead. No acceptable means of eliminating the take of sea turtles by hopper dredges was identified, and take of sea turtles continued.

Trawl surveys of five east coast channels, conducted during 1981 and 1982 (Butler et al., 1987), indicated that these channels did not contain sea turtles at abundances approaching those observed in Canaveral. One or two turtles were collected in each of the surveyed channels, while hundreds were caught in the Canaveral channel. Because NMFS had no information to suggest that turtle takes in other channels was significant, additional channel surveys were not required, and the Canaveral hopper dredging project was treated as a unique problem.

In 1986, the U.S. Navy reinitiated Endangered Species Act (ESA) Section 7 consultation on Kings Bay, Georgia, channel dredging. The scope of the project involved widening and deepening existing channels and extension of the channel approximately 14 miles. The Navy proposed to implement sea turtle conservation measures including observer coverage, screening of the dredge, and a stand-by trawler to catch and remove turtles, if necessary. From July 1987 through December 1989, a total of 21 turtles were taken during hopper dredging operations in the Kings Bay project.

Turtle take by hopper dredges in Kings Bay resulted in major changes in NMFS policy on channel dredging. This was the first documented take of turtles by hopper dredges anywhere other than in the Canaveral channel. Additionally, while takes in Canaveral were confined to loggerhead turtles, Kings Bay takes included three endangered Kemp's ridley turtles and three endangered green turtles. NMFS began to consider the additive consequences of hopper dredging along the southeast coast.

The Jacksonville District COE and the COE Waterways Experiment Station jointly sponsored a May 11-12, 1988, "National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles," held in Jacksonville, Florida. This workshop brought together representatives of the COE, NMFS, the U.S. Navy, the dredging industry and the environmental community to discuss the dredging/sea turtle conflict. In a July 8, 1988, letter from the Assistant Administrator for Fisheries to the Acting Commander of the COE, NMFS applauded the COE efforts in sponsoring the workshop and advised the COE of agency plans to assess the cumulative impacts to sea turtles of dredging in channels other than Canaveral. Formal consultation was requested for all areas in which hopper dredging was proposed, and observers were required on 25-100 percent of all hopper dredging activities in Brunswick, Savannah, and Wilmington Harbor dredging projects.

Consultation was reinitiated in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles, during hopper dredging in Brunswick and Savannah channels. The biological opinion, issued November 25, 1991, found that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. A reasonable and prudent alternative was given which included the prohibition of hopper dredging in the Canaveral channel, seasonal restrictions which allowed hopper dredging from December through March in channels from North Carolina through Canaveral, or use of alternative dredges in all southeastern U.S. channels.

The reasonable and prudent alternative issued in the 1991 biological opinion has proven very effective in reducing sea turtle captures. Since the implementation of the measures of the 1991 biological opinion, only 14 takes of sea turtles, including three live turtles, have been documented on board hopper dredges in channels along the southeastern U.S. Atlantic coast.

The COE has recently concluded extensive research in six southeast channels: Morehead City Harbor entrance channel, Charleston Harbor entrance channel, Savannah Harbor entrance channel, Brunswick Harbor entrance channel, Fernandina Harbor - St. Marys River entrance channel, and the Canaveral Harbor entrance channel. Seasonal restrictions were supported by the research; however, refinements in the restrictions due to new, more precise information were requested in the COE request for a new consultation, dated November 8, 1994. Additionally, a draghead deflector has been developed that has shown promising results in preliminary tests.

PROPOSED ACTIVITY

This consultation addresses COE channel dredging activities along the southeastern Atlantic seaboard from North Carolina through Key West, Florida (see Figure 1 from COE's Biological Assessment submitted November 8, 1994). This includes maintenance dredging, new construction dredging, and beach nourishment activities. A summary of major channel dredging projects in which hopper dredges are normally used include: Oregon Inlet, Morehead City, and Wilmington Harbor in North Carolina; Charleston and Port

Royal in South Carolina; Savannah, Brunswick, and Fernandina-St. Marys in Georgia (King's Bay); Jacksonville, St. Augustine, Ponce Inlet, Canaveral, West Palm Beach, and Miami in Florida.

Information on the timing and amount of materials removed during past hopper dredging projects in these channels was provided in the Biological Assessment (COE, November 8, 1994). Generally, the COE has asked that channel hopper dredging windows specified in the 1991 biological opinion be modified from no hopper dredging in Canaveral and dredging in other regional channels from December through March to:

HOPPER DREDGING IN SOUTH ATLANTIC DIVISION		
LOCATION	HOPPER DREDGING WINDOW[1]	INCIDENTAL TAKE MONITORING[2]
North Carolina to Pawles Island, S.C.	Year Round	1 May - 1 Nov
Pawles Island, S.C. to Tybee Island, Ga.	1 Nov - 31 May	1 Nov - 1 Jan 1 Apr - 31 May
Tybee Island, Ga. to Titusville, Fla.	15 Dec - 1 May	15 Dec - 1 Jan 15 Mar - 1 May
Titusville, Fla. to Key West, Fla.	Year Round[3]	Year Round

1 Applies to all hopper dredging along South Atlantic Coast. Use of sea turtle deflecting draghead is required unless waiver is granted by CESAD.

2 For navigation projects this requires inflow screens and NMFS approved observers. For beach nourishment projects this can be accomplished by either monitoring the beach or use of observers and screens on the hopper dredge.

3 Use of hopper dredging at Canaveral Navigation Channel will be restricted to those times when there is an urgent need for this type of equipment.

During a meeting between the COE and NMFS in February 1995, it was determined that the impacts of beach nourishment activities along the southeastern U.S. Atlantic coast should also be considered in this biological opinion. Therefore, projects being considered in this consultation include those listed in the Biological Assessment submitted on November 8, 1994, as well as channels south of Canaveral, and beach nourishment activities along the southeastern U.S. Atlantic coast in which hopper dredges may be used. Specific projects which have been considered in ongoing consultations include: Palm Beach Harbor maintenance dredging; the Fort Pierce Harbor entrance channel and turning basin; and the Dade County Beach Erosion Control Project at the northern end of Sunny Isles.

LISTED SPECIES AND CRITICAL HABITAT

Listed species under the jurisdiction of the NMFS that may occur in channels along the southeastern United States and which may be affected by dredging include:

THREATENED:
(1) the threatened loggerhead turtle - *Caretta caretta*

ENDANGERED:
(1) the endangered right whale - *Eubalaena glacialis*
(2) the humpback whale - *Megaptera novaeangliae*
(3) the endangered/threatened green turtle - *Chelonia mydas*
(4) the endangered Kemp's ridley turtle - *Lepidochelys kempii*
(5) the endangered hawksbill turtle - *Eretmochelys imbricata*
(6) the endangered shortnose sturgeon - *Acipenserbrevirostrum*

Green turtles in U.S. waters are listed as threatened, except for the Florida breeding population which is listed as endangered.

Information on the biology and distribution of these species was given in the 1991 biological opinion, and is incorporated by reference. Channel-specific information has been collected by COE for channels at Morehead City, Charleston, Savannah, Brunswick, Fernandina and Canaveral, and is presented in detail in the COE summary report entitled "Assessment of Sea Turtle

Abundance in Six South Atlantic US Channels" (Dickerson et al., 1994) and in the COE Biological Assessment. New information is included below.

Additional endangered species which are known to occur along the Atlantic coast include the finback (Balaenoptera physalus), the sei (Balaenoptera borealis), and sperm (Physeter macrocephalus) whales and the leatherback sea turtle (Dermochelys coriacea). NMFS has determined that these species are unlikely to be adversely affected by hopper dredging activities.

PROPOSED, THREATENED:
(1) Johnson's seagrass - Halophila johnsonii

According to federal regulations (50 CFR Section 402.10), a conference is required if a planned federal action is likely to jeopardize the continued existence of a proposed species. At this time, NMFS is unable to make a determination on the collective effects of hopper dredging in and adjacent to channels in which Johnson's seagrass occurs. The COE should develop estimates of annual take of seagrass anticipated by projects within Florida's intracoastal waterways within Johnson's seagrass habitat. Consideration of impacts to H. johnsonii should continue on a project-by-project basis until collective impacts have been estimated and/or listing has been finalized.

ASSESSMENT OF IMPACTS

Sturgeon

Table 1, taken from the February 6, 1995 draft Shortnose Sturgeon Recovery Plan (NMFS, 1995), gives the current, best available information on the distribution and abundance of shortnose sturgeon. South of the Chesapeake Bay, there is inadequate information to estimate the shortnose sturgeon population size in most rivers. Low abundance estimates have been made for the Ogeechee and Altamaha rivers.

Generally in southern rivers, adult sturgeon remain in estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. Embryos produced tend to remain in areas of irregular bottom, where they appear to seek cover. Juveniles, like adults, occur primarily at the interface between salt and freshwater. Recent observations suggest that salinity levels greater then seven ppt are harmful (Smith et al., 1992). In the Savannah River, shortnose sturgeon are found over sand/mud substrate in 10-14 m. depths (Hall et al., 1991). Spawning occurs in upstream channels of the Savannah, where the substrate consists of gravel, sand and logs (Hall et al., 1991). Shortnose sturgeon feed on crustaceans, insect larvae, and molluscs (NMFS, 1995).

Impacts of hopper dredging on sturgeon

NMFS believes that shortnose sturgeon may be adversely affected by hopper dredging within some channels and seasons. While endangered species observers on hopper dredges have documented the take of Atlantic sturgeon, no take of a shortnose sturgeon has been observed. Sturgeon may be encountered in channels north of Pawles Island, South Carolina, where dredging may be conducted year-round. Winter windows south of Pawles, however, will reduce the period in which shortnose sturgeon may be impinged. Adult sturgeon may occur in estuarine and tidal waters until February, when they migrate upstream to spawn. Salinity ranges favorable to adults and juveniles can exist in inner harbors during fall months. Use of the rigid draghead deflector developed to reduce the likelihood of incidental take of sea turtles by hopper dredges may also reduce the take of shortnose sturgeon. The impacts on small juveniles, larvae, and eggs, by other suction dredge types used upriver, will be considered on a case-by-case basis.

In addition to the possibility of a direct take of sturgeon, maintenance dredging by all dredge types has likely reduced foraging areas within dredged channels, since inter-dredging periods may be too brief to allow forage species to re-establish. Current primary foraging habitat is thought to occur outside of dredged channels.

Shortnose sturgeon are not likely to be affected by beach nourishment activities.

Sea Turtles

Precise data regarding the total number of sea turtles in waters of the southeastern U.S. Atlantic are not available. Trends in turtle populations are identified through monitoring of their most accessible life stages on the nesting beaches, where hatchling production and the number of nesting females can be directly measured. Figures 2 through 4 illustrate loggerhead, green and Kemp's ridley nesting trends at regularly monitored nesting beaches.

Index nesting beaches on which data collection methods and effort were standardized were established in Florida in 1989. Over 90 percent of all U.S. loggerhead nests occur in Florida, and over 80 percent of these are within indexed beaches (B. Schroeder, pers comm). During the six years monitored in this standardized manner, illustrated in Figure 2, loggerhead nesting appears to be stable. All green turtle nests in the United States occur in Florida, and most occur on index beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring (Figure 3).

The abundance of ridleys nests in Rancho Nuevo, Mexico, have been increasing since 1987 (Figure 4). Over 1500 nests were observed during the 1994 nesting season, representing the highest nesting year since monitoring was initiated in 1978. While these data need to be interpreted cautiously due to expanded monitoring efforts since 1990, up to 110,000 hatchlings were released from Rancho Nuevo during 1994, compared to 50,000 to 80,000 over the previous five to six years (Byles, pers comm).

Stranding data are generally believed to reflect the nearshore distribution of sea turtles (Figure 5). The use of turtle excluder devices (TEDs) in shrimp trawls is likely responsible for the sharp decrease in strandings after 1990 through a reduction in mortality resulting from incidental capture in shrimp trawls. While TEDs were required seasonally in most areas during much of 1990, compliance was poor until 1991. Since 1991, documented strandings of loggerheads were steady, while green turtle strandings increased in 1994 and ridleys in 1993 and 1994. Factors that may be affecting the distribution and abundance of sea turtles and turtle mortalities (ie. the distribution of strandings) include: vessel activity, fishery operations, and environmental factors such as storms, temperature changes, and eutrophication events.

The data suggest that green and Kemp's ridley turtle populations may be rising. While this supports cautious optimism, the numbers are well below recovery criteria established in the recovery plans.

Impacts of hopper dredging on sea turtles

Channels

NMFS believes that hopper dredging activities in the southeastern United States may adversely affect the endangered Kemp's ridley and Florida green turtles and the threatened loggerhead turtle. While hawksbill turtles likely occur infrequently in ship channels, they may be present during beach nourishment activities in areas near or between hard-bottom reefs.

Past maintenance dredging in the southeastern United States has been demonstrated to adversely affect sea turtles. The biological opinion issued in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles during hopper dredging in Brunswick and Savannah channels, concluded that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. Takes of 225 sea turtles had been documented since 1980 in southeast channels, including 22 turtles that were alive when found. The COE's strict adherence to the measures included in the 1991 biological opinion, including a prohibition of hopper dredging in Canaveral and seasonal restrictions on hopper dredging from North Carolina through the Canaveral ship channel, has greatly reduced the rate of sea turtle takes by hopper dredges. Only 14 sea turtle takes have been documented in hopper dredges since 1991, including three turtles that were alive when collected.

The COE conducted a comprehensive research program, beginning in 1991, to investigate the occurrence of sea turtles in six southeast channels to determine seasonal abundance, as well as spatial distribution within the channel and within the water column. Monthly surveys were conducted in Canaveral, Kings Bay, Brunswick, Savannah, Charleston, and Morehead City channels. The

Canaveral surveys supplement surveys conducted by NMFS and the COE since 1978.

Briefly, the surveys found the following: In areas where sea turtles occur, moderate to high abundance can be expected when water temperature is greater than or equal to 21 degrees C. Lower abundances were observed when temperatures were less than 16 degrees C. Other workers have observed sea turtles in waters as low as 8 degrees C, sometimes for extended periods (Morreale, pers comm 1993). Loggerheads, primarily adults, were the most abundant turtle captured (n = 645), although some Kemp's ridleys (n = 20) and green turtles (n = 5) were also taken. Juveniles of all species were observed, although only a few juvenile loggerheads were encountered in Canaveral. As documented in previous surveys, the Canaveral ship channel supports aggregations of sea turtles during all months of the year and particularly during cooler winter months (Henwood, 1987; Butler et al., 1987; Henwood and Ogren, 1987). North of Canaveral, turtles were seasonally abundant, with lower numbers from December through February. Recaptures of relocated sea turtles suggest some site fidelity, and the effectiveness of relocation efforts appeared to be related to the distance of relocation. Catch per unit effort (CPUE) in the surveyed channels, for all seasons cumulatively, was: Canaveral, 1.43 turtles per hour; Kings Bay, 0.571 turtles per hour; Brunswick Harbor, 0.489 turtles per hour; Charleston Harbor, 0.206 turtles per hour; and Morehead City Harbor, 0.025 turtles per hour.

As a result of observed CPUE, which were generally lower during cool water periods in the northern channels, the COE has asked NMFS to relax dredging windows to allow year-round dredging north of Pawles Island, South Carolina (which includes the ship channels at Oregon Inlet, Morehead City and Wilmington), and between November and May 31 from Tybee Island, Georgia through Pawles Island (including Charleston, Port Royal and Savannah channels). In recent years, the COE SAD has shown a willingness to cease dredging in channels in which take rates exceed those anticipated, despite the fact that the incidental take level was not approached. Given the COE's conservative record in these channels, and the great reduction in takes observed under current dredging windows, NMFS concurs that some expansion of hopper dredging windows, with requirements for observers and use of the rigid draghead deflector, may result in sea turtle takes, but is not likely to jeopardize the continued existence of any sea turtle species.

Beach Nourishment Activities

There has been increasing concern regarding the effects of hopper dredging during beach nourishment activities along the southeastern U.S. coast. Anecdotal accounts from divers and biologists suggest that sea turtles may use offshore fine sediment bottoms, as well as areas adjacent to hard bottom reefs, as internesting habitat. Limited observations have noted that at times of extreme drops in temperature, turtles have been observed buried in fine silt covering area reefs, either after beach nourishment or extreme freshwater runoff. Over 174 sea turtles have been observed on the sea surface during 16 right whale aerial surveys conducted between February 27 and March 19, 1995 along line transects within approximately 10 nm of the borrow area off of Jacksonville, Florida, suggesting an abundance of sea turtles in the vicinity of the borrow area. These turtles may be taken by hopper dredges. There has been no documented take of sea turtles during past beach nourishment activities at the borrow areas. However, due to potential impact, one hundred percent observer coverage is necessary for beach nourishment activities during the periods identified on the table. This observer coverage may be subsequently altered upon authorization from NMFS.

NMFS remains concerned that nearshore reefs, which provide foraging habitat and shelter for sea turtles, can be impacted by turbidity caused by dredging. While hopper dredges produce less turbidity than other dredge types, water quality impacts are still likely. State monitoring requirements do not relate directly to light restrictions caused by dredging, which has been shown to impact these ecosystems. Direct mechanical damage to hard bottom reefs, which may also be important turtle habitats, has also been documented (Draft Environmental Assessment prepared for the Second Periodic Nourishment of the Sunny Islands and Miami Beach Segments, Beach Erosion Control and Hurricane Protection Project, Dade County, Florida, January, 1995). The COE has proposed 1:1 mitigation of hard bottom habitat; however, replacement of biological material lost cannot be mitigated. Preventative steps should be identified within dredging contracts for borrow areas near hard-bottom reefs.

Rigid Draghead Deflector

Included within the COE's comprehensive research program, initiated in 1991, was a program to develop a mechanical solution to reduce the take of sea turtles at the dredge draghead. The COE SAD and the Waterways Experiment Station (WES) developed a rigid deflector for attachment to the draghead. This rigid draghead deflector has shown promising results during preliminary tests. The rigid device, similar in principal to the cow catchers developed for trains, is designed to deflect sea turtles encountered during hopper dredging activities. When deployed with mock turtles, the deflector draghead effectively avoided taking 95 percent of the models. According to the terms and conditions of the Incidental Take Statement issued for the 1991 biological opinion, testing of the effectiveness of the rigid deflector draghead in a channel where sea turtles occur present was necessary. NMFS recommended that the COE evaluate the new draghead in September in the Canaveral shipping channel, when juvenile turtles are present, but adults and gravid females are scarce. A supplementary biological opinion regarding the impacts of dredging using the deflector draghead in the Cape Canaveral channel for up to 15 days between September 14 and October 14, 1994 was issued in September 1994.

Although trawl sampling indicates that sea turtles were present in Canaveral at levels observed in previous years, only one sea turtle, a live green turtle, was observed entrained by the dredge. Twenty-one surface sightings of sea turtles were made in the channel, transit area, and at the disposal site. These results supported the mock turtle trials. However, despite the use of the rigid draghead deflector, two green turtle entrainments were documented in the Palm Beach Harbor entrance channel. Takes by a hopper dredge equipped with the deflector were also documented in Brazos Pass, in the Gulf of Mexico. NMFS believes that instruction of private dredge contractors is necessary to improve the performance of the rigid deflector draghead. Additionally, the effectiveness of the draghead may be dependent on the ability of the dredge operator to keep the dredging pumps disengaged when the dragheads are not firmly on the bottom to prevent impingement of sea turtles within the water column. Lastly, flexibility at the draghead is reportedly needed to improve the performance and ease of operation of this mechanical device. Additional assessment and development appears to be needed before the rigid draghead deflector can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities.

Whales

Right whale
The nearshore waters of northeast Florida and southern Georgia were formally designated as critical habitat for right whales on June 3, 1994 (28793). These waters were first identified as a likely calving and nursery area for right whales in 1984. Since that time, Kraus et al. (1993) have documented the occurrence of 74 percent of all the known mature females from the North Atlantic population in this area. While sightings off Georgia and Florida include primarily adult females and calves, juveniles have also been observed.

Twenty percent of all right whale mortalities observed between 1970 and 1989 were caused by vessel collisions/interactions with right whales. Seven percent of the population exhibit scars indicative of additional, non-lethal vessel interactions (Kraus, 1990). As a result of the potential for interactions between hopper dredges and right whales, the 1991 biological opinion required observers on board dredges operating from December through March in Georgia and northern Florida to maintain surveys for the occurrence of right whales during transit between channels and disposal areas. Continuation of aerial surveys, which had been instituted in Kings Bay, Georgia, was also required. Since January 1994, aerial surveys funded by the COE in association with dredge activities in the southeast have been amplified through the implementation of the right whale early warning surveys. These surveys, funded by COE, as well as the Navy and Coast Guard, are conducted to identify the occurrence and distribution of right whales in the vicinity of ship channels in the winter breeding area, and to notify nearby vessel operators of whales in their path. The COE has been instrumental in NMFS' communications with other federal action agencies regarding the importance of pro-active protection of right whales through a cooperative recovery plan implementation team.

Whales observed on aerial and shipboard surveys are individually identified and counted, cow/calf pairs are recorded, and the movements and distribution of the whales are noted. Dredge speeds are reduced to five knots or less during evening hours or periods of low visibility for 24 hours after sightings of right whales within 10 nm of the channel or disposal areas.

Data collected during these surveys suggest that right whales are observed off Savannah, Georgia, in December and March, and are relatively abundant between Brunswick, Georgia, south to Cape Canaveral from December through March. During early 1995, a right whale was also observed by shipboard observers off Morehead City, North Carolina (1/10/95, probable right whale).

Humpback whale

Humpback whales occur in waters under U.S. jurisdiction throughout the year. Migrations occur annually between their summer and winter ranges. The summer range for the Western North Atlantic stock includes the Gulf of Maine, Canadian Maritimes, western Greenland, and the Denmark Strait. All humpback whales feed while on the summer range.

The primary winter range includes the Lesser Antilles, the Virgin Islands, Puerto Rico, and the Dominican Republic (NMFS, 1991). In general, it is believed that calving and copulation take place on the winter range. Calves are born from December through March and are about 4 meters at birth. Sexually mature females give birth approximately every two to three years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years of age for males. Size at maturity is about 12 meters.

Until recently, humpback whales in the mid- and south Atlantic were considered transients. Few were seen during aerial surveys conducted over a decade ago (Shoop et al., 1982). However, since 1989, sightings of feeding juvenile humpbacks have increased along the coast of Virginia and North Carolina, peaking during the months of January through March in 1991 and 1992 (Swingle et al., 1993). Studies conducted by the Virginia Marine Science Museum (VMSM) indicate that these whales are feeding on, among other things, bay anchovies and menhaden. Researchers theorize that juvenile humpback whales, which are unconstrained by breeding requirements that result in the migration of adults to relatively barren Caribbean waters, may be establishing a winter foraging area in the mid-Atlantic (Mayo, pers comm, 1993). The lack of sightings south of the VMSM study area is a function of shipboard sighting effort, which was restricted to waters surrounding Virginia Beach, Virginia.

In concert with the increase in whale sightings, strandings of humpback whales have increased between New Jersey and Florida since 1985. Strandings were most frequent during the months of September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more then 11 meters in length (Wiley et al., 1995). Of the 18 humpbacks for which the cause of mortality was determined, 6 (33 percent) were killed by vessel strikes. An additional humpback had scars and bone fractures indicative of a previous vessel strike that may have contributed to its mortality.

Shipboard observations conducted during daylight hours during dredging activities in the Morehead City Harbor entrance channel during January and February 1995 documented sightings of young humpback whales on at least six days near the channel and disposal area, until the last sighting on January 22, 1995. Three humpback strandings were documented in North Carolina, one each in February, March, and April, suggesting that humpback whales remained within waters of the South Atlantic Division through April.

Impacts of hopper dredging on whales

Hopper dredging may adversely affect right and humpback whales, which occur during winter months in the vicinity of dredging projects within the SAD. While dredging itself is not likely to be a problem, the transit of hopper dredges between borrow, channel, and disposal areas is likely to result in increased vessel traffic in the vicinity of humpback and right whales, especially within right whale critical habitat. As discussed above, ship strikes are one of the primary human-caused sources of mortality for both humpback and right whales, and increased vessel traffic may increase the likelihood of whale/vessel interactions. Although whales have been observed in areas of dredge operations, as discussed below, there have been no documented collisions between dredges and whales.

Observers on dredges have documented close approaches between whales and dredges. On February 6, 1988, a right whale reacted to the approach of a hopper dredge within 100 yards by orienting itself toward the vessel in a defensive profile. On February 28, 1988, during clamshell dredging of Canaveral channel, a right whale remained in the Canaveral channel for a period of about 10 minutes. Fortunately, this took place during daylight hours and when no vessels were transiting the channel. On January 12, 1995, a humpback whale was observed within a quarter of a mile of the dredge at Wilmington channel and resurfaced near the dredge. An approaching humpback on January 13, 1995 was observed ahead of the dredge initially, but resurfaced near the stern after the vessel slowed. Dredging was stopped while the whale, and two other humpbacks nearby, approached within 100 yards, including one passage under the bow. On January 18, still within the Wilmington Harbor channel dredging area, one of a few humpbacks observed feeding surfaced and quickly dove again within 10 meters of the dredge.

NMFS believes that the cooperation of the dredge operators with endangered species observers greatly reduces the chance of whale/dredge interactions. Additional precautions that reduce the likelihood of dredge collisions with endangered whales include: aerial surveys conducted in right whale critical habitat during the breeding season, the adoption by dredge operators of necessary precautions when whales are sighted, and reduction in dredge speed during evening hours or days of limited visibility when whales have been spotted within the previous 24 hours.

CONCLUSIONS

NMFS concludes that endangered and threatened sea turtles, including the threatened loggerhead (*Caretta caretta*), and endangered Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) sea turtles, may be adversely affected by hopper dredging of channels and during beach nourishment activities along the U.S. southeast Atlantic coast, but are not likely to be jeopardized under the terms and conditions of the attached Incidental Take Statement. Shortnose sturgeon (*Acipenser brevirostrum*) may be adversely affected by hopper dredging of channels, but are not likely to be jeopardized in rivers of the Southeast Region. Right whales (*Eubalaena glacialis*) and humpbacks (*Megaptera novaengliae*) also may be adversely affected due to increased vessel traffic, but severe impacts can be avoided through continued cooperation between dredge operators and endangered species observers during the seasons whales may occur in the project area.

CONSERVATION RECOMMENDATIONS

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in reducing/eliminating adverse impacts to loggerhead, green, and Kemp's ridley turtles that result from hopper dredging in the southeastern United States. Many of these recommendations have been discussed and agreed upon at the recent COE/NMFS meeting in St. Petersburg, Florida.

1. The COE should continue to investigate possible modifications to existing dredges which might reduce or eliminate the take of sea turtles. The effectiveness of the rigid draghead deflectors should continue to be evaluated.

2. Spring and fall surveys are necessary in the Canaveral shipping channel to identify sea turtle temporal and spatial movement patterns if hopper dredging will be needed regularly for the Canaveral channel in the future. Telemetry using depth recorders may be needed to obtain information on water column use.

3. Spatial distribution of sea turtles taken in COE trawl surveys of southeast ship channels appeared to be non-random. Additional investigation into the characteristics of "preferred" sites may provide information to expand dredging windows in channel areas adjacent to these areas of greater abundance.

4. The COE should provide NMFS with a list of inshore and offshore borrow areas along the southeastern U.S. Atlantic in which hopper dredges are likely to be used. Frequency of anticipated beach nourishment activities should be identified as accurately as possible.

5. The COE should summarize information regarding borrow areas in which hopper dredges may be deployed. Information regarding the biological resources found at each borrow area

should be listed to identify the possible suitability of the area for foraging sea turtles.

6. The COE should evaluate the collective impact of all dredging projects within the Florida intracoastal waterways on Johnson's seagrass. A summary of anticipated projects and estimates of annual seagrass take levels should be developed to allow NMFS to provide a comprehensive conference or consultation.

7. NMFS, based on the recommendations of Griffen (1974), has recommended water column sediment load deposition rates of no more then 200 $mg/cm^2/day$, averaged over a seven day period to protect coral reefs and hard bottom communities, rather than use of only state standards.

INCIDENTAL TAKE STATEMENT

Section 7(b)(4) of the Endangered Species Act (ESA) requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA, and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, be provided that are necessary to minimize such impacts. Only incidental taking resulting from the agency action, including incidental takings caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent measures, and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7 of the ESA.

Based on results of previous hopper dredging activities in southeastern U.S. channels, new information regarding Kemp's ridley and green sea turtle abundance, and expanded dredging windows and appended monitoring of beach nourishment activities in the South Atlantic Division, NMFS anticipates that future hopper dredging activities may result in the injury or mortality of loggerhead, Kemp's ridley, green, and hawksbill turtles. Therefore, a low level of incidental take, and terms and conditions necessary to minimize and monitor takes, is established. The documented incidental take, by injury or mortality, of seven (7) Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, twenty (20) loggerhead turtles, and five (5) shortnose sturgeon is set pursuant to section 7(b)(4) of the ESA. This take level represents the total authorized take per year for hopper dredging in the Atlantic projects of the South Atlantic Division (SAD).

To ensure that the specified levels of take are not exceeded early in any project, the COE should reinitiate consultation for any project in which more than one turtle is taken in any day, or once five or more turtles are taken. The Southeast Region, NMFS, will cooperate with the COE in the review of such incidents to determine the need for developing further mitigation measures or to terminate the remaining dredging activity. Formal consultation must be reinitiated when 75% of the authorized incidental take is reached. The authorization for these incidental takes expires on August 31, 2000.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take in the Atlantic Region has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of listed right whales is provided.

The reasonable and prudent measures that NMFS believes are necessary to minimize the impact of hopper dredging in the southeastern United States have been discussed with the COE. The following terms and conditions are established to implement these measures and to document the incidental take should such take occur. It is anticipated that beach nourishment will not occur year-round, due to environmental protections instituted by other agencies.

1. Regular maintenance activity in Canaveral Harbor shall not be conducted with a hopper dredge. A hopper dredge should be considered only under emergency conditions when no other type of dredge can be used to remove hazardous shoaling in an expedited timeframe. Separate, specific Section 7 consultations must be conducted for all dredging activities in the Canaveral ship channel that may require the use of a hopper dredge. These consultations will be accelerated if warranted by emergency conditions.

2. One hundred percent inflow screening is required, and 100 percent overflow screening is recommended when sea turtle observers are required on hopper dredges in areas and seasons in which sea turtles may be present (see table below). If conditions disallow 100 percent inflow screening, inflow screening can be reduced but 100 percent overflow screening is required, and an explanation must be included in the preliminary dredging report (see 6, below).

3. The sea turtle deflecting draghead is required for all hopper dredging during the months that turtles may be present, unless a waiver is granted by the COE SAD in consultation with NMFS.

4. Beach observers cannot be used in place of shipboard observers for hopper dredging of borrow areas unless the COE

can demonstrate that the volume of sand deposited on beaches will not preclude observation and identification of turtles or turtle parts.

5. To prevent impingement of sea turtles within the water column, every effort should be made to keep the dredge pumps disengaged when the dragheads are not firmly on the bottom.

6. Reporting: A preliminary report summarizing the results of the dredging and the sea turtle take must be submitted to the COE and NMFS within 30 working days of completion of any given dredging project. An annual report (based on either calendar or fiscal year) must be submitted to NMFS summarizing hopper dredging projects, documented sea turtle and sturgeon incidental takes, and whale sightings.

7. The COE's continued participation in the Right Whale Early Warning System is necessary. Dredging within right whale critical habitat from December through March must follow the protocol established within the Early Warning System.

8. NMFS requires monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31, when humpback and right whales occur in the vicinity of channels and borrow areas, north of Cape Canaveral. Monitoring will be 100% for the first year of the biological opinion, unless subsequently altered upon authorization from NMFS. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transitting between areas if whales have been spotted within 15 nm of the vessel's path within the previous 24 hours. South of Cape Canaveral, surveys for whales should be conducted by endangered species observers during the intervals between dredge spoil monitoring.

9. The seasonal observer requirements under these terms and conditions are listed on the following table. North of the St. Johns River, in Florida, endangered species observers on hopper dredges within nearshore and riverine areas must also monitor for shortnose sturgeon impingements.

RESTRICTIONS AND MONITORING
REQUIREMENTS FOR HOPPER DREDGING ACTIVITIES IN THE ATLANTIC WATERS OF THE COE SOUTH ATLANTIC DIVISION

AREA	WHALE MONITORING for beach nourishment, navigation channels, and transit	SEA TURTLE MONITORING: NAVIGATION CHANNELS		SEA TURTLE MONITORING: BEACH NOURISHMENT ACTIVITIES	
		WINDOWS	MONITORING	WINDOWS	MONITORING[1]
North Carolina to Pawles Island, SC (includes channels at Oregon Inlet, Morehead City and Wilmington)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr and 30 Nov.	Year Round	100% observer monitoring from 1 Apr - 30 Nov	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Pawles Island, SC to Tybee Island, GA (includes channels at Charleston, Port Royal and Savannah)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr - 30 Nov.	1 Nov - 31 May	100% observer monitoring from 1 Nov - 30 Nov and 1 Apr - 31 May	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Tybee Island, GA to Titusville, FL (includes channels at Brunswick, Kings Bay, Jacksonville, St. Augustine, and Ponce de Leon Inlet)	Aerial surveys in right whale critical habitat, 1 Dec thru 31 Mar. 100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar.	1 Dec - 15 Apr	100% observer monitoring from 1 Apr - 15 Apr	Year Round	100% observer monitoring from 1 Apr - 15 Dec
Titusville, FL to Key West, FL (includes channels at West Palm Beach, Miami and Key West)	Whale observations are not necessary beyond those conducted between monitoring of dredge spoil.	Year Round	100% observer monitoring year round	Year Round	100% observer monitoring year round

[1] 100% of the dredge material must be screened and 100% of the screened material must be observed.

N.M.F.S. 8/25/95

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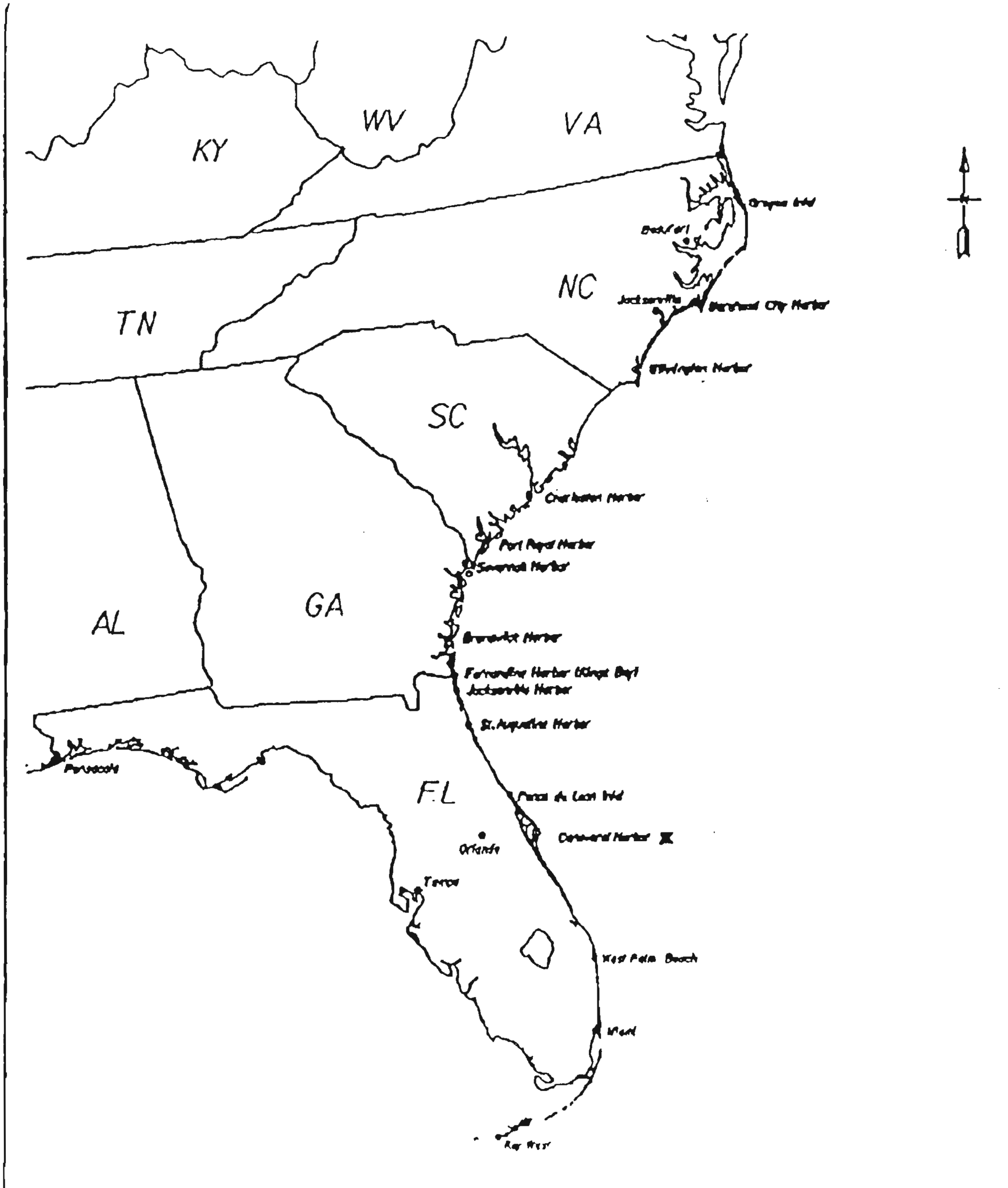
Table 1 Shortnose Sturgeon Population Estimates.

Locality	Time Segment	Population Segment	Marked m	Captured c	Recaptured r	Estimate Type	Population Estimate	Precision 95% CI		mc/4N	Source and Notes
St. John	1973-77	Adult	3,705	4,082	343	S-J	18,000	±30%		>1	Dadswell (1979)
Kennebec	1977-81	Adult	675	272	34	PET	5,273	3,632	6,914	8.7	Squiers et al. (1982)
	1977-81	Adult	703	272	56	SCH	7,222	5,046	10,765		Squiers et al (1982)
Merrimack	1989	Spawning, males				CAP	5	5	20		Kynard (unpublished data)
	1988-90	Spawning, males				CAP	12	10	28		Kynard (unpublished data)
	1989-90	Total				CAP	33	18	89		Kynard (unpublished data)
Connecticut											
Upper	1992	Spawning				CAP	47	33	80		Kynard (unpublished data)
	1993	Spawning				CAP	98	58	231		Kynard (unpublished data)
	1976-77	Total	51	162	16	PET	516	317	898	>1	Taubert (1980)
	1976-78	Total	51	56	4	PET	714	280	2,856	>1	Taubert (1980)
	1977-78	Total	119	56	18	PET	370	235	623	>1	Taubert (1980)
	1976-78	Total	170	56	24	PET	297	267	618	>1	Taubert (1980)
Lower		Total				SHU	895	799	1,018		Savoy and Shake (1993)
		Total				SCH	875				
		Total				CHA	856				
Hudson	1979	Spawning	548	899	38	PET	12,669			>1	Dovel (1981)
	1980	Spawning	811	698	40	PET	13,844			>1	Dovel (1981)
	1980	Total					30,311				Dovel (1981), extrapolation
Delaware	1981-84	Partial				PET	14,080	10,079	20,378		Hastings et al. (1987)
	1981-84	Partial				SCH	12,796	10,288	18,267		Hastings et al. (1987)
	1983	Partial				S-J	6,408				Hastings et al. (1987)
Ogeechee	1993	Total	31	38	5	PET	223				Rogers and Webber (1993)
Altamaha	1991	Total	551			SPET	3,250				Rogers (unpublished data)

Estimates Type:
S-J: Seber Jolly
PET: Modified Peterson
SCH: Modified Schnabel
CAP:CAPTURE Methodology
SHU: Schumacher
CHA:Chapman
SPET:Simple Peterson



LOCATION OF SOUTHEASTERN HARBOR PROJECTS IN WHICH HOPPER DREDGES ARE USED

✖ NOTE: HOPPER DREDGING IN CANAVERAL HARBOR WAS SUSPENDED IN 1980

FIGURE 1

N.M.F.S. 8/25/95

FIGURE 2[illegible]

FLORIDA INDEX NESTING BEACH SURVEYS
Caretta caretta

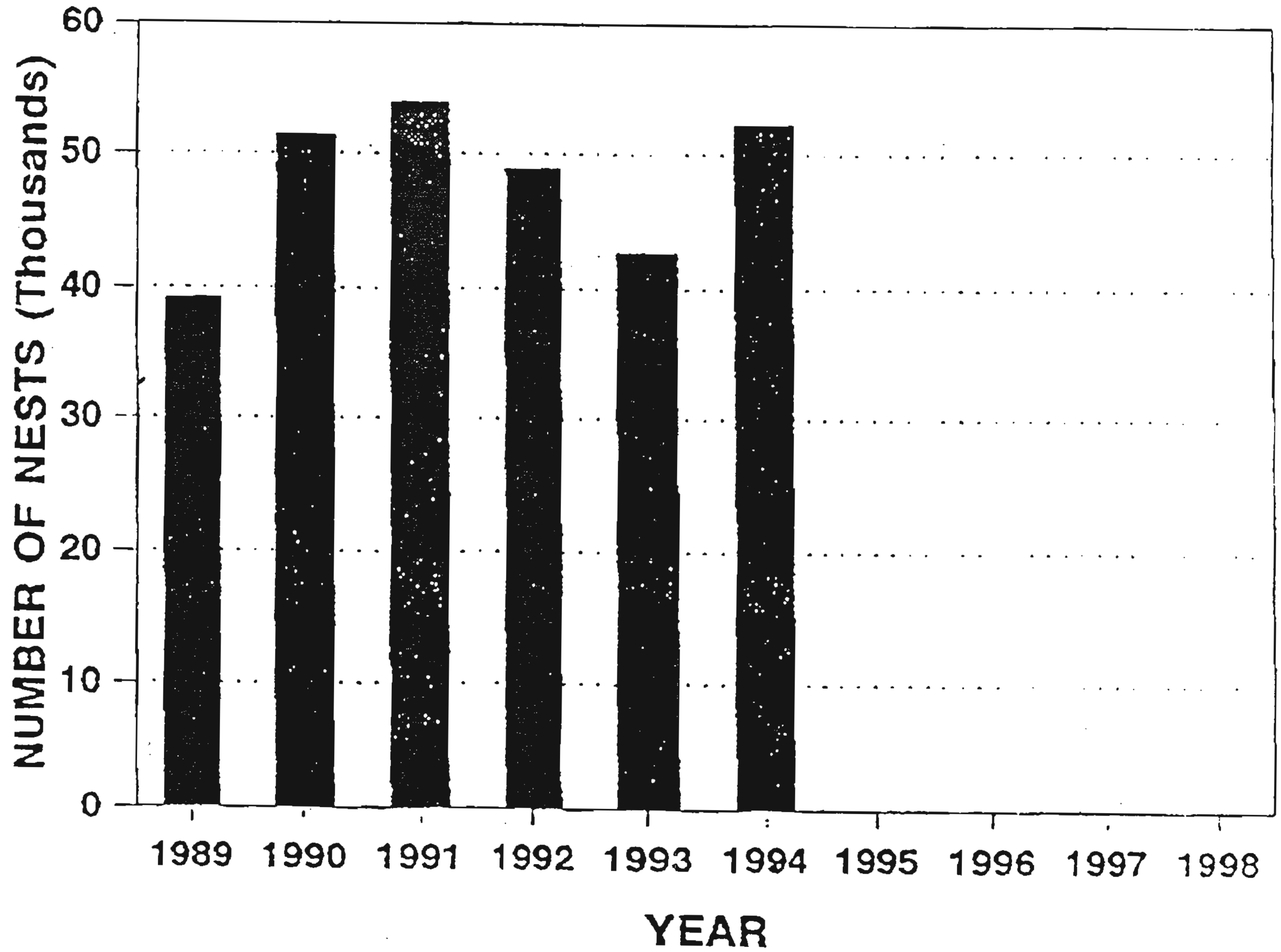


FIGURE 3

FLORIDA INDEX NESTING BEACH SURVEYS
Chelonia mydas

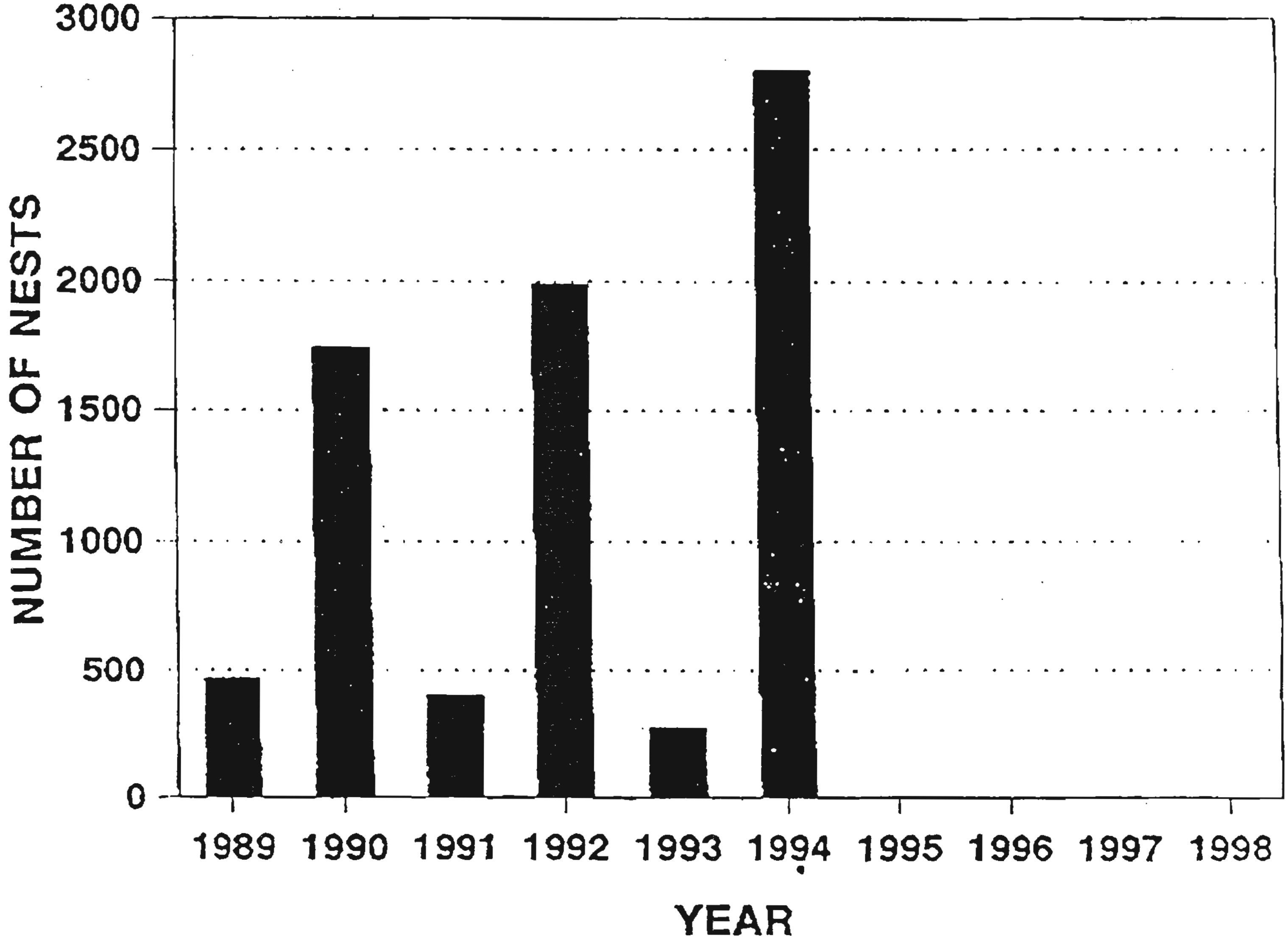


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FIGURE 4

KEMP'S RIDLEY NESTS AT RANCHO NUEVO
FWS/INP DATA 1978-1994 (R BYLES 12/94)

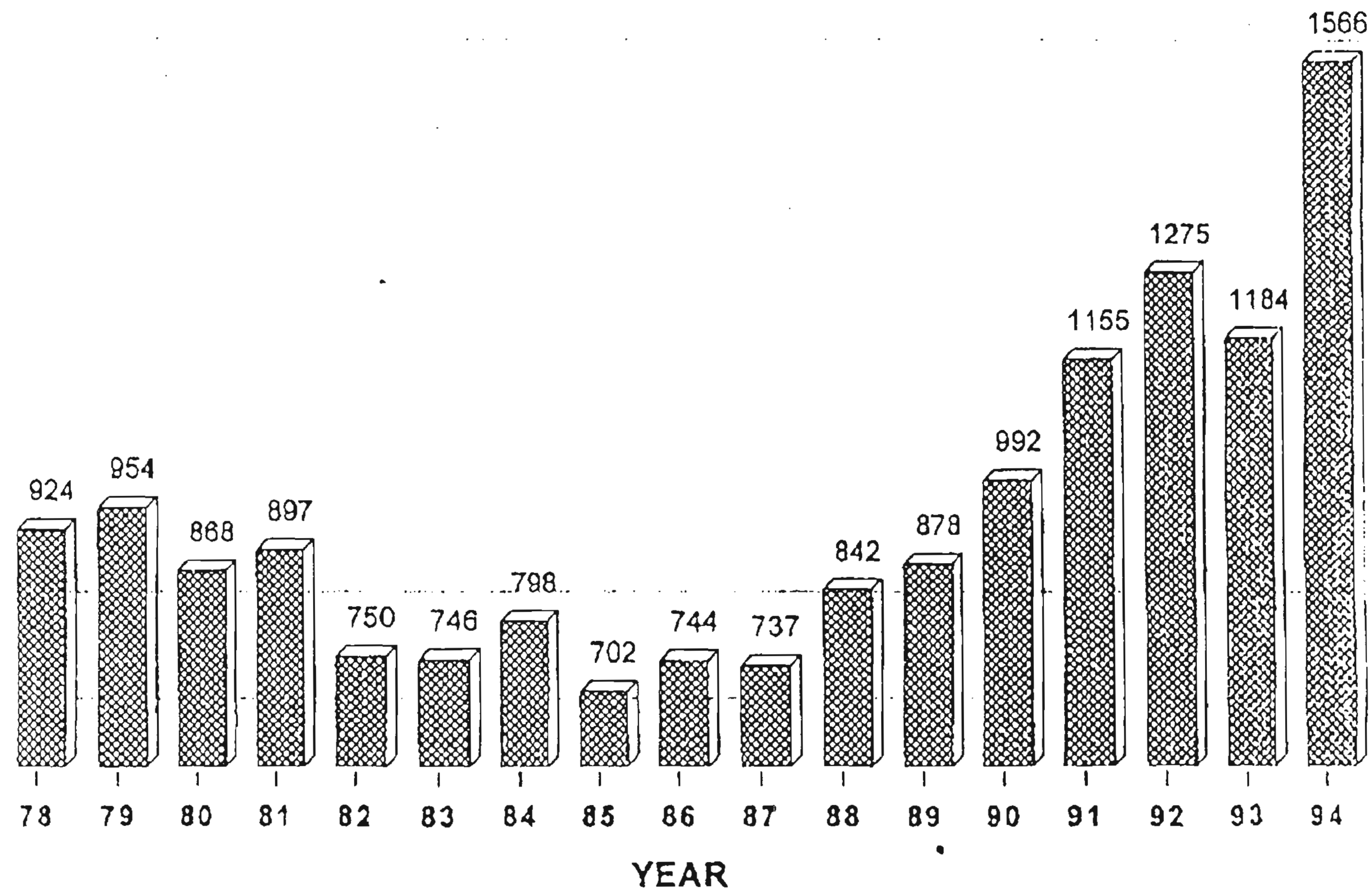
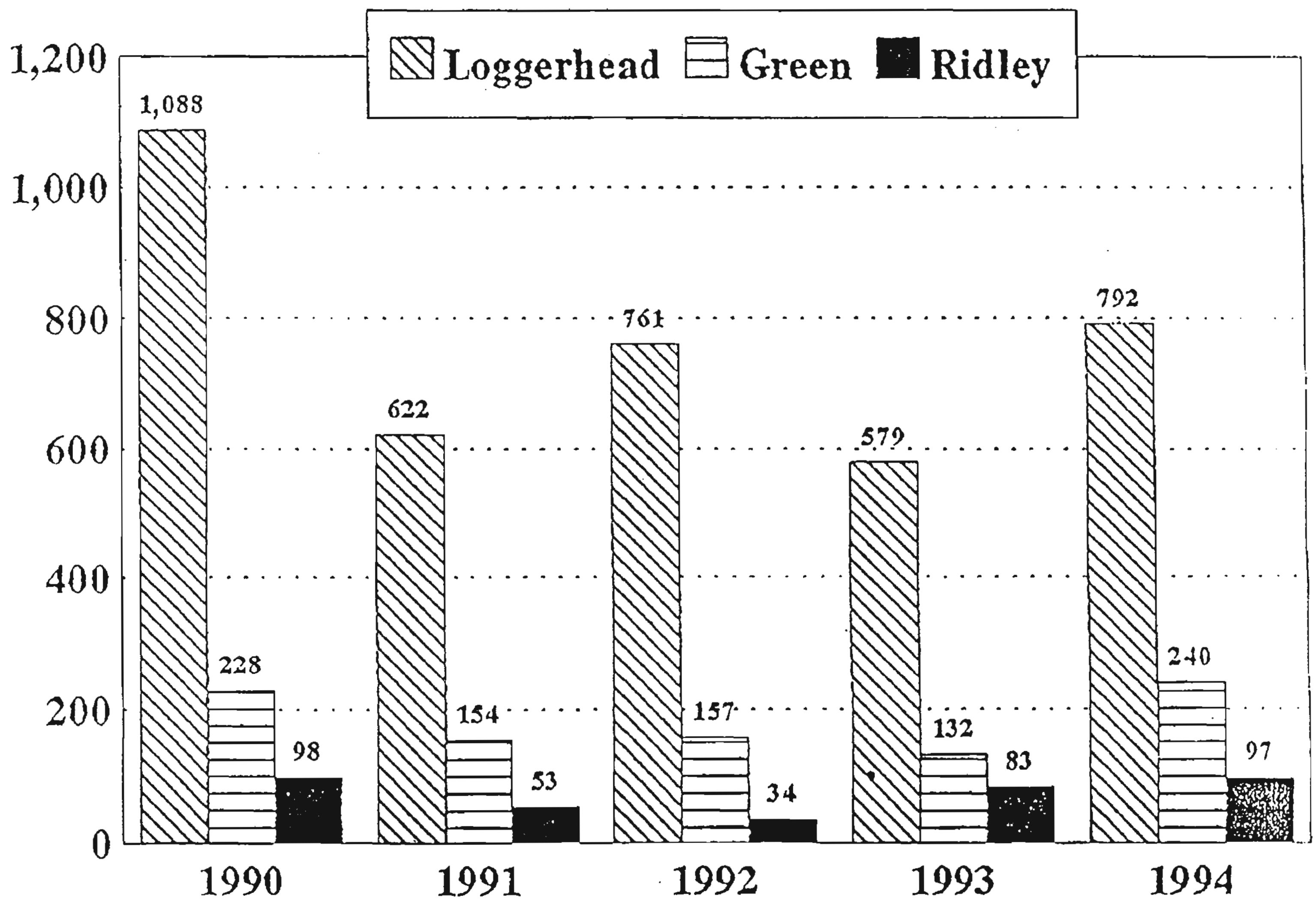


Figure 5

Southeast U.S. Atlantic Coast

Sea Turtle Strandings, 1990 - 1995



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PD

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive South
Suite 310
Jacksonville, Florida 32216-0912

IN REPLY REFER TO:
FWS/R4/ES-JAFL

FEB 17 1998

Colonel Joe R. Miller
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attn: Planning Division

Dear Colonel Miller:

Thank you for your December 18, 1997, letter regarding lighting requirements under the sea turtle incidental take statements for several beach nourishment projects. In your letter you identified problems associated with the restricted lighting requirements and requested that the red filters and low pressure sodium lighting requirements be deleted from all existing and future beach nourishment projects. The Fish and Wildlife Service's South Florida Ecosystem Office has already responded regarding projects within its area of jurisdiction. This letter addresses three projects you identified within the Jacksonville Field Office's area of jurisdiction: Ponce de Leon Inlet Navigation, Nassau County Shore Protection Program, and Brevard County Shore Protection Program.

The Service revises the Terms and Conditions regarding project-associated lighting for the Ponce de Leon Inlet Navigation and Nassau County Shore Protection Program projects to read as follows:

From April 15 through November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Shielded low pressure sodium vapor lights are recommended to minimize illumination of the nesting beach and nearshore waters. Lighting on offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

USFWS
2/17/98

The Service revises the Term and Condition regarding project-associated lighting for the Brevard County Shore Protection Program project to read as follows:

From March 1 through April 30 and November 1 through November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Shielded low pressure sodium vapor lights are recommended to minimize illumination of the nesting beach and nearshore waters. Lighting on offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

Please contact Don Palmer of our office at (904)232-2580 (extension 115) if you have any questions.

Sincerely,

Linda D. Finger

for David L. Hankla
Field Supervisor

cc: Sandy MacPherson, Fish and Wildlife Service, Jacksonville, FL
David Arnold, Florida Department of Environmental Protection, Tallahassee, FL

USFWS
2/17/98

BREVARD COUNTY, FLORIDA
SHORE PROTECTION PROJECT
REVIEW STUDY

U.S Fish and Wildlife Service
Coordination Act Report

FINAL REPORT

Submitted to:
Department of the Army
Jacksonville District U.S. Army Corps of Engineers
Planning Division, Environmental Branch
Jacksonville, Florida

Submitted by:
Department of the Interior
U.S. Fish and Wildlife Service
Ecological Services Office
Jacksonville, Florida
December 1995

1.0 INTRODUCTION

The purpose of this study is to assess and minimize the impacts to existing fish and wildlife resources in and adjacent to the U.S. Army Corps of Engineers (USACE) beach renourishment project in Brevard County, Florida. The U.S. Fish and Wildlife Service (USFWS) has evaluated the study area and commented on project impacts, including recommendations for conservation measures. Nourishment of the Atlantic shoreline of Brevard County was authorized by the River and Harbor Act of 1968 (N.A. 1992). This study is authorized by Section 933 of the Water Resources Development Act of 1990.

This project was authorized under a resolution adopted September 23, 1982 by the Committee on Public Works and Transportation, U.S. House of Representatives. Since that time, correspondence between Brevard County and the USACE reflects the county's interest in nourishing or renourishing problem areas. The USACE posted Public Notice in January 1992, and the USFWS responded with a Planning Aid Report in March 1992. Field reconnaissance took place on June 12-15, 1995, with members of the USACE, USFWS, and Brevard County Natural Resources Management Division.

2.0 PROJECT DESCRIPTION

The Jacksonville District of the USACE is currently determining the feasibility of a beach renourishment project in Brevard County, Florida which would place sand dredged from offshore shoals onto twenty miles of coastline. The study area begins adjacent to Port Canaveral at Jetty Park and extends twenty miles south to the project terminus at the southern limit of Melbourne Beach (figure 1). Fill material to be used for nourishment would originate from shoals located approximately two miles from Cape Point near Cape Canaveral (figure 2), and consists of beach quality sand.

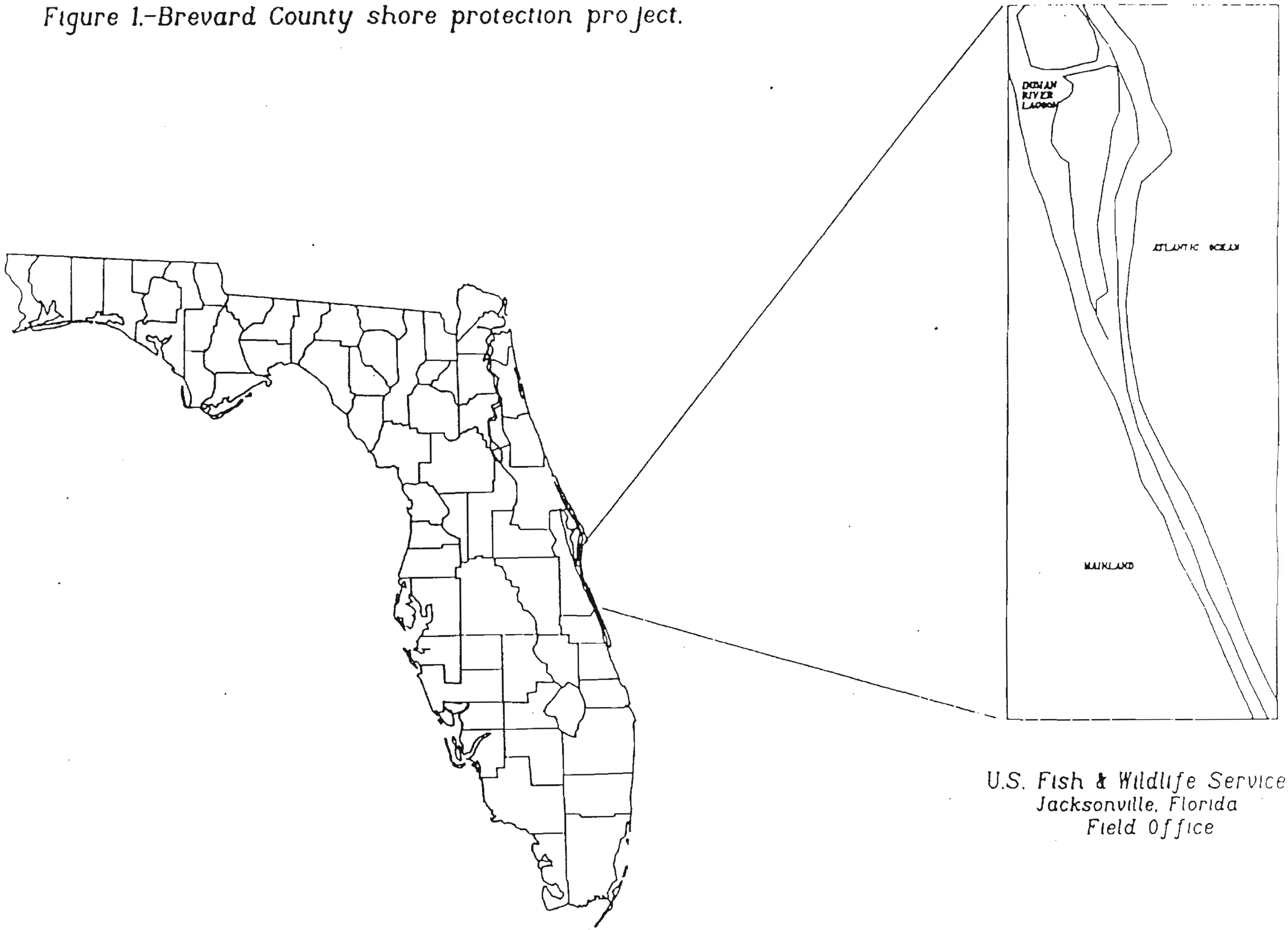
3.0 BACKGROUND

Brevard County is located on the east coast of central Florida and occupies a large inland area and extensive barrier island/estuarine lagoon system (Indian River, Banana River, and Mosquito Lagoon). The county is 72 miles long with a northwesterly to southeasterly orientation. The shoreline consists of sandy beach, vegetated dunes, barrier island strand, and maritime hammock habitat. Access to the study area is by causeway from the mainland and by coastal highway A1A.

Historically, beaches in the project area were more stable and maintained an equilibrium of sand net loss/gain. The following information is derived primarily from Olsen (1989). Natural winds and a north to south littoral drift pattern kept the process of coastline accretion and depletion balanced. Erosional shoreline loss as a result of "long term recession of the

USFWS Log No. 048D
12/7/95

Figure 1.-Brevard County shore protection project.



U.S. Fish & Wildlife Service
Jacksonville, Florida
Field Office

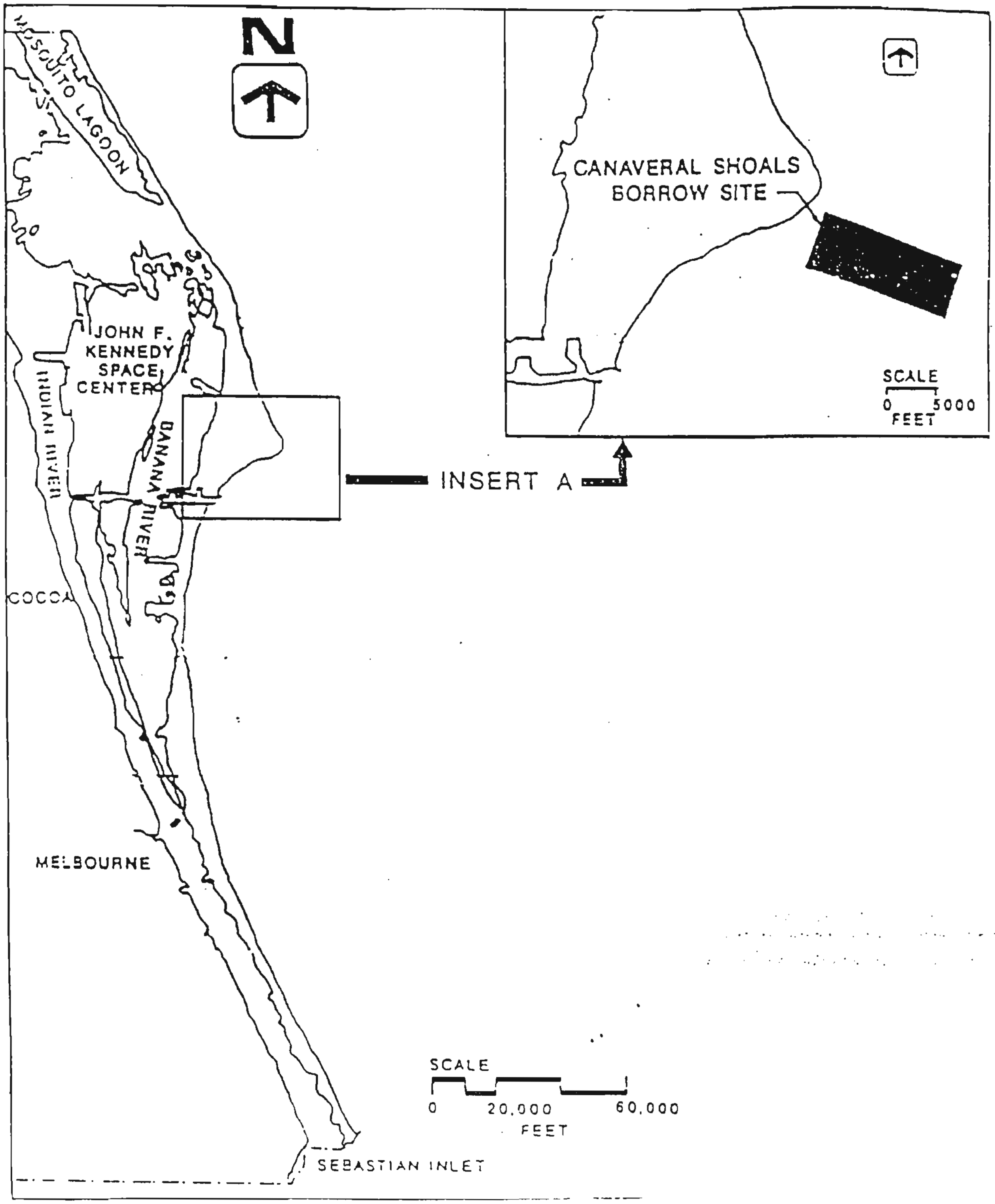


Figure 2. - Canaveral Shoals borrow site.

duneline and the general lowering of the nearshore beach profile" (USACE 1992) was a natural phenomenon over time. The addition of intense meteorological events such as "northeaster" storms in the fall and winter months, and hurricanes in the spring and summer months, act as major transporters and transformers of the beach/dune environment. Usually the dry or upper beach and bluff line are hardest hit. This reduces or eliminates the sand "reservoir" and effects the stability and longevity of the entire beach.

The creation of Port Canaveral has changed the natural littoral drift transport patterns in the immediate area and southward which exacerbates natural current reversals and drift fluctuations. This results in severe erosional "hotspots" as well as a few areas of accretion. The following areas have been included for potential renourishment: Cape Canaveral, Indialantic - Melbourne, Cocoa Beach, and Satellite - Indian Harbor Beach (USACE 1992). Current loss rates range from one foot a year at Melbourne Beach to fifteen feet a year at Cape Canaveral. In response, several beach restoration and nourishment projects have been undertaken by Brevard County and the USACOE. Strong longshore drift and reversal patterns cause these areas to naturally lose sand which accretes to the south. The USACE plan includes renourishment at varying intervals to maintain design template dimensions. Since this project will be conducted in two phases, the northern and southern reach, the Service and the Corps have agreed that each phase will require an amended Coordination Act Report from the Service, as will any new design documents forthcoming.

4.0 GENERAL DESCRIPTION OF PROJECT AREAS

4.1 Upland Dune / Dry Beach Zone

The upland dune areas of Brevard County are present throughout the project area and range from well developed in the southern portion to weakly defined in the north (See figures 3 and 4). These areas consist of dry sand beach above the mean high water level and is usually located 110-180 cm. in elevation from the mean low water level. The highest and most xeric area is characterized by a rapid loss of water and sharp temperature fluctuations. Shoreward, water is irregularly replenished through storms and high tides (Zottoli 1978). Natural processes and human impact have severely reduced the original formations. Most areas are developed with residential or commercial structures. Seawall armorment dominates the shoreline from Cocoa Beach north. Fragmented and degraded natural beach and dunes lie to the south. The natural areas are characterized as coastal strand and maritime hammock ecosystems. Typical vegetation of the coastal strand observed in the field consists of sandy, barren patches mixed with sea oats (*Uniola paniculata*), dune grass (*Ammophila breviligulata*), sea rocket (*Cakile edentula*), cacti (*Opuntia compressa*), iva (*Iva imbricata*), pennywort (*Hydrocotyle bonariensis*), croton (*Croton punctatus*), sea purslane (*Sesuvium portulacustrum*), wild bean (*Strophostyles helvola*), and morning glory (*Ipomoea purpurescens*) (Stalter 1993). The maritime hammock is composed of sea myrtle (*Baccharis halimifolia*), salt cedar (*Tamarix gallica*), wax myrtle (*Myrica cerifera*), yaupon, (*Ilex vomitoria*), senna (*Cassia fasciculata*),

Figure 3. Well developed foredune and upland dune zone in southern Brevard County

Figure 4. Weakly defined dunes in central Brevard County.

southern red cedar (*Juniperus silicicola*), muscadine (*Vitis rotundifolia*), Virginia creeper (*Parthenocissuss quinquefolia*), and greenbrier (*Smilax bona-nox*) (Stalter 1993).

Wildlife known in this area consists of raccoon (*Procyon lotor*), domesticated and feral cats (*Felis cattus*), domesticated dogs (*Canis familiaris*), the threatened southeastern beach mouse (*Peromyscus polionotus niveiventris*), threatened and endangered sea turtles, including the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*),and leatherback (*Dermochelys coriacea*); the American oystercatcher (*Haematopus palliatus*), Wilson's plover (*Charadrius wilsoni*), willet (*Catoptrophorus semipalmatus*), and laughing gull (*Larus atricilla*), gull-billed tern (*Sterna nilotica*), and Caspian tern (*Sterna caspia*) (Myers and Ewel 1990). Scrub jays (*Aphelocoma c. coerulescens*), a red-shouldered hawk (*Buteo lineatus*) and several common song birds were observed in the maritime scrub/hammock habitat throughout the study area. The ghost crab (*Ocypode quadrata*) was also observed in great numbers along the entire project area in swash, foredune and upland dune zones.

4.2 SWASH ZONE

The swash zone occupies the entire project area and is composed of quartz sand, shell hash, coquina beach rock and rubble. This zone extends 90-110 cm. in elevation from the mean low water level and is inundated by each tidal cycle. Water circulates easily through the loose-packed sand (Zottoli 1978). Sandy bottom beaches are populated by small, short-lived infauna with high species density and substantial reproductive potential and recruitment. Haustoriid amphipods constitute 50-90% of the fauna and contribute significantly to the total biomass (Nelson 1985). Decapod crustaceans, bivalves, and spionid worms complete the community. Each of these occur in relatively well-defined zones and depend to some extent on the nature of the substrate. Other species which dominate this area are *Emerita talpoida* (mole crab), *Donax* spp.(coquina), and several polychaetes (Nelson 1985, 1992). *Donax* and *Emerita* were observed in the field.

Birds known to inhabit this zone are least terns (*Sterna antillarum*), royal tern (*Sterna maxima*), sandwich tern (*Sterna sandvicensis*), black skimmer (*Rynchops niger*), and snowy plover (*Charadrius alexandrinus*) (Myers and Ewel 1990).

4.3 SURF ZONE

This ecozone also extends the length of the project area and extends from below the mean low water level to 80 cm. in elevation from the mean low water level. The sand remains saturated due to the constant submergence and inundation of the tides, allowing interstitial circulation of water throughout the sand. An increase in depth is typified by finer sediments and tightly packed sand, which inhibits water circulation (Zottoli 1978). Wave energy and exposure dictate the stability and diversity of the surf zone communities (Nelson 1985). The occupants of sandy bottom in this zone are the same as for the swash zone. Species reported to occupy the surf zone are polychaetes, gastropods, amphipods, sand dollars, portunid crabs, bivalves and small or juvenile fish. The seasonality of surf zone fish is high with few year round residents (Nelson 1985). Common species of fish in the surf zone are Engraulidae (anchovies), Clupeidae (herrings), Carangidae (jacks), Sciaenidae (kingfish, spot, croakers), silversides (*Menidia menidia)*, catfish (*Arius felis*), lizardfishes (*Synodus foetens*), sand drum (*Umbrina coroides*) and scaled sardine (*Harengula jaguana*). This zone also serves as the nursery grounds for the Florida pompano (*Trachinotus carolinus*) (Nelson 1985).

Coquina rock outcrops and scattered live worm rock reef occupy the surf zone and range from Cape Canaveral to the Florida Keys (Zale 1989). The reefs in the study area extend ten miles from the southern portion of Patrick Air Force Base south to Paradise Beach (figures 5-7). Aerial photography provided by the ASIC was inadequate due to high tide conditions which prevented accurate detection of the existing reefs. A unusually low spring tide enabled visual inspection of the reefs without snorkeling or diving. The coquina outcrops consist of Pleistocene remnants of coquina shell hash and sand lithified by a calcareous cement (Schmidt 1979) which provides substrate for the reef-building tube worm (*Phragmatopoma lapidosa*). In addition to the reefs themselves, individual nodules of worm rock were found to be growing on various places on the coquina outcrops, primarily on the undersides of ledges.

This reef system is important for two reasons: 1) it supports a stable and complex community of species, and 2) it functions as an offshore breakwater and sediment trap for suspended sediments which may act to prograde beaches (Zale 1989, Coastal and Oceanographic Engineering and Environmental Laboratory, 1973). Species reported to inhabit the reef are amphipods, isopods, decapod and stomatopod crustaceans including the porcellanid crab (*Pachycheles monilifer*), the xanthid crab (*Menippe nodifrons*), and the graspid crab (*Pachygrapsus transversus*) (Gore et al. 1978). Common fish species reported on or near the reef were striped blennies (*Chasmodes bosquianus*), porkfish (*Anisotremus virginicus*), sailor's choice (*Haemulon parrai*), spottail pinfish (*Diplodus holbrooki*), sargeant majors, amphipods, gastropods, macroalga and orange sponge (*Cliona lampa*) (Continental Shelf Associates 1989). Blennies and sargeant majors were most evident in the field. Several tidal pools created by holes in the rock hosted fish and amphipods. Several species of macroalgae were also growing on the rocks, mostly red (Rhodophyta) and brown (Bryophyta).

4.4 OFFSHORE ZONE

Offshore benthic habitats consist of sand bottoms and reefs. The sandy substrate grades slowly into a sandy-mud consistency as one nears the edge of the continental shelf. Community species found to inhabit the sandy bottom area are squid, amphipods, annelids, bivalves, gastropods, crustaceans and scallops. Reefs of lithified coquina occur in depths of water starting at 2-7 m to 110m (Continental Shelf Associates 1989), and are inhabited by several

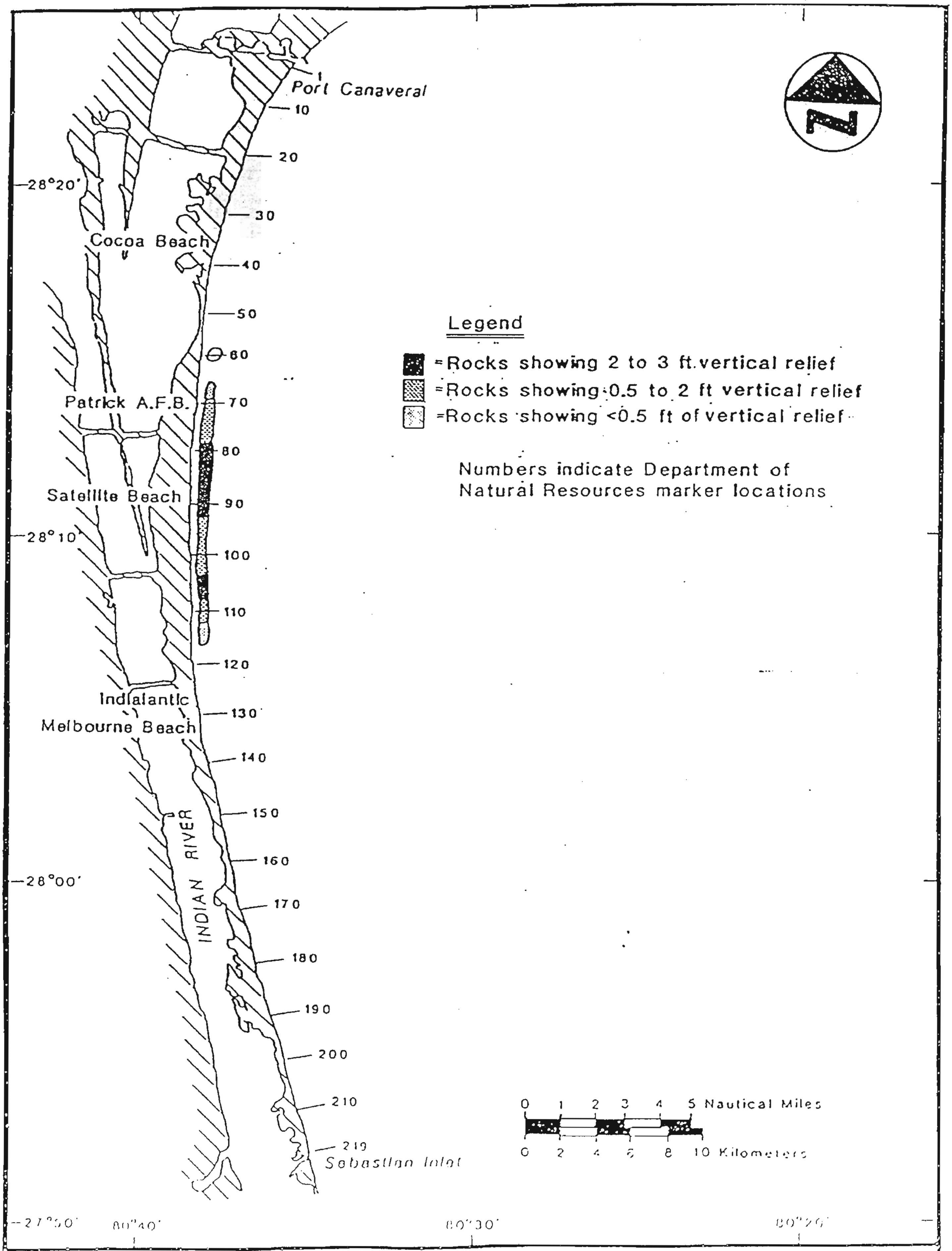


Figure 5 Location of nearshore rock outcrops along Brevard County

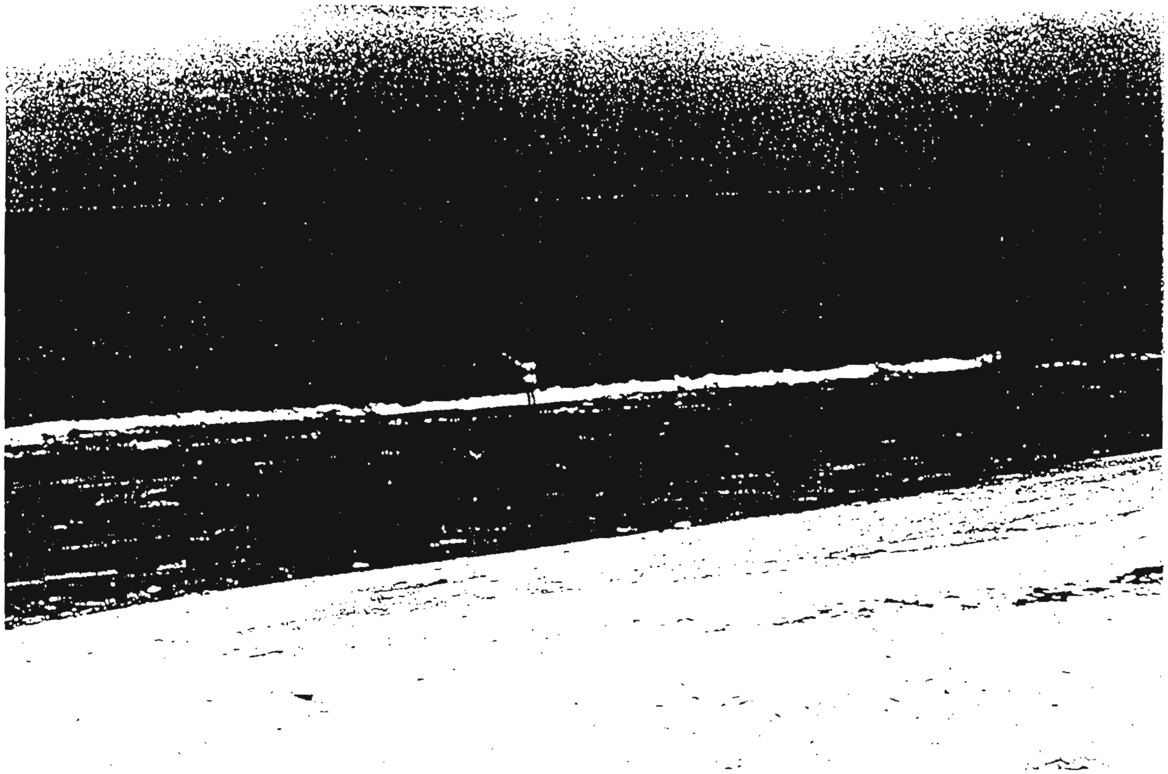


Figure 6. Healthy worm reef colonies and associated coquina rock outcrops.

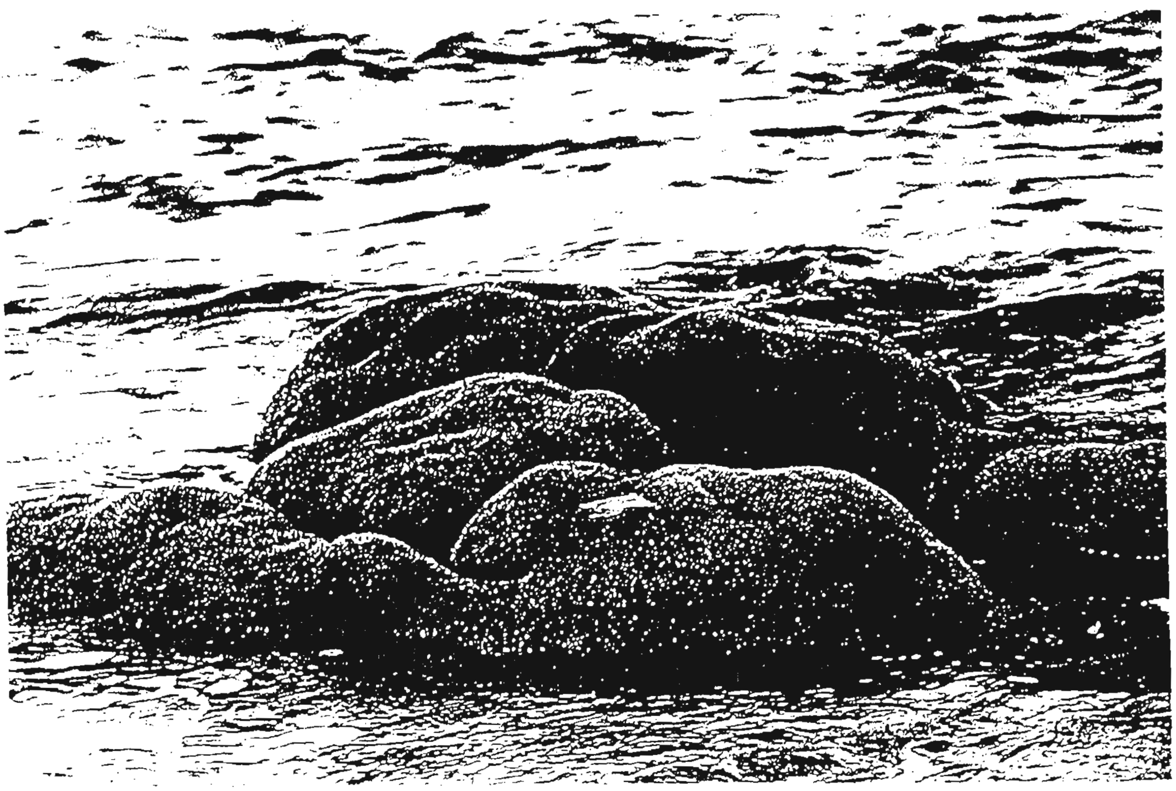


Figure 7. Live reef-building tube worm colony (Phragmatopoma lapidosa) colony in central Brevard County.

species of macroalgae. Minimal impacts from sand burial may occur on algae communities occurring nearer to shore, but should recover quickly. Dredging activity in the shoal area may create a sediment plume up to a half-mile long. The effects of this would be temporal, but may result in the mortality of a number of fish due to suffocation.

5.0 PROJECT IMPACTS

5.1 Upland Dune/ Dry Beach Zone

These areas serve as habitat for several animals including the threatened southeastern beach mouse. The current plan as proposed by the USACOE will avoid impact to the actual dunes and associated uplands but will impact the upper beach where turtles nest. Sand will be placed at the toe of the dunes and distributed by bulldozers. Additionally, the weight of earth-moving equipment is documented to create compaction and shear resistance of the substrate (Nelson and Dickerson 1988). Ghost crabs which occupy this area of the beach also risk burial. Limited information describes the crabs ability to "burrow up" to the surface if buried. If populations drop after nourishment takes place, it would be attributed to the emigration of crabs responding to a decreased food supply in the disturbed intertidal zone rather than from burial mortality (Nelson 1985).

5.2 SWASH ZONE

Information from Nelson (1985,1992) states that the mole crab is the predominant organism in the swash zone and numbers may be greatly reduced by beach nourishment activities. Mole crabs are filter feeders which rely on a high energy environment for food. They also need wet sand to burrow. Both factors place them at risk for beach fill burial. Studies indicate although they are weak swimmers, they will vacate the disturbed area by swimming or transversing the tide line. Few to none have been reported buried. Project areas recovered within two days to two months. *Donax* spp. (coquina) are the second dominant organism in the swash zone community and are most susceptible to beach nourishment activities due to decreased mobility. Nelson (1985, 1992) reports that in a North Carolina renourishment, no *Donax* were found until seven months after the project ceased and most were juveniles carried in by littoral drift. The studies indicate that mortality is due to burial, and recovery is highly dependent on the quality of beach fill used. Limited information on the effects of beach nourishment on polychaetes is inconclusive. Studies done by Nelson (1985) and Saloman and Naughton (1984), agree that beach nourishment reduces polychaete population numbers. Other studies indicate there were no significant effects to polychaetes at Sebastian Inlet, Florida. Nelson (1985) found *Scololepis squamata* to have a certain tolerance for sediment disturbance and concluded this worm could burrow itself out of 0.9 m of material provided the fill had little silt-clay content. Minimal impact is expected.

Placement of fill in the swash zone will eliminate some populations of *Donax* spp. and few polychaetes. Recovery should be rapid for both of these species. Mole crabs may avoid burial by voluntarily vacating the area. The proposed fill material is similar to native beach sand and should enhance the recovery of the existing fauna.

5.3 SURF ZONE

Anticipated impacts from beach nourishment in the surf zone will be actual fill placement (burial) and turbidity (from suspended solids). Although most organisms present in the surf zone are adapted to an increased suspended sediment load, some could be adversely affected. Nelson (1985) found that haustoriid amphipods experienced a negative impact from beach nourishment because of weak swimming capabilities which prohibit escape from sand "dump". This may be common for other organisms limited in mobility. Recovery is slow and new recruitment must come from juveniles or adults which migrate to the area. Polychaetes increase with depth in the intertidal zone and provide a food source for surf zone fishes. Although little conclusive information is available for beach nourishment effects, the burrowing action and cryptic nature of this organism point to possible mortality if emergence is restricted under too thick a layer of fill material. This occurrence could cause mortality for other species in the surf zone as well (Nelson 1985). Mobility is also severely limited for most gastropods and bivalves; therefore placing them at high risk of burial. Increased sediment load may affect the respiration of some species which could cause suffocation. Crustaceans will usually emigrate to other areas while nourishment takes place and return when activity has ceased. Maintenance of food supply and water clarity are important to maintain pre-project population numbers. If burial can be minimized, an increased sediment load should cause few mortalities. Information on surf zone fish is also limited but generally states that most fish will flee and avoid the disturbed area and will return within a few months. Nelson (1985) suggests that loss of habitat may be more harmful to fish than a suspended sediment loading which could clog their gills. Most surf zone fish may tolerate an elevated level of turbidity, but burrowing fish are at greater risk from burial. The overall impact on fishes should be minimal (Nelson 1985, 1992; Continental Shelf Associates 1989, Parkinson and Nelson 1994).

Several authors have concluded that beach nourishment projects are not damaging to existing biological communities in the long term (Gorzelany 1984, Saloman and Naughton 1984, Cutler and Mahadevan 1982, Nelson 1992). However, short term effects could include mortality (resulting from burial, suffocation or loss of habitat) and/or emigration of species to other areas which would reflect an immediate and temporal decline in individual species or species numbers. Many intertidal organisms have high reproductive potential and rapid dispersal rates, which help to enhance recovery from disturbance (Gorzelany 1984). Recovery as documented is fairly rapid depending on the quality of fill material, the seasonality, and living requirements of the species.

Sabellariid worm reefs are a major concern of this project. The reefs are formed by the reef building tube worm *Phragmatopoma lapidosa,* and occur erratically in the central portion of the work area. Reef formation is the aggregation of tubes built from platy shell fragments and sand bonded by a secreted proteinaceous cement lithified over a period of time to form extensive colonies (Coastal and Oceanic Engineering and Environmental Laboratory, 1973.) (figure 8). This species requires a firm substrate on which to attach, and a high energy intertidal surf zone for shell, sand, food, and waste removal (Zale 1989).

The reefs themselves are important landscape features which act as wave breaks and/or provide for the progradation of beach (Zale 1989). Waves break over the reefs more forcefully than over sandy bottoms carrying suspended solids up and over the reef and farther up the beach, trapping sediments on the shoreward side of the reef. The dissipation and absorption of wave energy by the reefs help to protect and prograde the beach. The reefs provide a stable substrate, shelter, and food source which supports a complex and stable marine community.

Several algal species were observed on the rock outcrops in the study area; the following were identified: *Dictyota cervicornis, Padina* spp., *Ulva* spp., *Caulerpa prolifera, Codium decorticatum, Gracillaria* spp. and *Luarencia* spp. Dr. W. Nelson (pers. comm. June 29, 1995) confirmed that the presence of *Padina* and *Caulerpa* indicate the "permanence" of the reefs (figure 9). One area appeared to support a tunicate colony (figure 10). Reef exposure depends on wave action and associated sand movement generated by storms and littoral drift. The history of the longevity and exposure of the reefs are still unknown today; however a study is planned in the near future to date the reefs (Sebastian Tax District Commission, per. comm., June 12, 1995).

The main impacts to the worm rock reefs are burial, turbidity, and hydrogen sulfide poisoning (Main 1986, Myers and Ewel 1990, Zale 1989). Burial by beach sand was tested in the laboratory by Main (1986) and Nelson (1985). Burial could be tolerated by the worms for only 24 hours in summer temperatures (28-31C), and 72 hours for temperatures of 17-23C. Turbidity experiments revealed a maximum tolerance period of 96 hours without suffering significant mortality. Zale (1989), Myers and Ewel (1990), and Main and Nelson (1985) have reported definite or possible mortality of reef-building tube worms as a result of past nourishment projects. Parkinson and Nelson (1994) allude to drifting sand from beach nourishment causing mortality and delayed worm recovery as well as poor algae re-establishment. Hydrogen sulfide may also be a problem when using fill with a high organic content. This is uncontrollable at times, as the dredge may unearth undesirable marine sediments. Research done by Dr. Nelson in 1985 revealed that the hydrogen sulfides contained in organic matter are lethal to *P. lapidosa* when mixed with deoxygenated seawater. These animals are adapted to high-energy, oxygenated environments, and cannot tolerate fine sediments such as silts and mud. If fill is placed in the surf zone, oxygen will slowly dissolve the toxic sulfides. Unless poor quality fill is used, hydrogen sulfides should not impact the worms. The literature indicates that nourishment activities create an environmental detriment to the survival of reef-building tube worms.

Figure 8. Live Phragmatopoma lapidosa worm reef nodule on coquina rock.

Figure 9. Typical species of macroalga observed on live worm/coquina reefs. Note orange sponges and nodes of worm rock

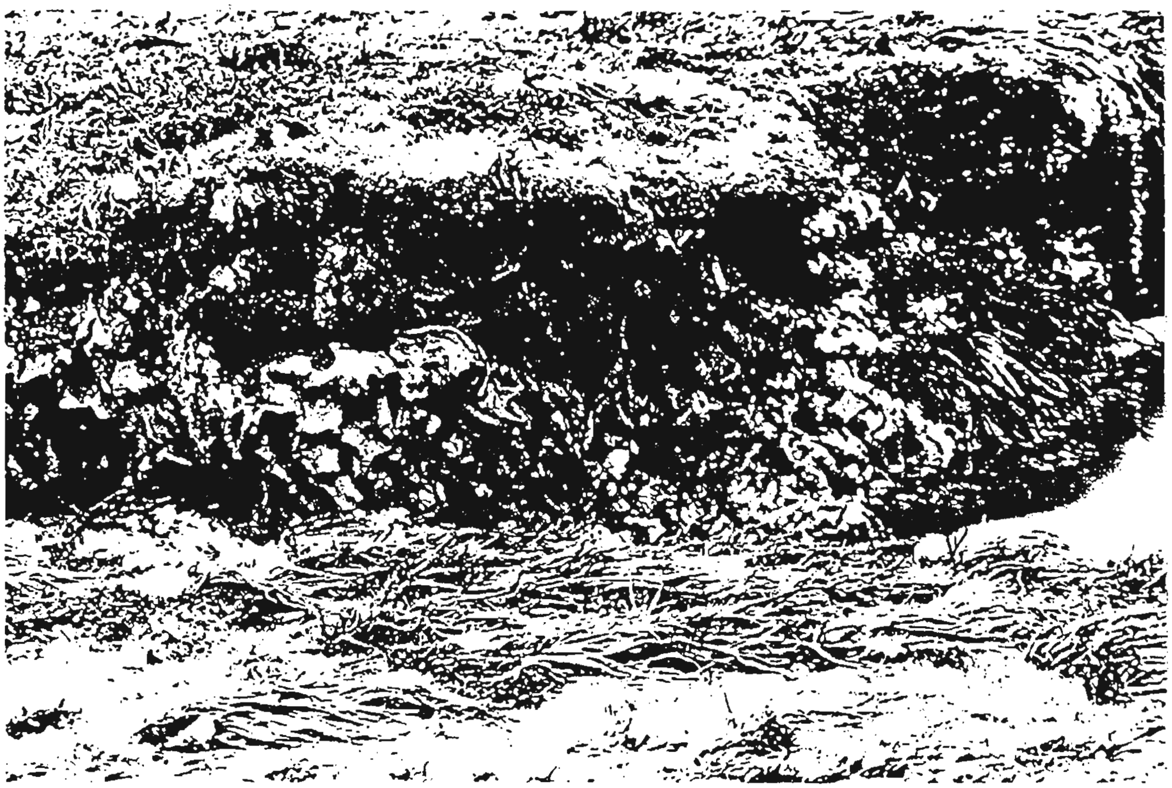


Figure 10. Tunicates and macroalga inhabiting coquina rock reef.

Due to the possible loss of this valuable resource, the Service recommends that beach nourishment not take place in areas of live worm reef-coquina rock (hard bottom) habitat. Other options to avoid nourishment in these areas should be explored. The Corps has offered four different nourishment options, none of which has been tested. In an effort to select the appropriate method of nourishment, the Corps will also perform computer modeling studies for the effects of sand movement on the reefs from the existing cross-shore drift. The studies are not yet complete at this time. There is also the possibility of a new design document to be formulated by the Corps (Tom Smith, pers. comm., 1995) which would include investigative studies on the various options available for nourishment in reef areas. Lacking that information, we will address each option and make the best recommendation for the resource based on the current literature. As results of these studies become available, it is possible that these recommendations may change. The options as offered by the Corps are as follows:

> 1). The placement of a "stable" berm at a distance greater than 23 feet behind the worm rock reefs with interval nourishment. depth
>
> 2) The placement of an "active" berm at a distance less than 23 feet behind the worm reefs with interval nourishment.
>
> 3) Mitigation - "in-kind"- Implants of a hard substrate would be placed in areas of depleted worm reef-coquina rock outcrops for the reestablishment of *P. lapidosa* and other associated marine life.
>
> 4) Mitigation - "out-of-kind" - Creation and placement of an offshore reef substrate to attract displaced fish, etc.

Options one and two involve the placement of berms consisting of dredged fill material behind the reef systems. As stated in preceding paragraphs, the biological and geological importance of the reefs are significant, as these ecosystems are highly productive in terms of biomass, food web constituents, and aquatic habitat for sport fish and endangered and threatened sea turtles (Erhart 1991; pers. comm., 1995). Primary threats to the reef system consist of burial and temperature extremes (Nelson 1985). The Service is concerned that the placement of berms may threaten or destroy the health and viability of the reefs through burial and siltation. This would result in the direct or indirect demise of existing species living in, on, or near the reef through the suffocation of organisms, the depletion of the food source, the impairment of filter feeders, and the hindrance of new *P. lapidosa* settlement. Although studies by Nelson (1985) and Kreuger (1976) indicate the ability for tubeworms to survive 24-72 hours of burial, and up to 96 hours of siltation, death is certain as these time frames expire.

Option 1 includes the placement of a "stable" berm at least 23 feet behind the reef system, with additional periodic nourishment. The berm would remain somewhat stable due to its location and therefore not subjected to the turbulence shoreward. This option is agreeable to the Service at this time, due to the decreased burial and siltation impacts to the worm rock- hard bottom community. We acknowledge this option is the most costly and offers the least feeder benefits; however, this is a technique that has not been tested but could be initiated without further testing. We feel the rock-reef habitats present in Brevard County are a unique biological feature of importance to the marine ecosystem and should be preserved.

Option 2, placement of an active berm with interval supplements, is also untested at this time but offers moderate feeder benefits. This technique is less reliable than option 1 in that its location increases the risk of damage or destruction to the reef. Placement of the berm would be crucial to the survival of sessile and slow-moving animals. Suspended silt particles are a related problem as they increase turbidity. The disadvantages are discussed above. The Service may agree to this method after further testing is concluded.

Options three (in-kind) and four (out-of-kind) involve mitigation as compensation for impacted reef systems in the project area. As of this writing, mitigation for worm rock has never been attempted, and the success of any future attempts would be purely speculative. Studies by Nelson (1985) and Kreuger (1976) point to the possibility of creating new worm rock formations, but only under very specific conditions which are uncertain at best. There exists one documented mitigation study (Cummings 1994) for a hard bottom community in Boca Raton, created for impacted reef resulting from a beach nourishment project. After five and one-half years, results of surveys demonstrated that the artificial reef had been suitable mitigation for the hard bottom communities lost. To measure its success, species present at Red Rock (a natural site nearby) were compared to the mitigation site, and was found to possess a majority of the species present there. Of course, this applies only to the rock outcrop communities, and not to the worm rock reefs.

As requested by the Corps, the following are recommendations as taken from a study done by Krueger (1976) for the reestablishment of *P. lapidosa* on new substrates for investigative purposes:

1. Use a live sample if possible. Reestablishment is more successful with a "catalyst".

2. Use a stable substrate located near an established adult colony. Initial settlement stimulates new growth needed to repair old reefs. For the best method, contact this office or consult Krueger 1976.

3. Locate and position substrate such that a constant supply of shell fragments and sand for food and building materials is available. Initially, establishment may occur on the calmer, shoreward side of the substrate, but growth will accelerate on the seaward side due to the availability of nutrients.

4. Supply a "catalyst" for attracting larvae to the substrate. Testing indicates that pulverized worm reef materials or adult worm cement (proteinaceous mucous) produces the best results.

5. Reapply the attractants after one month as they become water leached or consumed by bacteria.

6. Construct the new substrate with a rough surface instead of smooth, adding indentations or notches for added stability and shelter for settling larvae.

7. Rough weather will destroy new and old worm tubes. Subsequent burial and siltation prevents reestablishment. Lone formations are less stable and suffer damage more readily than group formations.

8. Even though studies reveal that larvae are present year round in the surf, settlement is sporadic at best. Time frames, intensity and extent of settlement are different at every site.

Overall, due to the uncertain nature of sand movement and mitigation success, the Service accepts option #1 and recommends that no further work be done in the area of the Brevard worm reef-hard bottom communities until further experiments or investigative work is performed by the Corps. Upon conclusive evidence as presented by the Corps, a new CAR will be prepared by the USFWS.

5.4 Offshore Zone

Little information is available for nourishment impacts in the offshore zone. Studies indicate the main concern in this zone is that of clogging the gills of resident fish by suspended solids, which may lead to suffocation (Nelson 1985). Pelagic and filter feeding fish are more affected than benthic feeders. The overall impact should be minimal because most fish will leave the work area and return only after the work is done.

This zone also includes the project borrow-site shoals. The dredging of placement material and associated disturbance of benthic sediments will most likely create a turbidity plume. Estimates from Corps personnel (Mike Dupes, pers. comm., 1995) indicate a possible plume size of one-half mile in length. Several studies by various authors on dredged borrow sites and turbidity indicate the short-term impacts to aquatic resources to be the immediate and temporary defaunation of the benthic community (Continental Shelf Associates 1989). Long-term effects observed in the study areas were a reduction in species diversity, density, and community stability. The studies also indicate that the reestablishment of the benthic community correlates directly to the recovery of the physical and chemical characteristics of site sediments. Natural shoal formation processes should help to mitigate for biological losses by replenishing and rebuilding the area. This would result in the restoration of the original physical and chemical composition of the sediments, and help to establish a more diverse and stable community.

6.0 BIOLOGICAL OPINION FWS Log No. 048D 12/7/95

Consultation History

On March 20 1992, the Service provided the USACE with a Planning Aid Report which addressed the reconnaissance phase of this project. Fish and wildlife resources as well as threatened and endangered species were listed and given brief comment. In March of 1992, USACE submitted a reconnaissance report listing possible impacts this project would have on the above listed species, in accordance with Section 7 of the Endangered Species Act of 1973, as amended, and determined impact to sea turtles and the southeastern beach mouse may occur.

Biological Opinion

Southeastern Beach Mouse

The southeastern beach mouse *(Peromyscus polionitus niveiventris)* historically inhabited sand dunes along the coastline from Ponce (Mosquito) Inlet, Florida (Bangs 1898, in Humphrey 1992) to Miami Beach, Florida (Layne 1974, in Humphrey 1992). Since the early 1970's most of the population from Cape Canaveral to Ft. Pierce, Florida has been lost or highly fragmented due to urbanization (see figure 11). Populations from Ft. Pierce southward may be entirely extirpated (Humphrey 1992). Loss of dune habitat from storm erosion and urban development pose the worst threats to this species' survival.

Current studies reveal healthy populations at Cape Canaveral National Seashore,Cape Canaveral proper, and Merritt Island National Wildlife Refuge. A few areas in Indian River County, including south Sebastian Inlet Park, have recently documented small numbers (Humphrey 1992). Recent trapping in south Brevard County (north Sebastian Inlet Park) indicate beach mice are no longer present (K.Owens , USFWS, pers. comm.).

Essential habitat for this species is primary and secondary dunes with a supply of sea oats *(Uniola paniculata)* and other grains, seeds and fruits. Field work in the study area revealed remnant mouse habitat and a lack of definite "sign" of mouse habitation. Future trapping activity may take place at Lori Wilson County Park and Spessard Holland State Park where optimum beach mouse habitat remains.

The USACE stated in their reconnaissance report that impact to sand dunes was unknown at that time. If dune nourishment took place, effects would be minimal pending quality of fill material. Sand was to be placed at the toe of the dune which would likely affect the mice and their habitat. Incidental take of this species would occur if beach mice were buried in their burrows during sand deposition.

USFWS 12/7/95 S'Eastern Beach Mouse

Subsequently, the USACE has finalized their plans. The project no longer includes dune enhancement, therefore southeastern beach mice will not be impacted. Field reconnaissance for this species also indicated none are known to exist in the study area. However, an exception to this may exist at Lori Wilson County Park in Cocoa Beach where suitable habitat remains. Although "sign" was not noticed, mice may inhabit this area. It is the Service's Biological Opinion that this project is not likely to jeopardize the continued existence of the southeastern beach mouse.

INCIDENTAL TAKE

Section 9 of the Endangered Species Act , as amended (Act), prohibits the taking of listed species without a special exemption. Taking is defined as to mean harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt to engage in any such conduct. "Harm" and "harass" are further defined in Service regulations (50 CFR 17.3). "Harass" is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding or sheltering. "Harm" is defined as an act which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

Under the terms of Section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement. The measures described below are nondiscretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in Section 7 (o)(2) to apply.

The Federal agency has a continuing responsibility to regulate the activity that is covered by this incidental take statement. If the agency fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7 (o)(2) may lapse.

The Service has reviewed the biological information for this species, and other available information relevant to this action. Based on our review incidental take is anticipated for all southeastern beach mice that may be found at the toe of the primary dune within the project area, specifically Lori Wilson County Park in Cocoa Beach. This is the only portion of the work area where beach mice may be encountered.

When providing an incidental take statement the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with to implement the reasonable and prudent measures.

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Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take:

1. The Corps shall instruct the contractor to prohibit mechanized equipment from the primary or secondary dune systems. Mechanized equipment is permitted only up to the toe of the primary dune.

2. The Corps will require the contractor to initiate a trapping program to remove southeastern beach mice that may be affected by the nourishment operation.

To implement the above reasonable and prudent measures, the Service has outlined the following terms and conditions for incidental take. In accordance with the Interagency Cooperation Regulations (50 CFR 402), these terms and conditions must be complied with to implement the reasonable and prudent measures for incidental take:

1. The Contractor shall contract with a qualified and permitted biologist to carry out the trapping program.

2. The trapping effort will be directed to only that section of beach at Lori Wilson County Park which will be impacted within a 24-hour period. The trapping program for that particular reach of beach will begin five days before material is deposited on site, and will conclude the morning of sand disposal. If there is a delay in sand disposal, trapping will continue until the work occurs.

3. Two traps will be placed at each southeastern beach mouse burrow. Captured beach mice will be held until nourishment activity in the area ceases, approximately 48 hours.

4. A report summarizing the number of trap nights and the number of beach mice captured and relocated will be submitted to the Corps and Service three weeks after project completion.

5. If a dead beach mouse is found or one dies in the trap, the specimen should be frozen and the Jacksonville Field Office contacted within 24 hours (904/232-2580).

Loggerhead, Green and Leatherback Sea Turtles

The Fish and Wildlife Service has responsibility for regulating sea turtles when they come ashore to nest. The National Marine Fisheries Service has jurisdiction over sea turtles in the marine environment. For at least two decades, several factors appear to have contributed to the decline of sea turtle populations along the Atlantic coast and in the Gulf of Mexico

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S'Eastern Beach Mouse

(National Research Council 1990a). These factors include commercial overutilization of eggs and turtles, increased natural predation of eggs and hatchlings, incidental catches in commercial fishing operations, degradation of nesting habitat by coastal development, and marine pollution and debris.

The reproductive strategy of sea turtles involves producing large numbers of offspring to compensate for the high natural mortality through their first several years of life. However, human perturbations have drastically reduced sea turtle populations from unnatural causes of mortality. Therefore, activities that affect the behavior and/or survivability of turtles on their remaining nesting beaches, particularly the few remaining high density nesting beaches, could have serious ramifications for the continued existence of U.S. populations.

The threatened loggerhead turtle *(Caretta caretta)* was listed as a threatened species on July 28, 1978, and is the most common nesting sea turtle in Florida. Their nesting range encompasses Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and both coasts of Florida (Hopkins and Richardson 1984). Primary nesting and hatching occurs from April through October. Total estimated nesting in the Southeast is approximately 50,000 to 70,000 nests per year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). There are approximately 49,000 nests laid per year throughout Florida. South Brevard County specifically, including the project area, is second in the world for known beach nesting density (Ross 1982 in Continental Shelf Associates 1989) and accounts for 40% of statewide nesting activity (Meylan *et al.* 1995).

From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Erhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). The status of the Oman colony has not been evaluated recently, but its location in a part of the world that is vulnerable to disruptive events (e.g., political upheavals, wars, catastrophic oil spills) is cause for considerable concern (Meylan *et al.* 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties) (National Marine Fisheries and U.S. Fish and Wildlife Service).

Recent genetic analyses using restriction fragment analysis and direct sequencing of mitochondrial DNA (mtDNA) have been employed to resolve management units among loggerhead nesting cohorts of the southeastern U.S. (Bowen *et al.* 1993; B.W. Bowen, University of Florida, Gainesville, in litt., November 17, 1994, and October 26, 1995). Assays of nest samples from North Carolina to the Florida Panhandle have identified three genetically distinct nesting populations: (1) northern nesting population - Hatteras, North Carolina, to Cape Canaveral, Florida; (2) South Florida nesting population - Cape Canaveral to Naples, Florida; and (3) Florida Panhandle nesting population - Eglin Air Force Base and the beaches around Panama City, Florida. These data indicate that gene flow between the three regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting population (Bowen *et al.* 1993, B.W. Bowen, University of Florida, Gainesville, in litt., October 26, 1995).

The nesting and hatching season for the southern Florida Atlantic beaches (including Brevard through Dade Counties) extends from March 15 through November 30. Incubation ranges from about 45 to 80 days.

The area from Indialantic to Melbourne Beach may be a transition zone between the densest and more moderate nesting zones. Nest density is calculated at 140 nests per km (Ehrhart 1980 in Continental Shelf Associates 1989). Patrick Air Force Base has been documented since 1987 as a highly successful nesting site with an average of 172 nests per km (Ehrhart 1993).

The northern range of nesting activity from Cocoa Beach to Cape Canaveral is armored and little suitable nesting beach is available. Lights and human interference from urbanization limit nesting. Chief Walker of the Cocoa Beach Fire Department (pers. comm., 1995) indicated moderate nesting does occur there (evidenced by previous relocated nests from 1989-1992). Nesting data from Jetty Park at Port Canaveral (Meylan *et al.* 1995) also indicate some nesting activity occurs. Tracks and nests were observed throughout the study area.

The endangered green sea turtle (*Chelonia mydas*), was listed under the ESA on July 28, 1978 (endangered for breeding populations in Florida and along the Pacific coast of Mexico and threatened elsewhere), and is a regular nester in Florida. Nesting has been recorded in every county on the east coast of Florida except Duval, but most occurs from Volusia through Broward Counties, with greatest densities in the Archie Carr National Wildlife Refuge, Melbourne Beach, Hutchinson Island, and Jupiter Island (Meylan et al. 1995, Moler 1992). Nesting has also been documented along the Gulf Coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (Meylan, Florida Department of Environmental Protection, in litt., October 17, 1994). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpubl. data). The green turtle also nests sporadically in North Carolina, where nesting has been reported on Masonboro Island (D. Webster, University of North Carolina, pers. comm., 1993) and Onslow Beach, Camp Lejeune (R. Warren, Camp Lejeune Marine Corps Base, in litt., July 20, 1995). Nesting also occurs at Kennedy Space Center and Cape Canaveral; two nests were recorded at Jetty Park in north Brevard County from 1979 to 1992.

The nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade Counties) is May 1 through November 30. Incubation ranges from about 45 to 60 days.

Guseman and Ehrhart (1990) and Ehrhart (1992) indicate that juvenile greens, subadult loggerheads, and an occasional juvenile hawksbill may use worm reefs as "developmental habitat" or as transitional areas between the first pelagic sea year and the subsequent juvenile years spent in lagoons. It may also be a staging area when inlets to lagoons are not readily found. Because a myriad of algae is found on the reefs, the herbivorous greens possibly forage here along with other species of sea turtles which feed upon the abundant fish and crustaceans. Another important finding by Ehrhart (1990) was that turtles found to inhabit the reefs had no evidence of fibropapilloma disease, which currently affects up to 45% of the turtles in Indian River Lagoon. No explanation is known at this time. Although these studies were done in Indian River County, this could also be occurring in Brevard County. No studies exist to verify it at this time, however, Erhart has observed greens and loggerheads foraging at the reefs at the southern portion of PAFB. Additionally, a documented incident (Erhart et al. 1991) of four green turtles killed in a gill net set over the reefs occurred in 1990. Ehrhart (1992) advocates protection of the nearshore worm rock reefs to support the endangered green turtle.

The leatherback turtle (*Dermochelys coriacea*) was also classified as endangered on June 2, 1970, and regularly nests in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia. The U.S. Caribbean (Puerto Rico and the U.S. Virgin Islands) may support nesting by 150 to 200 adult females per year, representing the most significant nesting activity of this species in the U.S. In the U.S. Virgin Islands, nesting has been reported on the islands of St. Croix, St. Thomas, and St. John. In Puerto Rico, leatherbacks nest on the islands of Culebra, Vieques, and Mona. On the main island of Puerto Rico, leatherbacks nest on beaches all around the island. Leatherback nesting in Florida was once considered rare, but today the species is known to nest regularly on the south Atlantic coast of the state. Leatherback nesting is rare on the west coast of Florida. In 1974, a nest was reported on St. Vincent National Wildlife Refuge (LeBuff 1976), a false crawl (non-nesting emergence) was observed on Sanibel in July 1988 (LeBuff 1990), a false crawl and one nest were observed on St. Joseph Peninsular State Park in 1993 (Meylan *et al.* 1995), and four nests were laid on St. George Island in 1995 (T. Lewis, St.Vincent National Wildlife Refuge, pers. comm., 1995). Leatherback turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpubl. data).

The nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade Counties) is February 15 through November 15.

Nesting ranges from St. Johns County in the north to Dade County in the south, but is concentrated in St. Lucie, Martin and Palm Beach counties with Palm Beach accounting for an average of 50% of statewide nesting (Meylan et al. 1995, Moler 1992). South Brevard County is documented by Meylan et al. 1993 and Erhart (pers. comm.) to have annual nesting activity, but most occurs outside of the project area. Cape Canaveral and Kennedy Space Center also report nestings in 1992 (Meylan et al. 1993), as well as host summer concentrations of feeding leatherbacks in water of depths of 20-40m (Moler 1992).

Environmental Baseline

The project area is located along a 22-mile stretch of Atlantic Ocean shoreline in Brevard County, extending from Port Canaveral south to Melbourne Beach. Natural meteorological events as well as human-induced changes in the coastline have created a severe erosion problem in several areas. These beaches also support a large sea turtle nesting population annually. The Service is concerned that if beach nourishment is conducted during the nesting season (April through October) this activity may discourage turtles from nesting. Work performed during the nesting season may result in the inadvertent crushing or burying of nests. Escarpment formation after nourishment may also prevent nesting.

Direct effects:

Although beach nourishment may increase the potential nesting area, there are significant negative impacts to sea turtles that may result if protective measures are not incorporated during consultation. Nourishment during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of offspring from unnatural mortality and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 percent of the nests can be missed (Schroeder 1994).

Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement or for unknown biological mechanisms to be affected. Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Mortimer 1982, Nelson and Dickerson 1989). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. In a study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida, hatching success was lower for relocated nests in five of seven cases by an average of 5.01 percent, and emergence success was lower for relocated nests in all seven cases by an average of 11.67 percent (Florida Marine Research Institute unpubl. data). Finally, relocating nests may concentrate eggs in an area resulting in a greater susceptibility to catastrophic events. Hatchlings released from concentrated areas may be subject to greater predation rates from both land and marine predators.

The placement of pipelines and the use of heavy machinery on the beach during a construction project may also have adverse effects on sea turtles. Even in a construction area that has been completely eroded and is devoid of dry sand, once sand is placed on the beach, turtles will attempt to use it. As a result, pipelines and heavy machinery can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

If the sand placed on the beach is different than the existing sand on the beach, there could be adverse impacts on nest site selection, clutch viability, and emergence by hatchlings (Nelson 1988). This impact can be minimized by making sure the nourishment sand matches the existing sand in grain size, shape, structure, moisture content, temperature, color, and density.

Beach compaction and unnatural beach profiles may result from beach nourishment activities and negatively impact sea turtles regardless of the timing of projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987). Sand compaction may increase the length of time required for female sea turtles to excavate nests and thus cause increased physiological stress to the animals (Nelson and Dickerson 1988c). On hard, nourished beaches, false crawls may occur more frequently than on natural beaches (Nelson *et al.* 1987), also resulting in increased physiological stress to nesting females. These impacts can be minimized by using suitable sand and by tilling the beach after nourishment if the sand becomes compacted. Nelson and Dickerson (1988b) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites. Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments which often results in failure of nests due to tidal inundation). This impact can be minimized by leveling the beach prior to the nesting season.

Another impact to sea turtles is disorientation (loss of bearings) and misorientation (incorrect orientation) of hatchlings from artificial lighting. Visual cues are the primary sea-finding mechanism for hatchlings (Carr and Ogren 1960, Ehrenfeld and Carr 1967, Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting from buildings and street lights is a well documented cause of hatchling disorientation and misorientation on nesting beaches (Philbosian 1976; Mann 1977; Florida Department of Environmental Protection, unpubl. data). In addition, research has also documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992).

Construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, disorient females trying to return to the surf after a nesting event, interrupt loggerhead and green sea turtle mating since those species copulate in nearshore areas, and disorient and misorient emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

Indirect effects:

This project will create or improve sea turtle nesting habitat, thereby attracting turtles into new areas where they may be impacted by existing artificial lighting. The project may also make the area more attractive to new development, thereby increasing the lighting problem. Impacts from lighting can be reduced by continued implementation and enforcement of the Brevard County (or nearby municipality) beach lighting ordinance during the nesting and hatching season each year.

Future erosion of nesting beaches is a potential indirect effect of nourishment projects on sea turtles. Dredging of sand offshore from a project area has the potential to cause erosion of the newly created beach or other areas on the same or adjacent beaches, which also serve as sea turtle nesting beaches, by creating a sand sink. The remainder of the system responds to this sand sink by providing sand from the beach to attempt to reestablish equilibrium (National Research Council 1990b).

Conclusion

After reviewing the current status of the green turtle, the loggerhead turtle and the leatherback turtle, the environmental baseline for the action area , the effects of the proposed beach nourishment, and the cumulative effects, it is the Service's biological opinion that the beach nourishment, as proposed, is not likely to jeopardize the continued existence of the sea turtles listed above, and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for this species; therfore, none will be affected.

The USACE has stated that work will occur outside of the nesting season; therefore no authorization for relocation is being requested. The Service requests that cone penetrometer readings be taken on the beach immediately following renourishment. If the beach is impenetrable or the average cone index exceeds 500, the beach must be tilled to a depth of 36 inches. Brevard County has also requested that construction take place in the northern reach of the project area in the early part of the nesting season. This request was based on the lower nesting densities occurring in the north area versus the south. The Service does not endorse this request and suggests that although densities may be lower there, the numbers are still great enough when compared to other parts of Florida and the southeast that nourishment activities would be harmful to the current turtle population. If the applicant has more recent and conclusive evidence than what the Service has on record, we request it be presented for another evaluation.

The Service has reviewed the information relative to sea turtle activity in Brevard County and has evaluated the impact this project will have on nesting turtles. Based on our review, the Service believes this project is not likely to jeopardize the continued existence of the loggerhead, green, or leatherback sea turtles.

INCIDENTAL TAKE

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The U.S. Army Corps of Engineers has a continuing duty to regulate the activity covered by this incidental take statement. If the U.S. Army Corps of Engineers (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or extent of incidental take

The Service has reviewed the biological information and other information relevant to this action. Based on our review, incidental take is anticipated for all sea turtle nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the proposed project. Incidental take is also anticipated for all sea turtle nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project.

Effect of the take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and prudent measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green and leatherback turtles.

1. Only beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence shall be used on the project site.

2. Beach nourishment activities shall not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles shall be conducted. If nests are constructed in the area of beach nourishment, the eggs shall be relocated.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles shall be conducted. If nests are constructed in the area of beach nourishment, the eggs shall be relocated.

5. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, beach compaction shall be monitored and tilling shall be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the contiguous United States.

6. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, monitoring shall be conducted to determine if escarpments are present and escarpments shall be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.

7. The applicant shall ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this biological opinion.

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8. During the early and late portions of the nesting season, no construction equipment shall be parked on the beach where it could hinder sea turtle nesting or hatching activities. In addition, all construction pipes shall be located to minimize impacts to sea turtles.

9. During the early and late portions of the nesting season, lighting associated with the project shall be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the U.S. Army Corps of Engineers must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. All fill material placed shall be sand that is similar to that already existing on the site in both coloration and grain size. All such fill material shall be free of construction debris, rocks, clay, or other foreign matter and shall not contain, on average, greater than 5 percent fines (passing the #200 sieve) and be free of coarse gravel or cobbles.

2. Beach nourishment shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes shall be stored on the beach.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, then daily early morning surveys for early nesting sea turtles shall be conducted within the period from March 1 through April 30 that the project is being conducted, and eggs shall be relocated per the following requirements.

3a. Nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in nest survey and egg relocation procedures. Surveyors shall have a valid Florida Department of Environmental Protection permit. Nest surveys shall be conducted daily between sunrise and 9 a.m.

3b. Only those nests that may be affected by construction activities shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days shall be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone shall be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, then daily early morning surveys for late nesting sea turtles shall be conducted 65 days prior to project initiation and continue through September 30, and eggs shall be relocated per the preceding requirements.

5. Immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years, sand compaction shall be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the state regulatory agency, and the applicant. At a minimum, the protocol provided under 5a and 5b below shall be followed. If required, the area shall be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. A report on the results of compaction monitoring shall be submitted to the Service prior to any tilling actions being taken. An annual summary of compaction and the actions taken shall be submitted to the Service. This condition shall be evaluated annually and may be modified if necessary to address sand compaction problems identified during the previous year.

5a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area); one station shall be midway between the dune line and the high water line (normal wrack line); and one station shall be located just landward of the high water line. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 27 values for each transect line, and the final 9 averaged compaction values.

5b. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

6. Visual surveys for escarpments along the project area shall be made immediately after completion of the beach nourishment project and prior to April 1 for 3 subsequent years. Results of the surveys shall be submitted to the Service prior to any action being taken. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 1. An annual summary of escarpment surveys and actions taken shall be submitted to the Service.

7. The applicant shall arrange a meeting between representatives of the contractor, the Service, the Department of Environmental Protection, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice shall be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

8. From March 1 through April 30 and November 1 through November 30, no construction equipment shall be parked on the beach where it could hinder sea turtle nesting or hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes shall be off of the beach to the maximum extent possible. Temporary storage of pipes on the beach shall be in such a manner so as to impact the least amount of nesting habitat and shall likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

REVISED 2/17/98
(SEE ATTACHED LETTER)

~~9. From March 1 through April 30 and November 1 through November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Such lighting shall be shielded low pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters should be placed over vehicle headlights (i.e., bulldozers, front-end loaders). Lighting on offshore equipment shall be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.~~

10. A report describing the actions taken to implement the terms and conditions of this biological opinion shall be submitted to the Jacksonville U.S. Fish and Wildlife Field Office within 60 days of completion of the proposed work for each year when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of hatcheries, nest survey and relocation results, and hatching success of nests.

11. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

12. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the Florida Marine Patrol at 1-800-DIAL FMP. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

13. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service believes that no more than those sea turtle nests and eggs that may be missed by a nest survey and egg relocation program, or those laid during the period when an egg relocation program is not required, will be incidentally taken. If, during the course of the action, this minimized level of incidental take is exceeded, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems, can provide technical assistance on the specifications for design and implementation.

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted.

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3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

This concludes formal consultation on the action(s) outlined in the Brevard County Shore Protection Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Michael M. Bentzien

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December 7, 1995

Date

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APPENDIX C

Minerals Management Service
Environmental Assessment
Issuance of Noncompetitive Lease for Canaveral Shoal II Sand and Gravel Borrow Area (2005)

Minerals Management Service
Environmental Assessment

Issuance of a Noncompetitive Lease for Canaveral Shoal II Sand and Gravel Borrow Area
Brevard County Beach Erosion Control Project
and
Memorandum of Agreement with Patrick Air Force Base for Canaveral Shoal II Sand and Gravel Borrow Area

January 21, 2005

Table of Contents

Environmental Assessment
Canaveral Shoal II

This Environmental Assessment (EA) evaluates the environmental effects associated with the Minerals Management Service (MMS) providing access to 2,350,000 cubic yards of Federal sand from Canaveral Shoals Borrow Area II (see figure 1). The MMS proposes to issue a noncompetitive lease to Brevard County, Florida and enter into a Memorandum of Agreement (MOA) with Patrick Air Force Base (PAFB) to restore eroded Atlantic coast shoreline as a result of hurricanes Charley, Frances, and Jeanne. The combined project proposes to place approximately 2,350,000 cubic yards of Federal sand along a 15.5-mile stretch of beach.

Pursuant to the National Environmental Policy Act of 1969 (NEPA), the proposed actions were examined to determine the potential environmental effects that may result from issuing a noncompetitive lease for offshore sands for beach nourishment. The USACE described the affected environment, evaluated the environmental effects and alternatives in its *Brevard County Shore Protection Feasibility and Environmental Impacts Statement* (USACE 2000). Similarly, the U.S. Department of the Air Force (Air Force) prepared NEPA documentation to cover its proposed action to restore the PAFB shoreline. This documentation tiered off of the existing Air Force NEPA documentation and USACE's environmental analysis to conclude that the PAFB Project is a categorically excluded activity (AF IMT 813 dated January 5, 2005). This MMS EA incorporates the information found and supplements the environmental analysis contained in USACE (2000) and the Air Force (2005).

DESCRIPTION OF AND NEED FOR THE PROPOSED ACTION

In August and September 2004, the Florida beaches sustained significant damage from Hurricanes Charley, Frances, and Jeanne. The damaged areas included principal portions of the Brevard County Federal Shore Protection Project, renourished with Federal sand in 2002, and PAFB, renourished with Federal sand in 2000. Both the County and PAFB propose to restore these damaged sites using 2,350,000 cubic yards of OCS sand from Canaveral Shoals Borrow Area II will be needed for these projects.

Brevard County and the USACE propose to restore the eroded sand along all or portions of the North and South Reach using up to 2 million cubic yards of Federal sand from Canaveral Shoals Borrow Area II (figure 1). The North Reach includes 9.4 miles of shoreline from Port Canaveral to PAFB and the South Reach includes 3.4 miles of shoreline in the vicinity of Melbourne Beach and Indialantic. The PAFB proposes to place 350,000 cubic yards of sand along a 15,000-ft project area comprising the north end of the Base's shoreline using Federal sand from Canaveral Shoals Borrow Area II (figure 1). The PAFB is located approximately 12 miles south of Cape Canaveral, in Brevard County, Florida.

Canaveral Shoals Borrow Area II is located approximately 5 miles from its nearest landward point (Cape Canaveral Air Force Station). This borrow area is located about 10.5 and 24 miles from the midpoints of the north and South Reach areas, respectively and approximately 13 miles from the middle of the project site at PAFB. The sand will be dredged from the Canaveral Shoals

Borrow Area II, then transported to the project site and hydraulically pumped from the dredge to the beach nourishment handling area.

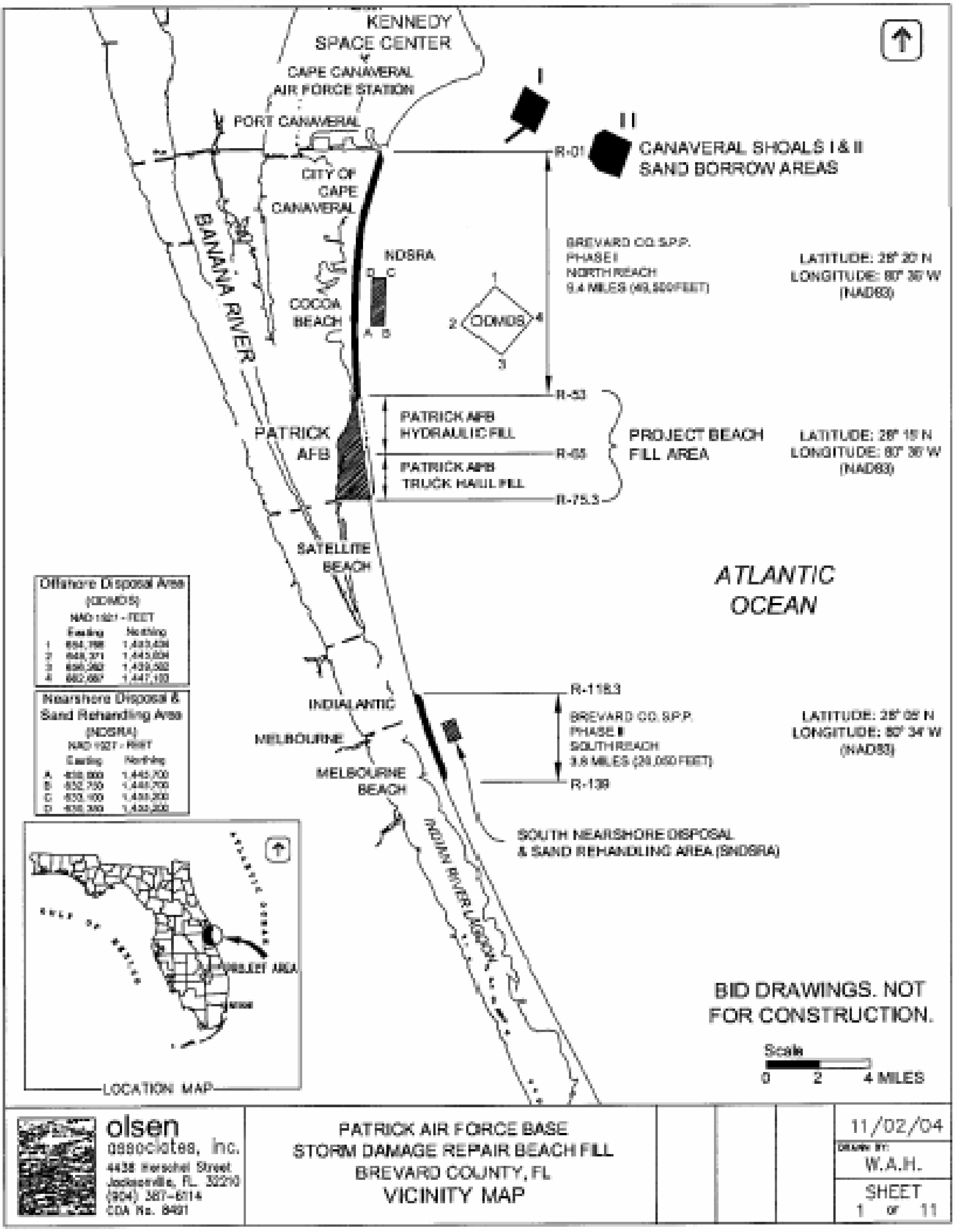

Figure 1 Proposed Brevard County and Patrick Air Force Base beach restoration.

DESCRIPTION OF THE AFFECTED ENVIRONMENT AND THE ENVIRONMENTAL EFFECTS

Pursuant to the NEPA, the proposed actions were examined to determine the potential environmental effects that may result from issuing a noncompetitive lease for offshore sands for beach nourishment. This MMS EA supplements USACE (2000) and Air Force Base (2005) with the following analyses.

Archaeology/Cultural Resources

Canaveral Shoals Borrow Area II lies on the Federal OCS approximately 5 miles southeast of Cape Canaveral, Florida, in approximately 6 to 12 meters of water. There is one known submerged prehistoric archaeological site in the general vicinity of the project area. This site, the Douglass Beach Site (8 SL 17), lies approximately 80 miles south-southeast of the project area in the vicinity of Fort Pierce, Florida, in water depths of 3 to 12 meters. Early reports of materials inadvertently found at the site during a shipwreck excavation included a permmeralized human cranium, a projectile point, elephant bone and ivoly (Cockrell and Murphy, 1978a and b). Subsequent investigations of the site produced a human maxilla with six teeth, a portion of the palate, and part of the sinus cavity, a Newnan-age projectile point (ca. 7,000 to 6,200 B.P.), and a line of wooden stakes, sharpened at one end and blunted at the other. The stakes gave a radiocarbon date of 4,630 ± 100 B.P.

The base of the Douglass Beach site area consists of coquina containing sediment-filled depressions. Some of the depressions contain a basal layer of sand. The coquina and sand are overlain with a layer of dark gray-green clay, capped by a dark gray deposit of probable lagoonal origin. The apparent explanation for the preservation of the Douglass Beach Site along the narrow, high-energy, Atlantic coast of Florida is that a series of parallel dead coral reefs top the site (Stright, 1990). Apparently these reefs damped the wave energy enough to allow the underlying site deposits to be preserved.

The unusual circumstances that prevailed at the Douglass Beach Site, allowing it to be preserved along a high-energy coastline, do not occur within the Canaveral Shoals project area. The sand deposits within Borrow Area II are described in the geology section of the EA as being littoral in origin, relatively homogeneous, and actively migrating in a predominately southerly direction. The core logs for 30 vibracores collected within Borrow Area II do not indicate evidence of any organic deposits such as peat layers which would indicate environments that might have archaeological potential (Olsen Associates, Inc., 1998). Although the core logs do report whole bivalve shells at varying depths within the cores, these occur in almost all of the cores collected across the borrow area, and therefore, do not indicate a concentrated, discrete shell deposit as would be the case with a prehistoric shell midden.

In summary, there is no evidence of prehistoric archaeological deposits, or of areas having a high potential for the occurrence and preservation of prehistoric archaeological deposits within Canaveral Shoals Borrow Area II.

Benthic Habitats/Organisms

Infauna

Infaunal organisms inhabiting inner shelf waters offshore central east Florida predominantly consist of members of the major invertebrate groups that commonly inhabit sand bottom marine ecosystems, including crustaceans, echinoderms, mollusks, and polychaetous annelids. Infaunal assemblages that inhabit shelf waters of the study area include taxa common to much of the South Atlantic Bight (SAB) (Tenore, 1985; Weston, 1988; Barry A. Vittor & Associates, Inc., 1991, 2000), eastern Gulf of Mexico (Dames & Moore, 1979), and tropical areas of southern Florida and the Caribbean (Foster, 1971; Camp et al., 1998). Generally, inner shelf infaunal assemblages are numerically dominated by polychaetes in terms of overall abundance and taxa (Day et al., 1971; Tenore, 1985; Weston, 1988; Barry A. Vittor & Associates, Inc., 1990, 1991, 2000). Other conspicuous members of the coastal infaunal community include amphipod crustaceans and bivalve mollusks.

East coast Florida waters are a transitional area between major zoogeographic zones. Macrofaunal assemblages inhabiting shelf sediments of the study area include a mixture of warm-temperate Carolinian and tropical Caribbean Province fauna (Briggs, 1974; Lyons, 1989), in addition to a significant endemic component (Camp et al., 1998). Briggs (1974) reviewed studies of species distributions along the U.S. east coast and determined that, based mostly on distributional data reported by others, the geographic location of a temperate/tropical faunal boundary is poorly defined, but that Cape Canaveral seemed to be centrally located within a broad north-south transition zone. The extent of tropical fauna intrusion into more northerly latitudes is due primarily to the Gulf Stream (also referred to as the Florida Current), which brings warm water northward (Briggs, 1974). Convergence of biogeographic provinces in the region of Cape Canaveral largely is a result of interaction between various ocean currents that determine the latitudinal extent of relatively cool or warm water temperatures, creating an ecological barrier for members of the respective province assemblages. According to Lyons (1989), the Cape Canaveral area is characterized by the occurrence of tropical assemblages more than 40 km offshore, where the Gulf Stream flows, whereas much of the inshore fauna is associated with the warm temperate Carolinian Province.

Epifauna

Many numerically dominant epifauna that inhabit inner shelf waters may more precisely be described as epibenthic, especially gastropods and decapods, although many of these taxa routinely are collected along with infauna when grab samplers are used. For example, certain epifaunal taxa, such as lady crabs (*Ovalipes* spp.), commonly burrow deeply into sediments, and adaptive behaviors of this type can complicate efforts to categorize such taxa into a specific, lifestyle-based, invertebrate group. In addition, many bivalves are effectively sampled using either a trawl or grab method. Given this dilemma of ecological classification, however, the taxa discussed below commonly are collected in trawl samplers and, for the sake of comparison and consistency with previous investigations, herein are considered epifauna.

Common epifaunal invertebrates occurring on open shelf bottoms offshore central east Florida include calico scallop (*Argopecten gibbus*), calico box crab (*Hepatus epheliticus*), iridescent swimming crab (*Portunus gibbesii*), brown shrimp (*Farfantepenaeus aztecus*), white shrimp

(*Litopenaeus setiferus*), striped sea star (*Luidia clathrata*), and arrowhead sand dollar (*Encope michelini*) (Continental Shelf Associates, Inc., 1987).

Relatively few open shelf benthic studies have been conducted near the proposes project area. The Canaveral Harbor Ocean Dredged Material Disposal Site (ODMDS) was investigated during June 1990 as part of a monitoring study of that site (Barry A. Vittor & Associates, Inc., 1991). Benthic samples were collected from 15 offshore stations at water depths of 12 to 18 m. Sand stations outside the ODMDS commonly yielded great abundances of the amphipod *Acanthohaustorius pansus*, archiannelid *Polygordius*, bivalve *Ervilia concentrica*, and polychaetes *Goniadides carolinae* and *Prionospio cristata.*

In April 2000, the MMS awarded a contract to Continental Shelf Associates of Jupiter, Florida to conduct a multi-disciplinary biological/physical environmental study (MMS, 2004) for the purpose of characterizing the local biological communities within several sand resource study areas along the east coast of Florida in addition to analyzing the impacts from offshore dredge operations. The Canaveral Shoals II borrow area is contained within one of those study areas, A1. The complete report is included as Appendix B.

Benthic infauna and trawl samples were collected form 7 and 2 stations respective within Area 1 and during the September 200 and June 2001. Tables 1 and 2 illustrate the ten most abundant infauna and epifauna from each survey.

Table 1. Ten most abundant infauna taxa in area A1 and adjacent stations (encompasses Canaveral Shoals II) for September 2000 and June 2001 (MMS 2004).

Taxonomic Name	**September Count**	**June Count**
Crassinella lunulata		49
Bivalvia (LPIL)	44	6
Metharpinia floridana	39	19
Tanaissus psammophilus	26	
Echinoidea (LPIL)	24	5
Magelona sp. H	20	
Goneplacidae (LPIL)	16	
Semelidae (LPIL)	13	
Protohaustorius sp. B	10	
Acanthohaustorius pansus	9	
Lucina multilineata		17
Bathyporeia parkeri		16
Rhynchocoela (LPIL)		11
Acanthohaustorius millsi		7
Protohaustorius wigleyi		6
Tubificidae (LPIL)		6
Acanthohaustorius shoemakeri		5

LPIL = Lowest practical identification level.

Table 2. Epifauna collected by mongoose trawl during the September 2000 and June 2001 Surveys of A1 (encompasses Canaveral Shoals II) (MMS 2004).

Invertebrates	**September**		**June**	
	Trawl 1	**Trawl 2**	**Trawl 1**	**Trawl 2**
Squilla empusa	32	17		
Portunus gibbesii		9		
Squid		13		
Litopenaeus setiferus	11	15		
Libinia dubia	16	1	*5*	
Portunus spinimanus		10		
Callinectes sapidus	8	8		
Hepatus epheliticus	12			
Renilla sp.	3	1		
Iliacantha sp.	2			
Bryozoa		1		
Argopecten gibbus				2
Luidia senegalensis			3	
Portunus gibbesii				
Portunus sp.			1	
Sicyonia sp.			1	

Physical removal of sediments from a borrow site removes benthic habitat along with infauna and epibiota that are incapable of avoiding the dredge, resulting in drastic reductions in number of individuals, number of species, and biomass. Extraction of habitat and biological resources may in turn disrupt the functioning of existing communities. Removal of benthic resources is of concern because the resources are important in the food web for commercially and recreationally important fishes and invertebrates and contribute to the biodiversity of the pelagic environment.

The amount of sediment suspension that results from the proposed dredging is not anticipated to be of a scale that would cause significant negative impacts to the benthic community. Central east Florida sand resource areas are characterized by a relatively limited amount of very fine sediments, indicating that the region encompassing those areas currently is not a depositional environment, but is hydrologically dynamic. In general, benthic assemblages of the inner central east Florida shelf probably are adapted to periodic reworking of surficial sediments caused by tropical and extra-tropical storms. Impacts of dredging-induced elevations in turbidity would be short-term and localized. Motile organisms could avoid turbid areas and are unlikely to be affected by sediment resuspension.

Of the various faunal categories, infaunal and sessile epibiotal populations would be most negatively affected by significant deposition of sediments. In the unlikely event that significant dredging-related deposition of fine-grained sediments were to occur, the deposited sediments likely would not persist at sites of initial redeposition because of the high-energy inner shelf environment. However, some low areas of the seafloor could receive substantial deposition of fine sediments. Given the relatively small amount of sediment suspension anticipated to occur during dredging, the degree of burial should be substantially less than would be required to impact negatively on infaunal populations.

Germano (1999) has suggested that, despite all advances in theoretical ecology over the last half century and huge amounts of data that have been collected in various marine monitoring programs, we still do not know enough about how marine ecosystems function to be able to make valid predictions of impacts before they occur. The relative lack of understanding of complex ecological systems may in some cases even preclude our ability to observe significant negative environmental effects of activities of concern. However, review of previous studies does provide some evidence as to how certain activities, such as dredging, might affect benthic communities.

The length of time required for reestablishment of predredging infaunal assemblages within excavated sites depends in part on the length of time required for refilling of those mined areas. Shallow waters of the central east Florida inner shelf are strongly influenced by factors such as tidal currents, circulation, and storms. These same forces would tend to modify dredged sites toward predredging morphology. The rate of reestablishment of natural benthic conditions at dredged sites may depend especially on the extent of storm-induced sediment transport, which can be substantial at the relatively shallow depths of the sand resource areas. The length of time required to reestablish infaunal assemblages also depends in large measure on the sediments exposed by dredging. Canaveral Shoals II consists of well-sorted sands and is vertically uniform in sediment composition. Dredge cut limits are in place to ensure the new surfical sediments will not differ substantially from the previous surficial sediments.

Assuming that the depth of sand excavation would not be so great as to substantially alter local hydrological characteristics, removal of benthic organisms along with sediments should quickly be followed by initial recolonization of dredged areas by opportunistic infaunal taxa. Early-stage succession tends to begin within days of sediment removal through settlement of larval recruits, primarily annelids and bivalves (Grassle and Grassle, 1974; Simon and Dauer, 1977). Initial larval recruits likely would be dominated by populations of deposit feeding, opportunistic taxa, such as those collected from muddy sediment stations offshore central east Florida. These taxa may include polychaetes such as *Magelona* sp. H, *Mediomastus*, and *Paraprionospio pinnata*, and bivalves such as *Lucina* and *Tellina*. These species are well adapted to environmental stress and exploit suitable habitat when it becomes available. Later successional stages of benthic recolonization will be more gradual and involve taxa that generally are less opportunistic and longer-lived. Immigration of motile annelids, crustaceans, and echinoderms into impacted areas also will begin soon after excavation. Untouched patches or remenant island within the borrow area will help t0 ensure that a supply of non-transitional, motile taxa will be available for rapid migration into dredged areas.

Because sediment shoals in the central east Florida sand resource areas tend to be vertically uniform in terms of sediment composition, recolonization of exposed sediments by later successional stages likely will proceed even if dredged shoals are not completely reestablished, particularly if the depth of dredging does not cut below ambient grade. While community composition may differ for a period of time after the last dredging, the infaunal assemblage type that exists in mined areas will be similar to naturally occurring assemblages in the study area, particularly those assemblages inhabiting inter-ridge troughs. Johnson and Nelson (1985) documented changes in benthos following excavation of a nearshore borrow site close to Fort Pierce Inlet. They found that relatively large reductions in abundance, but not number of species, occurred in the borrow site after dredging and that both parameters approximated predredging levels in from 9 to 12 months after the last dredging. Based on previous observations of infaunal reestablishment in dredged areas, the infaunal community in the proposed borrow area will most likely will become reestablished within 2 years, and will exhibit levels of infaunal abundance, diversity, and composition comparable to nearby nondredged areas should time between borrow area use be limited to intervals of 2-3 years. Given that the last beach renourishment using Canaverals Shoals II was conducted in 2003, removing approximately 4.0 million cubic yards of sand, the full recovery time for benthic communities may vary from those projected and should be reexamine if the borrow area will be used again within the next 2 years.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (16 United States Code [U.S.C.] §1801-1882) established Regional Fishery Management Councils and mandated that Fishery Management Plans (FMPs) be developed to responsibly manage exploited fish and invertebrate species in Federal waters of the United States. When Congress reauthorized this act in 1996 as the Sustainable Fisheries Act, several reforms were made. One change was to charge the Oceanic and Atmospheric Administration Fisheries (NOAA–F) with designating and conserving Essential Fish Habitat (EFH) for species managed under existing FMPs. This is intended to minimize, to the extent practicable, any adverse effects on habitat caused by fishing or non-fishing activities, and to identify other actions to encourage the conservation and enhancement of such habitat.

The South Atlantic Fisheries Management Council (SAFMC) has produced several FMPs for single and mixed groups of species. All of these FMPs were recently amended in a single document (SAFMC, 1998a) to address EFH for shrimps; spiny lobster; golden crab; corals, coral reefs, and hard/live bottom; red drum; snapper-grouper management unit; and coastal pelagic fishes. In addition to the FMPs prepared by the SAFMC, highly migratory species are managed by the Highly Migratory Species Management Unit, Office of Sustainable Fisheries, NOAA–F. One FMP was recently prepared for highly migratory species that includes descriptions of EFH for sharks, tunas, and swordfish (NMFS, 1999a); a second FMP for Atlantic billfishes was amended to include EFH designations (NMFS, 1999b). Two additional highly migratory species, dolphin and wahoo, will soon be formally managed by the SAFMC, and an FMP is in progress. A separate FMP describing EFH for pelagic *Sargassum* in the South Atlantic was prepared in late 1998 (SAFMC, 2002).

Within the EFH designated for various species, particular areas termed “Habitat Areas of Particular Concern” (HAPCs) also are identified. The HAPCs either play important roles in the life history (e.g., spawning areas) of Federally-managed fish species or are especially vulnerable to degradation from fishing or other human activities. In many cases, HAPCs represent areas where detailed information is available on the structure and function within the larger EFH. Descriptions of EFH and HAPCs follow for the aforementioned FMPs and key managed species present in the borrow area. Some of these species also are “aquatic resources of national importance” under Section 906(e)(1) of the Water Resources Development Act of 1986, and Part IV, Section 3(a) of the current Memorandum of Agreement between the Department of Commerce and USACE.

Penaeid and Rock Shrimps

EFH for penaeid shrimps includes inshore nursery areas such as tidal freshwater, estuarine, and marine wetlands (Table 3). Offshore sedimentary habitats where spawning and growth to maturity take place are important as EFH. Areas considered to be HAPCs for penaeid shrimps include all coastal inlets, all State-designated nursery habitats, and State-identified overwintering areas. Rock shrimp EFH is composed of offshore terrigeneous and biogenic sedimentary bottoms in water depths ranging from 18 to 182 m deep, with maximum occurrence and abundance of organisms between 34 and 55 m (Table 3). EFH includes the water current transport system near Cape Canaveral, Florida, which is important in the retention and inshore transport of larval rock shrimp. The Gulf Stream also is considered an important larval transport mechanism (SAFMC, 1998b). Because rock shrimps are found generally in waters deeper than the sand resource areas, impacts to EFH will be minimal. The EFH for penaeid shrimps could be affected by entrainment and turbidity. However, due to the small aerial coverage of these sand resource areas, effects are expected to be minimal.

Spiny Lobster

Spiny lobster EFH consists of hard bottom, coral reefs, crevices, cracks, and other structured bottom in shelf waters (Table 3). Juvenile habitat is in nearshore waters and ranges in type from massive sponges, mangrove roots, and seagrass meadows to soft bottom with macroalgal clumps. The Gulf Stream provides an important mode of transport for early life history stages of the spiny lobster (SAFMC, 1998b). All HAPCs for spiny lobster are located south of the borrow area and include the Dry Tortugas, Florida Keys, and hard bottom from Fowey Rocks near Miami to Jupiter Inlet.

Golden Crab

Table 3 indicates the EFH for golden crab in the central east Florida region. Golden crab EFH includes a variety of bottom types, including foraminiferan ooze, distinct mounds of dead corals, ripple bottom, dunes, black pebbles, low outcrop, and soft bioturbated bottom (SAFMC, 1998b). All of these habitats are in water depths exceeding 200 m. The Gulf Stream is considered to be important in dispersal of planktonic eggs and larvae. There is not enough information available on the ecology of golden crab from which to identify HAPCs. Golden crab EFH occurs in water depths much greater than the depths of the proposed borrow area, and therefore no impacts are expected.

Corals, Coral Reefs, and Hard/Live Bottom

EFH for reef building stony corals is outside of the borrow area and extends from Palm Beach County, Florida south through the Florida reef tract bordering the Florida Keys. This area extends from nearshore (0 to 4 m) to 30 m water depths where salinity is consistently above 30 ppt and water temperatures range from 15ºC to 35ºC.

EFH for *Antipatharia* (black corals) includes hard, exposed, rough, stable substrate throughout the management area in high salinity (30 to 35 ppt) offshore waters and depths exceeding 18 m not restricted by light penetration.

Table 3. Managed invertebrate and reef fish species for which EFH has been identified off central east Florida (From: South Atlantic Fishery Management Council, 1998b).

Species	**Life Stages (Reproductive Activity)**	**Habitat**
Invertebrates		
Rock shrimp (*Syconia* spp.)	Adults; juveniles; larvae	Soft bottom (18 to 180 m); pelagic
Pink shrimp (*Farfantepenaeus duorarum*)	Adults; juveniles; larvae	Soft bottom, seagrass areas; pelagic
Spiny lobster (*Panulirus argus*)	Adults; juveniles; larvae	Hard bottom; seagrass areas, mangrove areas, sponges, macroalgae; pelagic
Golden crab (*Chaceon fenneri*)	Adults; larvae	Soft bottom (>200 m); pelagic
Reef Fishes		
Red grouper (*Epinephelus morio*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Snowy grouper (*Epinephelus niveatus*)	Adults; juveniles; larvae; eggs	Hard bottom; pelagic
Black grouper (*Mycteroperca bonaci*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Gag (*Mycteroperca microlepis*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Scamp (*Mycteroperca phenax*)	Adults; juveniles; larvae; eggs	Hard bottom; pelagic
Mutton snapper (*Lutjanus analis*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Gray snapper (*Lutjanus griseus*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; mangrove areas; pelagic
Red snapper (*Lutjanus campechanus*)	Adults; juveniles; larvae; eggs	Hard and soft bottom shelf waters; pelagic
Lane snapper (*Lutjanus synagris*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Vermilion snapper (*Rhomboplites aurorubens*)	Adults; juveniles; larvae; eggs	Hard bottom; pelagic
Yellowtail snapper (*Ocyurus chrysurus*)	Adults; juveniles; larvae; eggs	Hard bottom; seagrass areas; pelagic
Tilefish (*Lopholatilus chamaeleonticeps*)	Adults; juveniles; larvae; eggs	Soft bottom; pelagic
Greater amberjack (*Seriola dumerili*)	Adults; juveniles; larvae; eggs	Hard bottom; *Sargassum*; pelagic
Almaco jack (*Seriola rivoliana*)	Adults; juveniles; larvae; eggs	Hard bottom; *Sargassum*; pelagic
Gray triggerfish (*Balistes capriscus*)	Adults; juveniles; larvae; eggs	Hard bottom; *Sargassum*; pelagic

EFH for octocorals, except the order Pennatulacea (sea pansies and sea pens), includes hard, exposed, rough, stable substrate throughout the management area in subtidal to outer shelf depths within a wide range of salinity and light penetration.

EFH for Pennatulacea (sea pansies and sea pens) includes muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration.

HAPCs for corals, coral reefs, and hard/live bottom habitats of central east Florida include 1) *Phragmatopoma* worm reefs in nearshore waters; 2) nearshore hard bottom in water depths of 0 to 4 m; 3) offshore hard bottom in water depths of 5 to 30 m; and 4) *Oculina* banks from Fort Pierce to Cape Canaveral in water depths >30 m. None of these category occurs in the borrow area areas but, several areas of worm reef exist does exist within around the vicinity of the sand placement areas.

Worm rock, also known as Coquina/Sabellariid rock reefs as a Habitat Area of Particular Concern (HAPC) for postlarval/juvenile and subadult pink shrimp and postlarval/juvenile and subadult red drum. HAPC's are subsets of EFH that are rare, particularly susceptible to human-induced degradation, have special ecological importance, or are located in an environmentally stressed area. The coquina rock provides substrate for the sabellariid polychaete worm *Phragmatopoma lapidosa.* These worms construct reefs by collecting sand grains of suitable size and cementing them together by mixing the sand with protein mucus (USACE, 1996). The worm reefs expand as worm larvae settle on existing worm tubes and the entire process is continually repeated (USACE, 1996). These worm reefs provide two very important functions. First, as hardened structures, the reef helps to dissipate destructive wave energy. Second, the reefs provide substrate for sessile benthic invertebrates and plants, and structural habitat for a wide variety of invertebrates and fishes. Although worm reefs are found from Cape Canaveral to Key Biscayne, they are best developed between St. Lucie and Martin Counties off Hutchinson IslandUsing

USACE, 1996 reported a well developed line of rock outcroppings running approximately 10 miles from PAFB FEDP Reference Monuments (R-59) south to Paradise Beach Park (R-110). They reported the rock to be low showing little relief at the northern and southern extremes, with higher well defined ledges of 2-3 feet of vertical relief in the middle between R-78 and R-93, the area located between the southern limit of the PAFB project and the northern limit of the Brevard County Shoreline Project, South Reach (this area between projects will be called the "Mid Reach" from this point forward). Additionally, aerial photographs taken in July 1995 identified rock outcrops and associated worm rock from (R-76 through R-117). A site visit conducted by NOAA–F in December 2004 of the PAFB project area identified rock outcrops between R-65 and R75. These rock outcrops are comprised of lithified coquina rock of the Pleistocene Anastasia Formation (Olsen 1989). USACE, 1996 reported that within the Brevard Shore Protection project area, colonies of worm rock were growing on various places along the coquina rock outcrops. These colonies ranged from large dense patches of worm rock to small isolated patches located along the sides of the rock ledges.

Sand emplacement from the proposed projects may have several direct and indirect impacts. Changes in nearshore bathymetry may occur from the movement of finer fill material placed on the beach offshore. This however is usually temporary and over several months, wave and tidal action causes a redistribution of the material. Additionally, following placement, there will be an increase in long shore transport of sediment away from sand placement area possible resulting in the burial of non mobile benthos and hard bottom in the surf zone.

NOAA–F has expressed concerned that placement of fill material in the area between FDEP Reference Monuments R-65 and R-75 is likely to result in burial of portions of worm rock formations within the PAFB project area. Furthermore, NOAA–F believes that worm rock may be buried in the adjoining "Mid-Reach" as a result of sediment being transported south and north from the surrounding Brevard County Shore Protection projects (North and South Reach) being conducted concurrently with the PAFB project. The possible burial of the worm rock may result in the subsequent loss or diminishment of the ecologically significant nursery, maturation, cover, and forage base functions which this habitat provides. NOAA–F estimates that the "Mid Reach" area encompasses 60.8 acres of high value worm rock formations.

NOAA–F has made the following recommendations to avoid and mitigate for possible impacts to near shore hard bottom:

- Sand placed between FDEP Reference Monuments R-65 and R-75 shall be confined to areas located landward of the mean high water (MHW) line;

- Sand placed in the vicinity of FDEP Reference Monument R-65 shall end in a 500 foot taper and no fill shall be deposited within 50 feet of that reference monument or any Coquina/Sabellariid rock outcrops;

- Throughout the project and in the adjoining Mid-Reach area a baseline pre-construction bottom profile which includes the mapping and acreage Coquina/Sabellariid rock coverage shall be established. Post-construction monitoring surveys shall be performed at one year intervals, following project completion, for a period of seven years. A consistent survey methodology which provides a reliable measure of shoreline accretion and erosion and change in Coquina/Sabellariid rock exposure shall be developed by PAFB, Brevard County, and the USACE. All monitoring reports shall be made available for review by NOAA–F, and other state and federal resource agencies;

- A plan for assigning areas of responsibility within the Mid-Reach shall be developed by PAFB, Brevard County and the USACE. This plan shall address monitoring and compensatory mitigation obligations. This plan, base-line profiles, and monitoring methodologies shall be made available for NOAA–F review prior to project implementation; and,

- A plan for providing full compensation for unavoidable direct, indirect, and cumulative impacts to Coquina/Sabellariid rock outcrops and other categories of EFH shall be developed and made available NOAA–F review prior to project implementation. The plan shall address compensation for loss of productivity and habitat availability, including that which may be realized during the period between the onset of any impact and reestablishment of a comparable replacement resource.

In addition, to avoid impacts to the identified near shore hard bottom within Brevard County Shore Protection Project, the USACE will place beach fill between R-119 and R-137 with a 1,000 foot transition section and the northern limit and a 1,500 foot transition section at the southern limit of the reach. The northern end of the transition fill would be approximately 500 feet south of the closest hard ground.

Red Drum

EFH for red drum includes artificial reefs, estuarine emergent vegetated wetlands (flooded brackish marsh, mangrove fringe, salt marshes, and tidal creeks), high salinity coastal areas, oyster reefs, submerged rooted aquatic vegetation (seagrasses), tidal freshwater, and unconsolidated bottom (Table 4). These habitats occur from Virginia to the Florida Keys (SAFMC, 1998b). The HAPCs for red drum are all State-designated nursery habitats of particular importance to red drum, coastal inlets, documented sites of spawning aggregations, and habitats for submerged aquatic vegetation (SAFMC, 1998b). EFH for red drum exists mostly in inshore waters well isolated from the borrow areas but may exist in the near shore waters during sand placement.

Snapper-Grouper Management Unit

The snapper-grouper management unit is composed of 73 species from 10 families. Only the most important species of snappers, groupers, jacks, tilefishes, and triggerfishes are listed in Table 3. Families not listed in Table 3 are grunts, porgies, spadefishes, temperate basses, and wrasses. The EFH for adults of this species group consists of hard bottom features such as artificial reefs, coral reefs, live bottom, and rocky outcrops (SAFMC, 1998b).

Table 4. Managed species (red drum and coastal pelagic fishes) for which EFH has been identified off central east Florida (From: South Atlantic Fishery Management Council, 1998b).

Species	Life Stages (Reproductive Activity)	Habitat
Red Drum		
Red drum (*Sciaenops ocellatus*)	Adults; larvae and eggs (spawning area)	Soft bottom; seagrass areas; oyster reefs; mangrove areas; pelagic
Coastal Pelagic Fishes		
Cobia (*Rachycentron canadum*)	Adults; juveniles/subadults; larvae; eggs	Pelagic; hard bottom areas
Dolphin (*Coryphaena hippurus*)	Adults; juveniles/subadults; larvae and eggs (spawning area)	Pelagic; *Sargassum* mats
King mackerel (*Scomberomorus cavalla*)	Adults; juveniles/subadults; larvae and eggs (spawning area)	Pelagic; hard bottom areas
Spanish mackerel (*Scomberomorus maculatus*)	Adults; juveniles/subadults; larvae; eggs	Pelagic; hard bottom areas
Little tunny (*Euthynnus alletteratus*)	Adults; juveniles/subadults; larvae and eggs (spawning area)	Pelagic; hard bottom areas

These features extend from nearshore out to at least 200 m water depths. Juveniles of many species utilize either hard bottom features or inshore habitats, including artificial structures (i.e., dock and bridge pilings), mangrove roots, oyster reefs, and seagrass meadows. Eggs and larvae of reef fishes are pelagic and reside in the upper water column for the first 20 to 50 days of life.

HAPCs described for the snapper-grouper management unit include high relief offshore areas where spawning occurs, localities of known spawning aggregations, and nearshore hard bottom areas. There are no HAPCs in the borrow area. However, sporadic patches of hard bottom do exist within the nearshore sand placement areas.

Coastal Pelagic Fishes

All members of the coastal pelagic management unit occur in central east Florida waters. Species most important to regional fisheries are cobia, dolphin, king and Spanish mackerels, and little tunny. Coastal pelagic species are migratory water column dwellers, however, most species have some affinity for manmade or natural structures. Hard bottom features, sandy bottoms, and shoal areas occurring from the surf zone to the shelf break encompass EFH for coastal pelagic fishes. Coastal inlets, high-salinity bays, and *Sargassum* rafts also are important for various life stages of coastal pelagic fishes. A species account of EFH for these species in central east Florida is given in Table 4.

EFH for coastal pelagic fishes could be affected by turbidity that could alter migratory routes or temporarily disrupt feeding activity in shelf or nearshore waters. Coastal pelagic species such as cobia, jacks, king and Spanish mackerels, round scad, and Spanish sardine could be attracted to a dredge and its attendant structures. Although these effects could occur, the small spatial and temporal scales of individual projects make these effects negligible.

Highly Migratory Species

Many highly migratory species are caught in the fisheries of central east Florida because of the proximity of the Gulf Stream to shore. Table 5 lists the billfishes, dolphin, sharks, swordfish, tunas, and wahoo with EFH in the central east Florida. For many of these fishes, species-specific information is limited. Blue and white marlins occur off central east Florida. Several shark species also frequent Gulf Stream, shelf, and in the case of the bull shark, estuarine waters of the region. *Sargassum* is important habitat for various life stages of swordfish and tunas. Swordfish and bluefin tuna migrate through the Florida Straits and into the eastern Gulf of Mexico to spawn (NMFS, 1999a). From an analysis of oceanic longline catch records, Worm et al. (2003) found the oceanic waters off east Florida to be “diversity hotspots” for highly migratory species. HAPCs have not been designated by NMFS (1999a) for members of the highly migratory species groups.

As with coastal pelagic fishes, highly migratory species could be affected by turbidity generated during a dredging project. Turbidity plumes could alter normal migratory and feeding patterns, but these effects would be of short duration. Some highly migratory species could be attracted to a dredge or related structures.

Table 5. Managed highly migratory species for which EFH has been identified off central east Florida (NMFS, 1999a,b).

Species	Life Stages (Reproductive Activity)	Habitat
Sharks		
Nurse shark (*Ginglymostoma cirratum*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic; hard bottom areas
Longfin mako shark (*Isurus paucus*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Oceanic whitetip shark (*Carcharhinus longimanus*)	Late juvenile/subadult	
Spinner shark (*Carcharhinus brevipinna*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Silky shark (*Carcharhinus falciformis*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Bull shark (*Carcharhinus leucas*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic; bays and estuaries
Night shark (*Carcharhinus signatus*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Dusky shark (*Carcharhinus obscurus*)	Neonates/early juveniles	Pelagic
Caribbean reef shark (*Carcharhinus perezi*)	Adult; late juveniles/subadults	Pelagic
Sandbar shark (*Carcharhinus plumbeus*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Tiger shark (*Galeocerdo cuvier*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Lemon shark (*Negaprion brevirostris*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Scalloped hammerhead (*Sphyrna lewini*)	Adults; late juvenile/subadults	Pelagic
Great hammerhead (*Sphyrna mokarran*)	Adults; late juvenile/subadults	Pelagic
Bonnethead (*Sphyrna tiburo*)	Adults; late juvenile/subadult; neonates/early juveniles	Pelagic
Tunas		
Wahoo (*Acanthocybium solanderi**)	Adults; juveniles and subadults; larvae and eggs (spawning area)	Pelagic
Skipjack tuna (*Katsuwonus pelamis*)	Adults; larvae and eggs (spawning area)	Pelagic; *Sargassum*
Yellowfin tuna (*Thunnus albacares*)	Adults; juveniles/subadults; larvae and eggs (spawning area)	Pelagic; *Sargassum*
Bluefin tuna (*Thunnus thynnus*)	Adults; larvae and eggs (spawning area)	Pelagic; *Sargassum*
Swordfish		
Swordfish (*Xiphias gladius*)	Adults; larvae and eggs (spawning area)	Pelagic
Billfishes		
Blue marlin (*Makaira nigricans*)	Adults; juveniles and subadults; larvae and eggs	Pelagic
White marlin (*Tetrapterus albidus*)	Adults; juveniles and subadults	Pelagic
Longbill spearfish (*Tetrapterus pfluegeri*)	Adults	Pelagic
Atlantic sailfish (*Istiophorus platypterus*)	Adults; juveniles and subadults; larvae and eggs (spawning area)	Pelagic

* Fishery Management Plan in progress.

Sargassum

Sargassum floats at the sea surface, often forming large mats. These accumulations attract numerous small fishes and invertebrates that become mobile epipelagic assemblages. Larger fishes, particularly billfishes, dolphin, tunas, and wahoo, associate with *Sargassum* mats in search of prey and possibly shelter (SAFMC, 2002). EFH for *Sargassum* is simply the shelf waters and Gulf Stream. The Gulf Stream is considered an HAPC for drifting *Sargassum*. *Sargassum* EFH encompasses some small portions of the borrow area. Effects on the drifting *Sargassum* assemblage are expected to be minimal.

Fishery Resources

In April 2000, the MMS awarded a contract to Continental Shelf Associates of Jupiter, Florida to conduct a multi-disciplinary biological/physical environmental study (MMS 2004). Results from MMS (2004) indicate that that fish assemblages in the proposed borrow were similar in terms of species composition to that found previously in the Cape Canaveral area (Anderson and Gehringer, 1965; Wenner and Sedberry, 1989). This shelf assemblage is part of the warm temperate/temperate (Carolinean) fauna that generally ranges from Cape Canaveral north to Cape Fear, NC (Wenner and Sedberry, 1989) and is numerically dominated by sciaenids (croakers and drum) and elasmobranchs (sharks and rays). This assemblage gradually changes in a southerly direction with warm temperate species dropping out and more subtropical and tropical species occurring.

Demersal Fishes

The demersal soft bottom fish assemblage that inhabits the open shelf off eastern Florida is composed of 213 species and 53 families (Gilmore et al., 1981; Gilmore, 2001). The most abundant families include skates (Rajiidae), stingrays (Dasyatidae), torpedo rays (Torpedinidae), left-eye flounders (Bothidae), soles (Soleidae), cusk-eels (Ophidiidae), and searobins (Triglidae). Numerically abundant demersal fishes present on the open shelf include croakers, drums, and seatrouts (all three being sciaenids) and porgies (sparids).

As with most fishes, members of the eastern Florida demersal assemblage are distributed variably across space and time. Broad patterns are evident along cross shelf (bathymetic) and latitudinal axes as species segregate in recognizable assemblages. In the shallowest water depths, the surf zone, the demersal fish assemblage is characterized by kingfishes (*Menticirrhus* spp.), sand drum (*Umbrina coroides*), threadfins (*Polydactylus* spp.), and others (Peters and Nelson, 1987).

In shelf waters beyond the surf zone, the demersal assemblage is generally more diverse. The most comprehensive surveys of the eastern Florida demersal soft bottom assemblage have been conducted around Cape Canaveral and to the north using bottom trawl sampling gear (Anderson and Gehringer, 1965; Strushaker, 1969; Wenner and Sedberry, 1989). In the general project region, demersal fish are numerically dominated by sciaenids such as Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), silver seatrout (*Cynoscion nothus*), and star drum (*Stellifer lanceolatus*).

Results from MMS (2004) indicate that demersal fishes in the proposed borrow area numerically dominated by sciaenids such as Atlantic croaker (*Micropogonias undulatus*), rock sea bass

(*Centropristis philadelphica*), silver seatrout (*Cynoscion nothus*), moonfish (*Selene setipinnis)* and star drum (*Stellifer lanceolatus*). There were considerable differences in the composition, diversity, and numbers of fishes caught by trawling during September 2000 and June 2001 surveys during the study reflecting seasonal trends in the occurrence and abundance of fishes in the South Atlantic Bight area (Table 6). Fishes collected were common members of the region exhibiting expected spatial and temporal patterns in their distribution.

Table 6. Demersal fishes collected by mongoose trawl during the September 2000 and June 2001 Surveys of areas A1 (MMS 2004).

Fishes	**September**		**June**	
	Trawl 1	**Trawl 2**	**Trawl 1**	**Trawl 2**
Anchoa lyolepis	1			
Cynoscion nothus	125	38		
Centropristis philadelphica	8	24		1
Stellifer lanceolatus	16	12		
Micropogonias undulatus		16		
Selene setipinnis	19	6		
Prionotus scitulus	1			
Prionotus rubio	11	3		
Eucinostomus gula				
Menticirrhus americanus	6	2		
Etropus crossotus	7	1		
Sphyraena borealis		1		
Selene vomer		7		
Harengula clupeola	2			
Monacanthus hispidus	1			
Anchoa hepsetus	2			
Citharichthys spilopterus	1	3		
Larimus fasciatus	3	1		
Opisthonema oglinum	1			
Arius felis	1	2		
Citharichthys macrops		3		
Narcine brasiliensis	1	2		
Scorpaena		3		
Diplectrum formosum		1		
Ogcocephalus radiatus		1		
Gymnura mircrura		1		
Synodus foetens			2	
Citharichthys macrops			1	
Prionotus sp.			1	
Total Individuals	206	127	4	1
Total Taxa	17	19	3	1

Pelagic Fishes

Pelagic fishes can be subdivided into oceanic and coastal pelagic components. Oceanic pelagic species are the highly migratory epipelagic fishes including billfishes *Istiophorus platypterus*, *Makaira nigricans*, and *Tetrapterus* spp., tunas *Thunnus* spp., *Euthynnus alleteratus*, and *Katsuwonus pelamis*, wahoo (*Acanthocybium solanderi*), and dolphin (*Coryphaena* spp.) that rarely venture far into shelf waters, preferring the warmer and clearer Gulf Stream. These species will enter shelf waters, especially when environmental conditions are optimum, but they are more common within the Gulf Stream. Because the Gulf Stream is very close to shore in the project region, oceanic pelagic fishes may occur.

Coastal pelagic species prefer shelf waters and usually range from near shore to the shelf break. Coastal pelagic fishes can be divided into two ecological groups. The first group includes large predatory species such as bluefish (*Pomatomus saltatrix*), cobia (*Rachycentron canadum*), jacks (*Caranx* spp.), king (*Scomberomorus cavalla*) and Spanish (*S. maculatus*) mackerels, little tunny (*Euthynnus alletteratus*), and sharks (*Carcharhinus* spp.). With the exception of sharks that tend to be slow growing, these species typically form schools, undergo migrations, grow rapidly, mature early, and exhibit high fecundity. Each of these species is important to some extent to regional recreational and commercial fisheries. The second group exhibits similar life history characteristics, but the species are smaller in body size and are planktivorous. This group is composed of anchovies (*Anchoa* spp.), bigeye scad (*Selar crumenophthalmus*), menhaden (*Brevoortia* spp.), round scad (*Decapterus punctatus*), Spanish sardine (*Sardinella aurita*), and thread herring (*Opistonema oglinum*). These species form large schools in inner shelf and coastal waters, where they are often preyed on by members of the larger predatory coastal pelagic group.

All members of the coastal pelagic group migrate north and south, and east and west over the shelf area encompassed by the sand resource areas. Migratory patterns for most species are not well known. In general, as water and air temperatures decrease in early winter, bluefish, pompano, and Spanish mackerel will migrate southward along the coast. In mid-shelf waters, cobia and king mackerel migrate from either direction. The Atlantic population migrates between Cape Hatteras and southern Florida. In winter and spring, the population migrates to southeastern Florida. Little tunny migrate into shelf waters during spring and summer months, moving to shelf edge waters to spawn.

Coastal pelagic fishes spawn in shelf or shelf edge waters. Although precise spawning locations are not well documented, eggs and larvae of most species occur throughout the study area. The Gulf Stream transports spawning products into the study area from other regions, and associated eddies retain locally spawned eggs and larvae within the area. Some pelagic species, such as bigeye scad (*Selar crumenopthalmus*), move from offshore waters into nearshore waters to spawn (Continental Shelf Associates, Inc., 1992).

Surf Zone

Some coastal pelagic species are found in the nearshore environment along sandy beaches from the shoreline to the swash zone (Peters and Nelson, 1987). This habitat occurs along the coast for the entire study area. Nearshore fish assemblages show considerable seasonal structuring. The lowest abundance of all species occurs in winter, with peak numbers found during summer and fall. Large predatory species (particularly bluefish, jacks, sharks, and Spanish mackerel) may be attracted to large concentrations of anchovies, herrings, and silversides that congregate in nearshore areas. Mullets, particularly striped mullet (*Mugil cephalus*) and white mullet (*M. curema*), are seasonal members of the coastal pelagic assemblage when adults migrate downstream to the ocean to spawn. During fall months throughout the study area, large schools of striped mullet migrate along the coast, usually from north to south in response to cold fronts and other atmospheric disturbances.

Potential impact producing factors from dredging operations in the sand resource area that may affect pelagic fishes offshore of central east Florida include physical injury, turbidity and noise.

Physical injury through entrainment of adult fishes by hydraulic dredging has been reported for several projects (Larson and Moehl, 1988; McGraw and Armstrong, 1988; Reine et al., 1998). The most comprehensive study of fish entrainment took place in Grays Harbor, Washington during a 10-year period when 27 fish taxa were entrained (McGraw and Armstrong, 1988). Most entrained fishes were demersal species such as flatfishes, sand lance, and sculpin; however, three pelagic species (anchovy, herring, and smelt) were recorded. Entrainment rates for the pelagic species were very low, ranging from 1 to 18 fishes/1,000 cy (McGraw and Armstrong, 1988). Few of the coastal pelagic fishes occurring offshore of Florida should become entrained because the dredge's suction field exists near the bottom and many pelagic species have sufficient mobility to avoid the suction field.

Even though dredges are temporary structures, they can still attract roving pelagic fishes. This attraction would be similar to an artificial reef effect, where both small and large coastal pelagic fishes become associated with fixed structures. This may temporarily disrupt migratory routes for some members of the stock, but it is unlikely that there would be an appreciable negative effect.

Turbidity can cause feeding impairment, avoidance and attraction movements, and physiological changes in adult pelagic fishes. Pelagic species are primarily visual feeders, and when turbidity reduces light penetration, the fishes reactive distance decreases (Vinyard and O'Brien, 1976). Light scattering caused by suspended sediment also can affect a visual predator's ability to perceive and capture prey (Benfield and Minello, 1996). Some fishes have demonstrated the ability to capture prey at various turbidity levels, but the density of prey and light penetration are important factors (Grecay and Targett, 1996).

Some species will actively avoid or be attracted to turbid water. Experiments with pelagic kawakawa (*Euthynnus affinis*) and yellowfin tuna (*Thunnus albacares*) demonstrated that these species would actively avoid experimental turbidity clouds, but also would swim directly through them during some trials (Barry, 1978). Turbidity plumes emanating from coastal rivers may retard or affect movements of some pelagic species. Most fish are motile and would most likely leave the area while dredging and sand placement occurs, significantly decreasing their abundance and diversity in the short term.

Gill cavities can be abraded and clogged by suspended sediment, preventing normal respiration and mechanically affecting food gathering in planktivorous species (Bruton, 1985). High suspended sediment levels generated by storms have contributed to the death of nearshore and offshore fishes by clogging gill cavities and eroding gill lamellae (Robins, 1957). High concentrations of fine sediments can coat respiratory surfaces of the gills, preventing gas exchange (Wilber and Clarke, 2001).

Understanding and predicting effects of suspended sediments on fishes requires some information on the range and variation of turbidity levels found at a project site prior to dredging (Wilber and Clarke, 2001). The spatial and temporal extents of turbidity plumes from either cutterhead or hopper dredges are expected to be limited. Fortunately, there is only a minor portion of fine-grained sediment within the material to be dredged and placed. These impacts would subside upon cessation of construction activities. Because of the open nature of the sites, turbidity should decrease as the particles in the water column rapidly dissipate into the surrounding coastal ocean waters. For these reasons it is assumed that impacts from turbidity will be minor (MMS, 1999). Short-term beneficial impacts could result from the increase in suspended, nutritive material as a food source creating areas of feeding concentrations (MMS, 1999)

Noise associated with all aspects of the dredging process may affect organisms in several ways. Continental Shelf Associates, Inc. (2004) reviewed effects of noise on fishes. This report stated that all fish species investigated can hear, with varying degrees of sensitivity, within the frequency range of sound produced by cutterhead dredges, hopper dredges, and clamshell excavators. These sounds can mask the sounds normally used by fishes in their normal acoustic behaviors at levels as low as 60 to 80 dB (just above detection thresholds for many species). Levels as high as 160 dB may cause receiving fish to change their behaviors and movements that may temporarily affect the usual distribution of animals and commercial fishing. Continuous, long-term exposure to levels above 180 dB has been shown to cause damage to the hair cells of the ears of some fishes under some circumstances. These effects may not be permanent because damaged hair cells are repaired and/or regenerated in fishes. None of the dredge types proposed for this project produce continuous sounds above 120 dB (Richardson et al., 1995). Due to the short duration of dredge projects, the effects of underwater noise on fish populations should be minimal.

Little direct information is available describing the impacts of beach nourishment of fish species found in the inter-tidal and super-tidal beach habitat (MMS, 1999) but are expected to similar as those described above. Some coastal pelagic species are found in the nearshore environment along sandy beaches from the shoreline to the swash zone (Peters and Nelson, 1987) along the east coast of Florida. The majority of fish living in the surf zone is motile and can easily escape from sand placement. The greatest impacts of sand placement are the initial decrease in fish abundance, the potential for gill clogging caused by increased turbidity, and the direct burial of demersal finfish (MMS, 1999). The potential impacts are short term and not associated with a higher mortality rate of dredging the borrow areas (MMS, 1999).

Threatened or Endangered Species

Smalltooth sawfish (*Pristis pectinat*)

The endangered status of the smalltooth sawfish (*Pristis pectinata*) was finalized on May 1, 2003, (50 CFR Part 224). Critical habitat has not been defined and data are being collected on life history and biology of this species. Information that follows was obtained from NMFS (2000). The smalltooth sawfish is distributed in tropical and subtropical waters worldwide. The smalltooth sawfish normally inhabits shallow waters (10 m or less) often near river mouths or in estuarine lagoons over sandy or muddy substrates, but also may occur in deeper waters (20 m) of the continental shelf. Shallow water less than 1 m seems to be important nursery area for young smalltooth sawfish. Smalltooth sawfish grow slowly and mature at about 10 years of age. Females bear live young and the litters reportedly range from 15 to 20 embryos requiring a year of gestation. Diet consists of macroinvertebrates and fishes such as herrings and mullets. The saw is reportedly used to rake surficial sediments in search of crustaceans and benthic fishes or to slash through schools of herrings and mullets.

Within U.S. waters, it was historically distributed throughout the Gulf of Mexico and along the Atlantic coast to North Carolina. This species has become rare in the northern Gulf of Mexico during the past 30 years and its known range is now reduced to the coastal waters of Everglades National Park in extreme southern Florida (figure 2). Fishing and habitat degradation have extirpated the smalltooth sawfish from much of this former range. The presence of a smalltooth sawfish (*Pristis pectinata*) within Canaveral Shoals II is unlikely as the species is predemoniatey found in lagoon and nearshore waters. Historically, the Indian River lagoon (IRL) on the east coast of Florida was an area of smalltooth sawfish abundance. Bean (1884) reported that in "the Indian River and its tributaries the Saw-fish is said to be very common" and Evermann and Bean (1896) noted the sawfish was "an abundant species," with a single commercial fisher having captured 300 smalltooth sawfish in a single fishing season. Published and museum records of sawfish are plentiful from the lagoons south of Cape Canaveral throughout this time period. Post-1907 records from this region, however, have been far more limited and occurrences north of the Florida Keys are noteworthy events these days. Snelson and Williams (1981) did not capture any sawfish in an extensive multi-year study of the Indian River lagoon system. They speculated that the species' absence was caused by "heavy mortality associated with incidental captures by commercial fishermen" since the decline seemed to predate most of the manmade habitat alterations of the area.

In the unlikely event that a smalltooth sawfish is within the project area venturing to close to the dredge intake, it could be entrained and destroyed. Again, while unlikely, the smalltooth sawfish may reside within the vicinity of the sand placement area due to is proximity to the IRL various inlets which provide access to the IRL. Smalltooth sawfish are highly mobile and could easily swim away and relocate to other areas to avoid direct impacts. Food web disturbances caused by the destruction of benthos and alteration of nearshore bottom habitat are not likely to impact the smalltooth sawfish because of the lack of a preferable food source and the localize nature of disturbance in the sand placement area. The proposed project may affect but is unlikely to adversely affect the small tooth sawfish population.

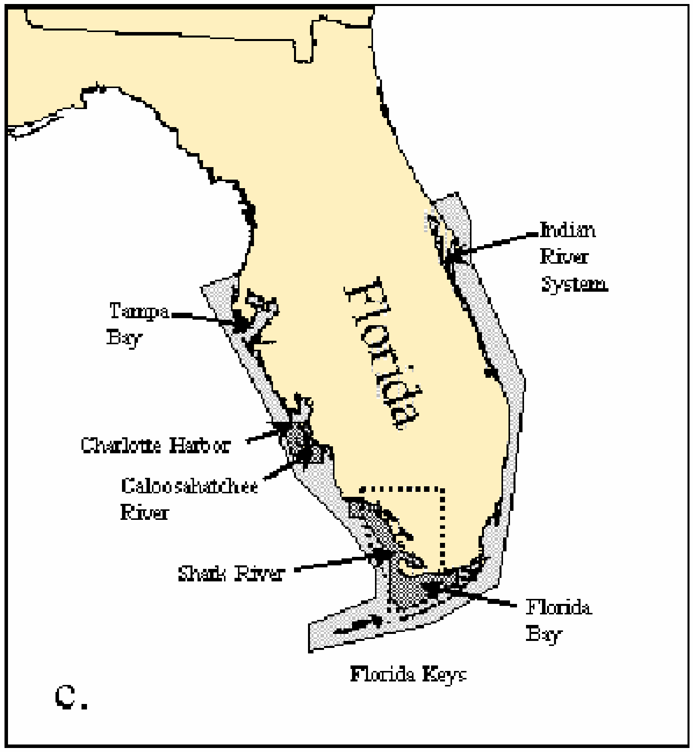

Figure 2. Detailed distribution of small tooth sawfish in Florida. The light grey indicates the distribution, the dark grey indicates areas where they are most commonly observed; the dotted line indicated the approximate boundary of the Everglades National Park.

Johnson's seagrass *(Halophila johnsonii)*

The seagrass *Halophila johnsonii* Eiseman (Johnson's seagrass) is a rare plant that may have the most limited distribution of any seagrass. The species is only known to reproduce asexually and may be limited in distribution because of this characteristic. Johnson's seagrass is found in disjunct and patchy distributions along the east coast of Florida, growing in lagoons from central Biscayne Bay to Sebastian Inlet. The species has been found in coarse sand and muddy substrates and in areas of turbid waters and high tidal currents. It plays a major role in the viability of benthic resources and has been documented as a food source for endangered West Indian manatees and threatened green sea turtles.

Ten areas were designated as critical habitat (65 FR 17768). These ten areas include: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay. As none of these areas are within the proposed project area we believe that the proposed project is unlikely to affect Johnson's sea grass.

Southeastern Beach Mouse

The southeastern beach mouse *(Peromyscuspolionitus niveiventrLc)* historically inhabited sand dunes along the coastline from Ponce (Mosquito) Inlet, Florida (Bangs 1898, in Humphrey 1992) to Miami Beach, Florida (Layne 1974, in Humphrey 1992). Since the early 1970's most of the population from Cape Canaveral to Ft. Pierce, Florida has been lost or highly fragmented due to urbanization. Populations from Ft. Pierce southward may be entirely extirpated (Humphrey 1992). Loss of dune habitat from storm erosion and urban development pose the worst threats to this species' survival.

Current studies reveal healthy populations at Cape Canaveral National Seashore, Cape Canaveral, and Merritt Island National Wildlife Refuge. A few areas in Indian River County, including south Sebastian Inlet Park, have recently documented small numbers (Humphrey 1992). Recent trapping in south Brevard County (north Sebastian Inlet Park) indicate beach mice are no longer present (K.Owens, USFWS, pers. comm.).

Essential habitat for this species is primary and secondary dunes with a supply of sea oats *(Uniola paniculaa)* and other grains, seeds and fruits. Field work in the project area revealed remnant mouse habitat and a lack of definite "sign" of mouse habitation. Field reconnaissance for this species also indicated none are known to exist in the study area. However, an exception to this may exist at Lori Wilson County Park in Cocoa Beach where suitable habitat remains. Although "sign" was not noticed, mice may inhabit this area. It is anticipated that he Southeastern beach mice will not be impacted.

Physical Oceanography

The Florida Current dominates circulation along the central east Florida continental shelf. However, wind-driven currents also play an important role. Unlike other shelf regions where density and tidal forces contribute substantially to circulation processes, the controlling parameter in the Florida Current area seems to be the lateral position of the frontal zone relative to the shelf; the closer the front, the greater the influence on local circulation.

The Florida Current is the local manifestation of the Gulf Stream, the intense western boundary current of the North Atlantic that transports heat north from the equator. The system narrows and intensifies between the southeast Florida shore and the Bahamas; this portion of the Gulf Stream is commonly known as the Florida Current. The axis of the Florida Current runs northward, east of the project area. Flow speeds can exceed 2.5 m/sec (Lee et al., 1985).

Circulation processes within the project area include spin-off eddies and meanders of the Florida Current, wind-driven currents, upwelling/downwelling dynamics, and tides. Other contributions may stem from shelf waves, inertial oscillations, and coastal inlet exchange. Shelf currents are aligned principally along isobaths; cross-shelf components are typically much weaker. Despite the presence of multiple forcing mechanisms, most current energy on the shelf can be related to subtidal variability (Lee and Mayer, 1977). The position of the Florida Current front is the principal control of subtidal shelf circulation from Miami to Cape Hatteras (Zantopp et al., 1987).

Florida Current and Eddies

The Florida Current frontal zone meanders laterally along the shelf break. Meanders can be caused by instability of the Florida Current, instabilities caused by topographic features, and variable wind stress that pushes the Florida Current axis onshore and offshore (Lee and Mayer, 1977). Meanders travel northward as waves; wave crests are onshore excursions of the front and troughs are offshore excursions (Zantopp et al., 1987). Horizontal velocity shear between the Florida Current and ambient shelf waters produces cyclonic ‘spin-off’ eddies along the western edge (Lee, 1975). Once formed, these eddies propagate northward along the shelf. Eddies have length scales of approximately 10 km in the east-west direction and 20 to 30 km in the north-south direction. Eddies form consistently, about once every 2 days to 2 weeks, depending on location and time of year (Lee, 1975; Lee and Mayer, 1977). Spin-off eddies translate northward at speeds about 20 to 100 cm/sec (Lee and Mayer, 1977). Zantopp et al. (1987) tracked three eddies in summer of 1984 and reported translation speeds of 40 to 60 cm/sec. Swirl speeds within the eddy can be 100 cm/sec to the north and 50 cm/sec to the south (Lee and Mayer, 1977).

Eddies penetrate occasionally onto the inner shelf (depths less than 20 m). North of Cape Canaveral, where the shelf is relatively broad, Santos et al. (1990) showed that Gulf Stream effects were negligible at the 28-m isobath. Wind stress along the shelf dominated subtidal currents in the nearshore region. Gulf Stream effects became more pronounced at the 40-m isobath and dominated currents at the shelf break (75-m isobath). Lemming (1980) reported inner shelf currents at locations north of Cape Canaveral were highly consistent with winds. At Miami, where the shelf is quite narrow, Lee and Mayer (1977) found flow on the inner shelf markedly different than the outer shelf. At depths less than 10 m, inner shelf currents responded directly to wind stress, either northward or southward depending on wind direction, while variability on the outer shelf was due to eddy and Florida Current meander effects. Smith (1981) found that current variability on the narrow inner shelf (depths <10 m) near Fort Pierce was poorly correlated to wind stress, suggesting observed variability was likely a dynamic adjustment to Florida Current eddy intrusions.

Eddies also are important drivers of water mass exchange along the shelf, triggering upwelling events along the shelf throughout the year. Smith (1981, 1982, 1987) and Lee and Pietrafesa (1987) show intrusions of cooler water onto the shelf were inconsistent with Ekman-type wind stress, where winds push surface waters offshore and colder bottom waters upwell toward shore in response to a pressure deficit near shore. Rather, temperature and current variability were more consistent with eddy intrusion. Hsueh and O’Brien (1971) described how frictional forces between a steady alongshore current and the shelf create a cross-shore geostrophic imbalance, inducing onshore bottom flow, or upwelling. Colder waters, beneath the Florida Current, upwell and become entrained in spin-off eddies. The cyclonic eddies then mix horizontally with warmer Florida Current waters, especially on the leading edge of the meander, forming elongated filaments and shingles of the Florida Current along the shelf (Zantopp et al., 1987). Such mechanisms explain observed temperature and density variability within the study area as well as the important role eddies play as nutrient suppliers to coastal waters (Lee et al., 1991). Freshwater inputs, such as river runoff, have negligible impact on density along the Florida shelf (Lee and Pietrafesa, 1987).

Wind-Driven Currents and Upwelling

Seasonal wind variations contribute to shelf circulation indirectly by enhancing or repressing eddy-induced upwelling. From October to March, prevailing northeasterly winds create an onshore Ekman response and associated downwelling. Bottom currents oppose upwelling induced by Florida Current eddies. Hence, winter upwelling events are not as prolonged as during other months when predominant southeast winds create upwelling-favorable conditions, enhancing eddy-induced effects. Summer upwelling events can last for several weeks (Smith, 1983, 1987). Lee and Pietrafesa (1987) suggest that southwest winds drive localized upwelling due to the anomalous topographical feature at Cape Canaveral. On the inner shelf, wind-driven subtidal variability also would be expected to have seasonal responses; winter conditions (northeast winds) would drive a southerly flow and summer conditions (southeast winds) would favor northerly currents.

Tidal Currents

Mayer et al. (1984) analyzed recent observations of the Florida Current around 27° latitude, and they reported tidal currents were responsible for approximately 16% of the total Florida Current variability. Diurnal tides were stronger than semi-diurnal tides, accounting for as much as 80% of the tidal energy. Peak tidal current speeds in water deeper than 300 m were about 12 cm/sec. Mayer et al. (1984) also suggested tidal oscillations were greatest on the western edge of the Florida Current. Lee and Mooers (1977) reported tides accounted for 10% to 25% of the Florida Current variability on the 300 m deep Miami Terrace area. Kielmann and Duing (1974) analyzed a 50-day record obtained offshore of Miami in about 300 m water depth, and tides accounted for about 25% of the along-axis current; diurnal components dominated. Cross-axis tides contained about 6% of the overall variance, again dominated by the diurnal constituent.

Storm-Generated Currents

Smith (1982) also described the response of shelf waters to Hurricane David (1979) based on near-bottom observations collected in 10 m water depth offshore Fort Pierce. Storm effects were characterized as a brief 1 m rise above normal high water, a doubling of peak current speeds along shore, and a marked decrease in bottom temperatures. Current speeds exceeded 60 cm/sec during the event compared to typical peak speeds of 30 cm/sec. Cross-shelf currents reached 30 cm/sec versus more typical speeds of 15 cm/sec. Near-surface currents at mid-shelf (depth ~26 m) measured 80 cm/sec versus typical peak currents of 40 cm/sec in the alongshore direction. Peak wind gusts during the event measured about 75 knots in southern Florida (National Hurricane Center archives).

Waves and Wave-Generated Currents

Wave height, period, and direction of approach, in addition to the magnitude and phasing of storm surge, are the most important dynamic factors influencing beach change in central east Florida. In most cases, buoy data are the preferred source of wave information because they represent actual measurements rather than hindcast information derived from large-scale models. However, very few sites along the U.S. east coast have wave measurement records of sufficient length to justify their use as a source of long-term information. McBride (1987) summarizes variations in wave height for the east coast of Florida using various USACE reports (Figure 3). Offshore central east Florida, sources of measured directional wave data include the Florida Coastal Data Network (CDN) (Wang et al., 1990) and various short-term deployments of individual gages (e.g., the 1991 University of Florida deployment of a wave gage offshore Jupiter Island [Harris, 1991]). However, the most comprehensive analysis of nearshore wave climate for central east Florida is by the USACE, Coastal and Hydraulics Laboratory, through wave hindcast studies (Hubertz et al., 1993).

Nearshore Sediment Transport

Waves offshore central east Florida propagate principally from the east and northeast, producing net southerly transport of sand on beaches and in the nearshore (Duane et al., 1972; McBride, 1987; Dean, 1988; USACE, 1996). As illustrated in Figure 4, estimated net longshore sand transport along the east coast of Florida is quite variable, decreasing from approximately 600,000 yd^3/yr at Fernandina to about 10,000 yd^3/yr at Miami (Dean, 1988). Within the central east Florida study area, net southerly littoral drift is estimated at 350,000 yd^3/yr near Cape Canaveral (USACE, 1967, 1996; Kraus et al., 1999), decreasing to about 230,000 yd^3/yr at Jupiter Inlet (Duane et al., 1972; Dean, 1988). Substantial variations in estimated net longshore sand transport exist within this area as a function of dominant wave approach angle and shoreline orientation.

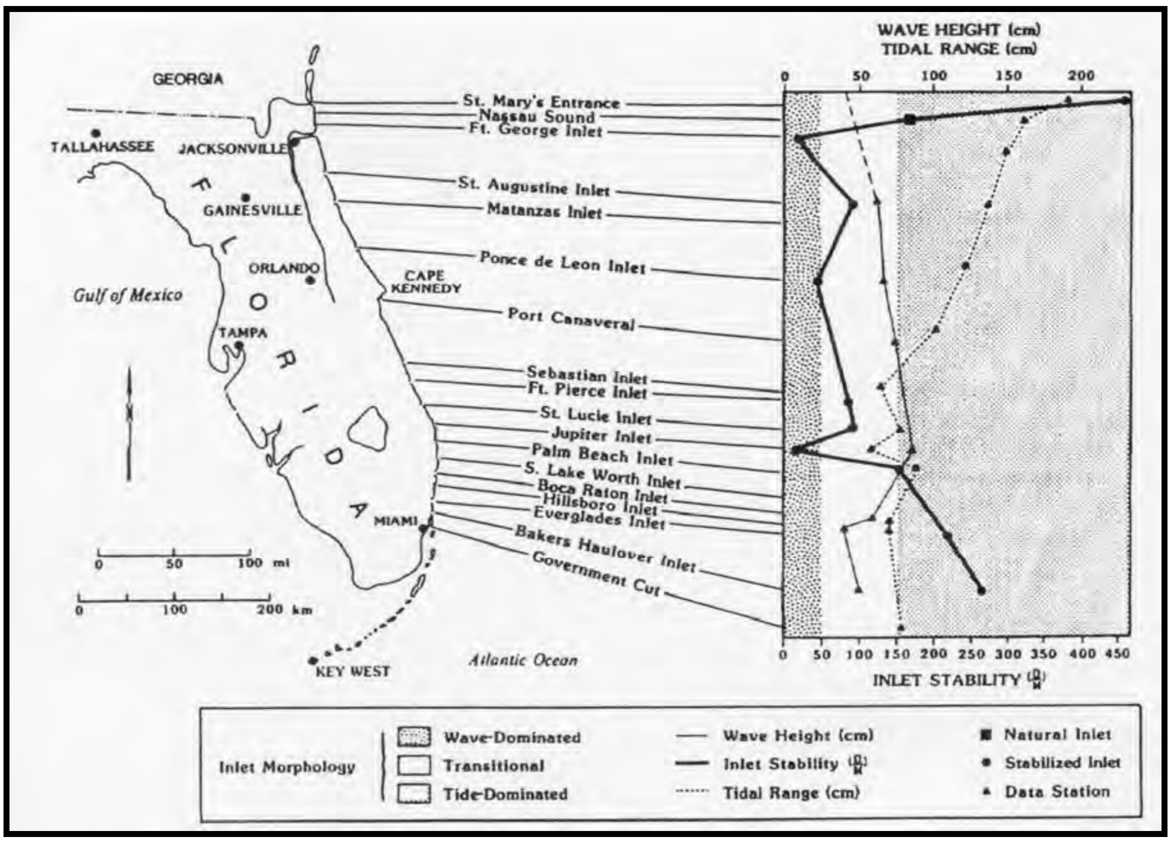

Figure 3. Plot of tidal range and wave height for the east coast of Florida (from McBride, 1987).

Excavation of an offshore borrow site can affect wave heights and the direction of wave propagation. The existence of an excavated hole or trench on the OCS can cause waves to refract toward the shallow edges of a borrow site. This alteration to a wave field by a borrow site may change local sediment transport rates, resulting in some areas experiencing a reduction in longshore transport and other areas showing an increase. To determine potential physical impacts associated with dredging borrow sites offshore the central east coast of Florida, wave transformation modeling and sediment transport potential calculations were performed for existing and post-dredging bathymetric conditions. Comparison of computations for existing and post-dredging conditions illustrated the relative impact of borrow site excavation on wave-induced coastal processes.

Figure 4. Estimates of net annual longshore sand transport along the east coast of Florida derived primarily from USACE documents (from Dean and O'Brien, 1987; Dean, 1988).

In April 2000, the MMS awarded a contract to Continental Shelf Associates of Jupiter, Florida to conduct a multi-disciplinary biological/physical environmental study (Hammer et al, 2004). The physical objectives of the study, conducted via a subcontract to Applied Coastal Research and Engineering (ACRE) of Mahspee, MA were as follows:

- Wave Modifications: Evaluate potential modifications to waves and currents in the study area due to offshore dredging within potential sand resource areas.

- Sediment Transport Patterns: Evaluate impacts of dredging in Federal waters and consequent beach nourishment in terms of potential alterations in sediment transport patterns and sedimentary environments, and impacts to local shoreline processes.

For the central east Florida shelf study, ACRE used STWAVE (STeady-state spectral WAVE model) v2.0, a model developed by the U.S. Army Engineering Waterways Experiment Station (WES). Two-dimensional (frequency and direction vs. energy) spectra are used as input to the model. STWAVE is able to simulate wave refraction and shoaling induced by changes in bathymetry and by wave interactions with currents. The model includes a wave breaking model based on water depth and wave steepness. Pre-dredging wave model output is compared against post-dredging model output to look for:

1. Increased wave heights inshore of the borrow areas which might lead to increased shoreline erosion;

2. Coupled to a nearshore sediment transport model, significant differences in longshore transport which might result in less sand getting to one beach area, and more sand getting to another area.

The post-dredging model runs assume certain pre-determined levels of sand extraction as a result of dredging operations.

The first step involved in using STWAVE is to compile accurate bathymetric data in the study area as input to the model conditions. Figure 5 shows the 1996 bathymetric surface in the Canaveral Shoals area; Figure 6 uses this data to depict the area three-dimensionally.

Also vital as input to the STWAVE model is accurate wind speed and directional data. Offshore wave conditions used as input for wave modeling can be derived from two main sources: measured spectral wave data from offshore data buoys or hindcast simulation time series data. In general, buoy data are the preferred source of wave information for modeling because they represent actual offshore measurements rather than hindcast information derived from large-scale models. However, very few sites along the U.S. east coast have wave measurement records of sufficient length to justify their use as a source of long-term information. For the Canaveral Shoals area, hindcast wind/wave data were generated using Wave Information Study (WIS) Station AU2019 (Figures 7 and 8). Table 7 shows the input wave spectra parameters used for the STWAVE model runs for the Canaveral Shoals area.

Table 7. Input wave spectra parameters used for existing and post-dredging STWAVE runs for Canaveral Shoals area.

Period Band	STWAVE Model Input Condition	Percent Occurrence	H_{mo} Wave Height (m)	Peak Wave Period, T_p (sec)	Peak Wave Direction, θ_p (true north)	Peak Wave Direction, θ_p (grid relative)	Direction Bin (grid relative)
1	1A	8.2	1.7	7.7	55	55	30-60
	2A	20.8	1.4	7.7	80	80	60-90
	3A	24.6	1.0	7.7	100	100	90-120
	4A	2.3	1.5	6.3	130	130	120-150
2	5A	6.5	1.7	12.5	60	60	30-60
	6A	28.5	1.6	14.3	65	65	60-90
	7A	3.4	1.5	11.1	100	100	90-120

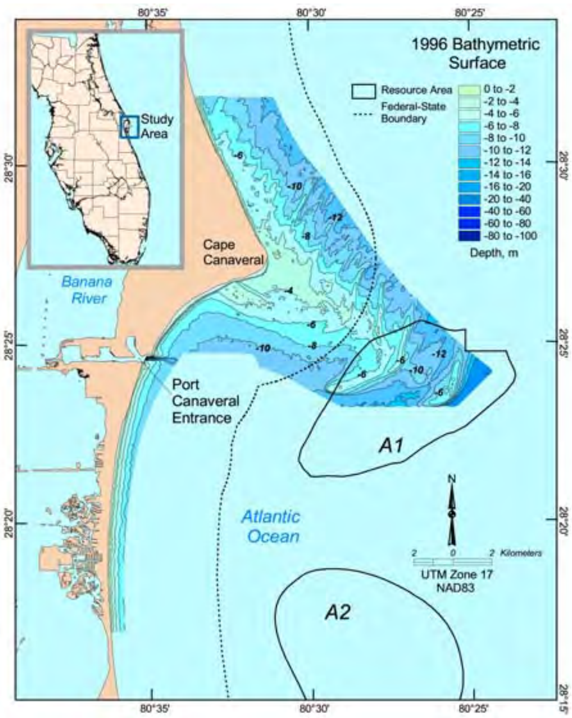

Figure 5. Nearshore bathymetry (1996) for offshore Florida in the Canaveral Shoals area. (Area A1)

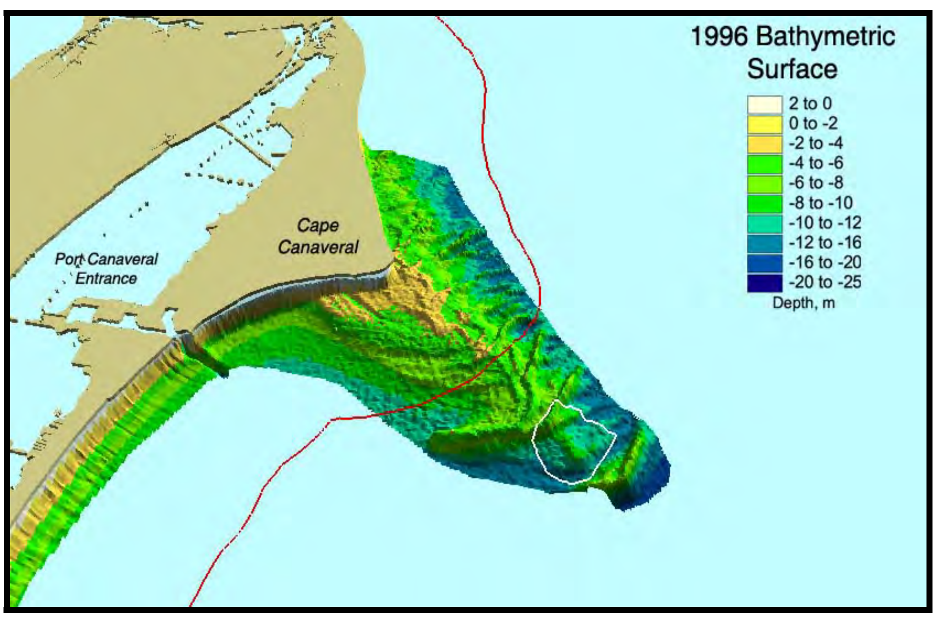

Figure 6. Three-dimensional view of Canaveral Shoals, 1996.

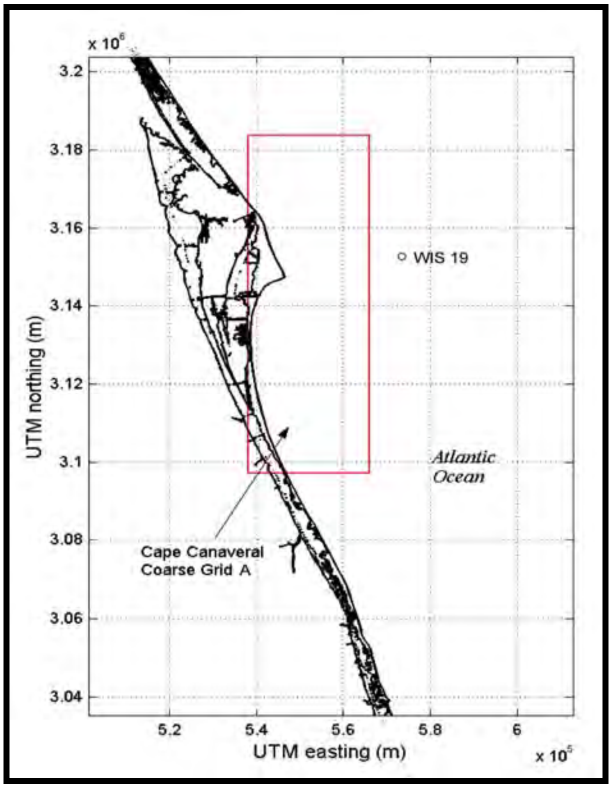

Figure 7. Location of WIS Station AU 2019.

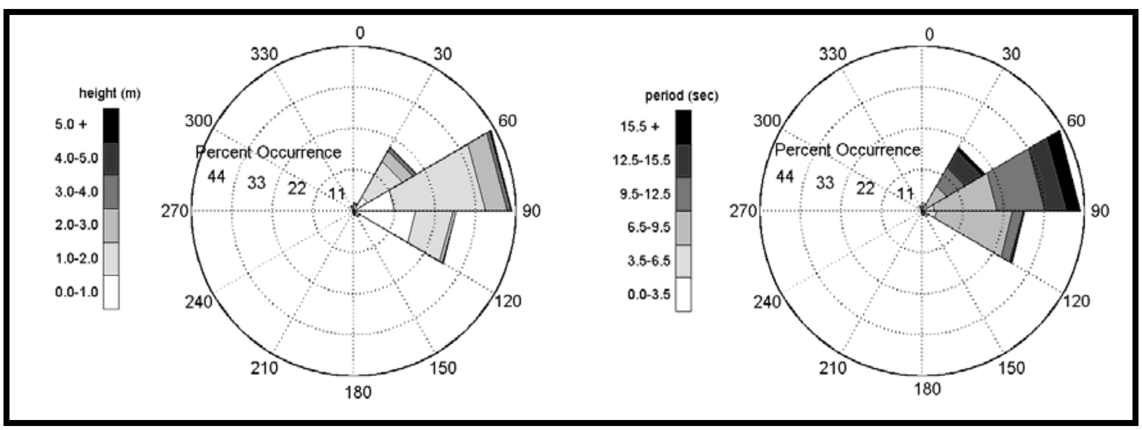

Figure 8. Wave height and period for hindcast data from WIS station AU2019, January 1976 and December 1995. Direction indicates from where waves were traveling, relative to true north. Radial length of gray tone segments indicates percent occurrence for each range of wave height and period.

Input spectra and a coarse grid were developed for the sand resource area for simulating wave propagation over existing and post-dredging bathymetry. A fine grid, nested within the coarse grid, was developed to obtain greater resolution of wave characteristics in the nearshore, landward of borrow sites (Figure 9). Table 8 shows the dimensions of the coarse and fine grids.

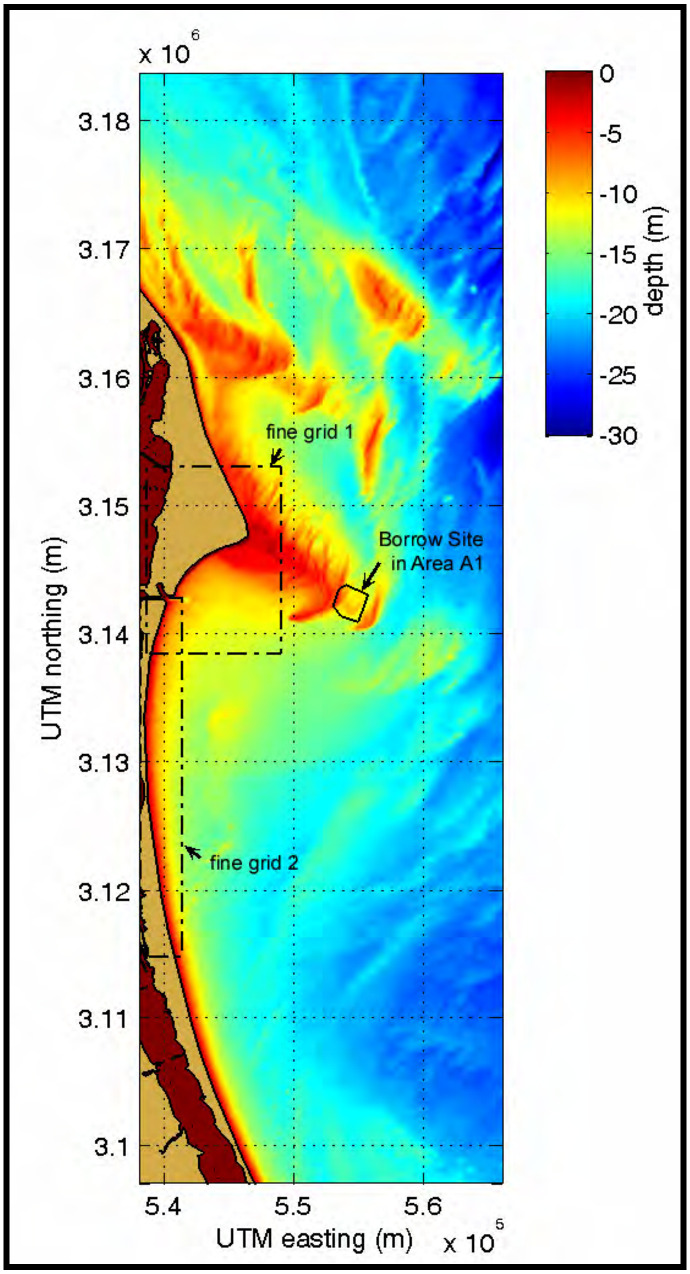

Figure 9. Coarse model grid (200 x 200 m spacing) used for STWAVE simulations offshore Cape Canaveral, FL. Depths are relative to NGVD. Borrow site location is indicated by the solid black line, and fine grid limits are indicated by a dashed line.

Table 8. Numerical grid dimensions for offshore (coarse) and nearshore (fine) grids for the Canaveral Shoals Area A borrow site.

Coarse Grid (200 m spacing)		Fine Grid (20 m spacing)		Grid Angle (true north)
Nodes	Distance (km)	Nodes	Distance (km)	
141 x 434	28 x 87	520 x 730	10 x 15	0

Following development of the grids, STWAVE model runs were initiated to simulate wave conditions for different wave heights and directions prior to dredging or excavation of sand from within the borrow area (Figures 10 and 11).

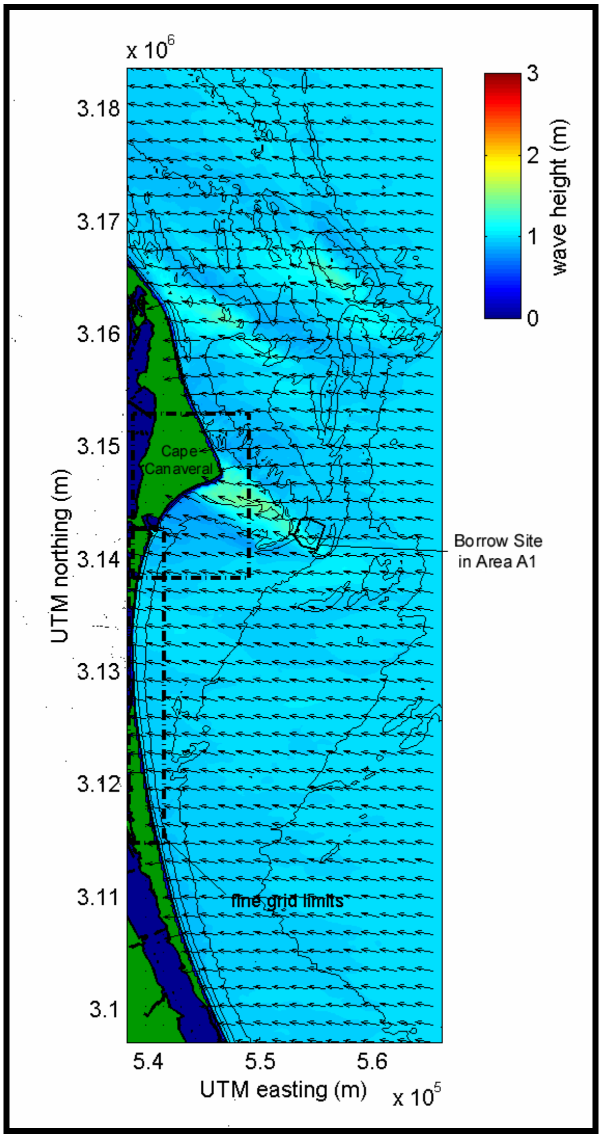

Figure 10. STWAVE output for wave modeling Area A, wave Case 3A (Hs = 1.0 m, Tpeak = 7.7 sec, ˜pea k = 100 deg). Color contours indicate wave height, and vectors show mean direction of wave propagation. Seafloor contours are shown at 5 m intervals.

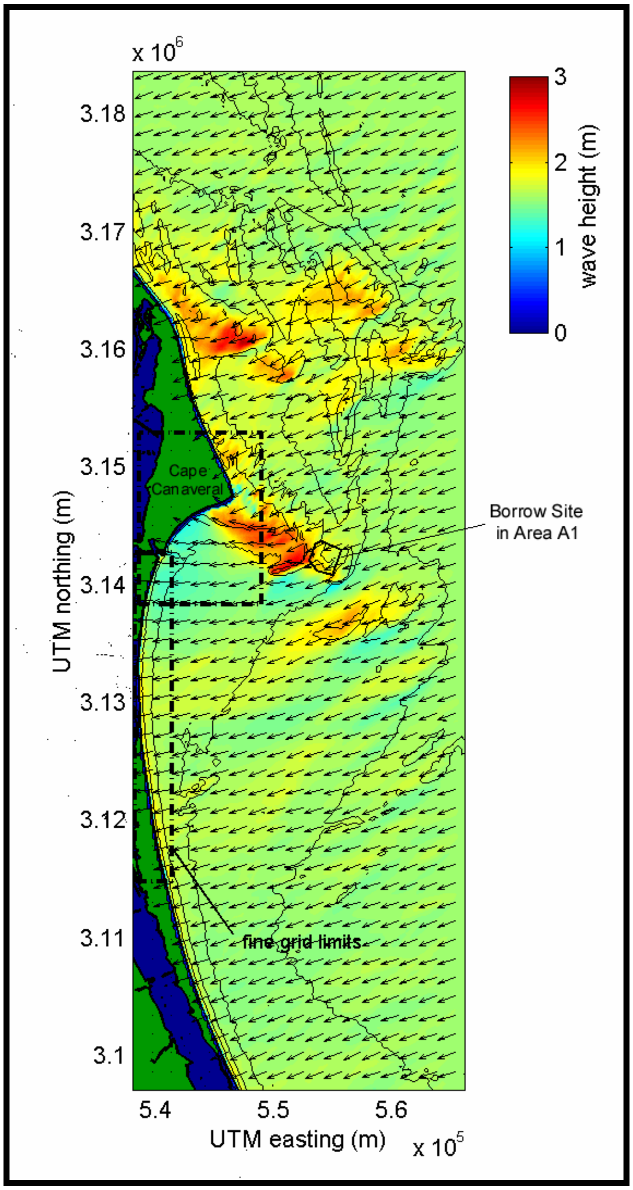

Figure 11. STWAVE output for wave modeling Area A, wave Case 6A (Hs = 1.6 m, Tpeak = 14.3 sec, ˜pea k = 65 deg). Color contours indicate wave height, and vectors show mean direction of wave propagation. Seafloor contours are shown at 5 m intervals.

The next step was to numerically excavate sand from within the borrow site. Table 9 indicates the degree of sand extraction and Figures 12 and 13 show STWAVE model runs for representative wave conditions comparing pre- and post-dredging wave conditions.

Table 9. Borrow site A1, offshore Cape Canaveral, surface area dimensions, excavated sand depth and volume.

Borrow Site Surface Area (x 10^6 m^2)	Maximum Excavation Depth (m)	Borrow Site Sand Volume
5.39	12	13.6 million cubic meters (17.8 million cubic yards)

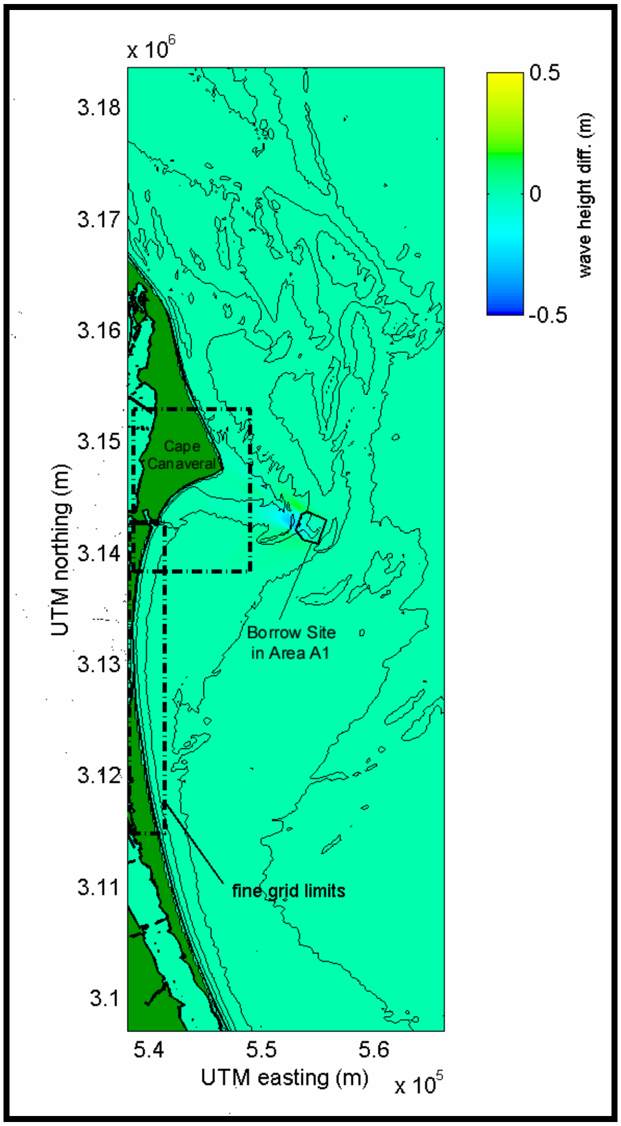

Figure 12. Wave height change between existing and post-dredging conditions at wave modeling Area A for STWAVE simulations, wave Case 3A (Hs = 1.0 m, Tpeak = 7.7 sec, ˜pe ak = 100 deg). Seafloor contours are shown at 5 m intervals.

For Case 3A (Figure 12), maximum wave height increase resulting from dredging the borrow site was 0.2 m, and the maximum decrease in the shadow zone of the site was 0.3 m. The overall area of influence for this borrow site extended approximately 14 km north of the Cape to about 4 km south of Canaveral Harbor.

Similar wave difference results were illustrated for Case 6A (Figure 13). Maximum change in post-dredging wave heights was 0.7 m, substantially greater than change observed at other sites. The area of greatest wave height increase occurred at the northwest corner of the site. Wave heights did not increase by the same amount at the southwest corner, likely due to local bathymetry and geometry of the site. Deeper excavation depths at the northwest corner cause a greater degree of wave refraction. The longshore extent of influence was similar to that of Case 3A, but its location shifted slightly southward due to the direction of wave propagation.

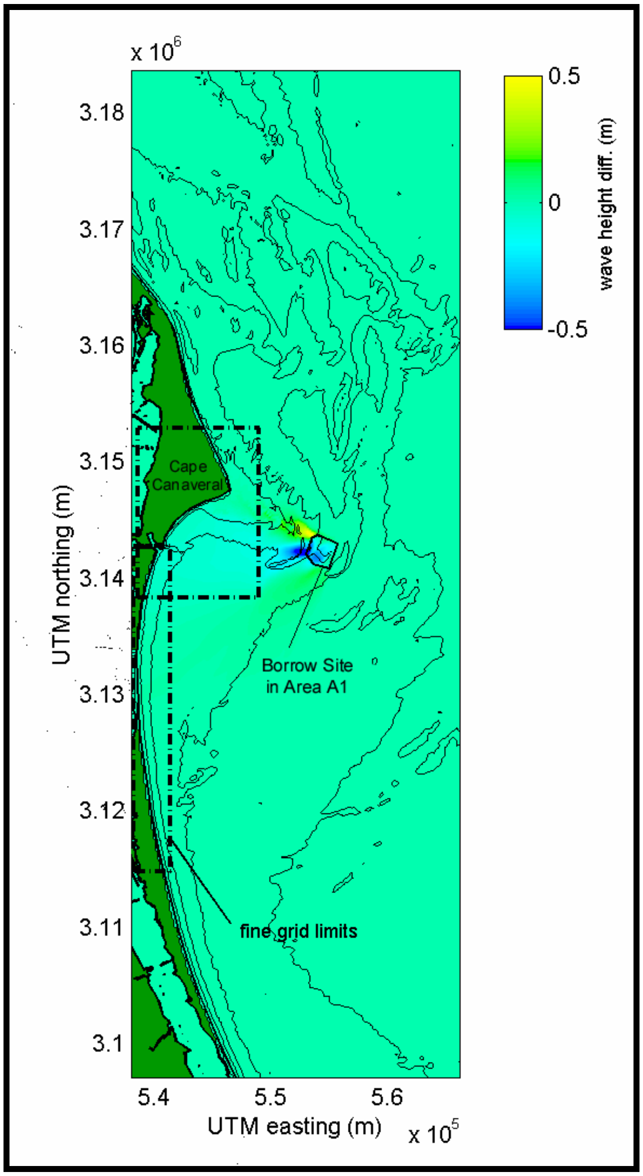

Figure 13. Wave height change between existing and post-dredging conditions at wave modeling Area A for STWAVE simulations, wave Case 6A (Hs = 1.6 m, Tpeak = 14.3 sec, ˜ peak = 65 deg). Seafloor contours are shown at 5 m intervals.

The net sediment transport potential associated with average annual conditions was then computed for shorelines landward of the sand borrow site. Transport potential was computed using fine grid model results. In addition to average annual results, wave model simulations and sediment transport potential calculations were performed for 20 individual years of WIS data to provide information necessary to develop a $\pm 0.5\sigma$ transport significance envelope. Wave modeling for 20 individual years proceeded in a similar fashion to the modeling effort for average annual conditions (i.e., wave data for each separate year was binned according to direction and period to develop several wave cases for each year). Results for the borrow site offshore Cape Canaveral (Area A) were based on an earlier form of the transport significance criterion developed for the MMS by ACRE (Kelley et al, 2001; Kelley et al, 2004). Application of this method used $\pm 1\sigma$ as the significance criterion based on splitting the 20-year wave-hindcast record into five 4-year periods as opposed to 20 individual. For this study, more than 1,000 individual wave model runs were completed to determine average annual conditions and associated transport significance envelopes.

Mean sediment transport potential calculated for Area A (adjacent to Cape Canaveral) for the modeled 20-year period is illustrated with computed transport curves of the 20 individual years used in the determination of the ±σ significance envelope (Figure 14). The shoreline south of Port Canaveral indicated strong net southerly transport of approximately 500,000 m^3/yr, which gradually reduced to approximately 300,000 m^3/yr at the southern limit of the model grid. The significance envelope was largest (approximately ±300,000 m^3/yr) north of Cape Canaveral and in the southern half of the modeled area, and it reduced to approximately ±50,000 m^3/yr just north of Port Canaveral. The relatively small significance envelope for this section of shoreline suggested that inter-annual variability of mean sediment transport was small due to the sheltering effect of Cape Canaveral and Canaveral Shoals.

Average annual results for modeled Area A1 documented gross northerly- and southerly-directed transport potential (Figure 15), with average net transport, for the 20-year modeled period. The modeled shoreline generally had a strong south-oriented transport potential between the cusp of Cape Canaveral and Port Canaveral. Between Port Canaveral and the southern limit of the grid, potential transport gradually became less southerly dominated, with gross northerly transport rates (~200,000 m^3/yr) that were roughly half of gross southerly transport rates.

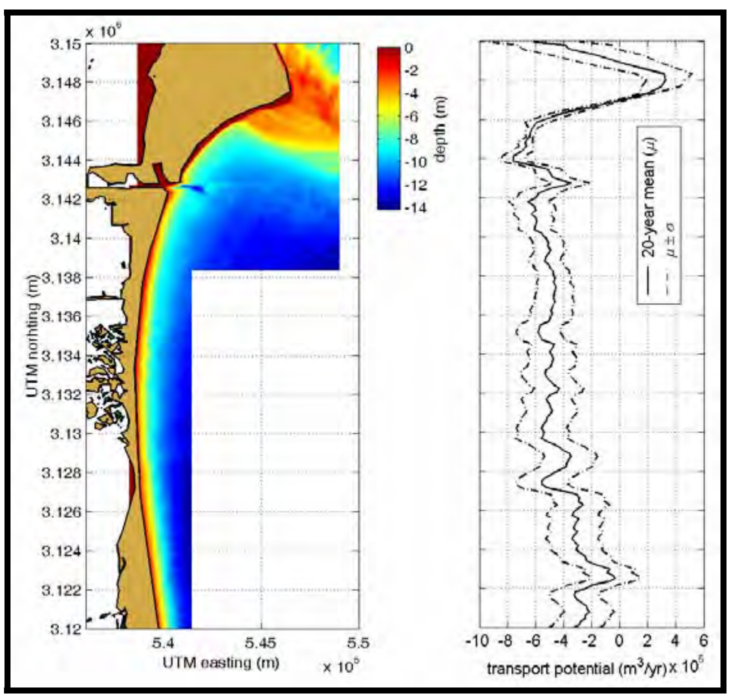

Figure 14. Average annual sediment transport potential (solid black line) computed for the shoreline landward of the borrow site in Area A1 (Port Canaveral). The black dot-dash lines indicate the ±σ significance envelope about the mean net transport rate.

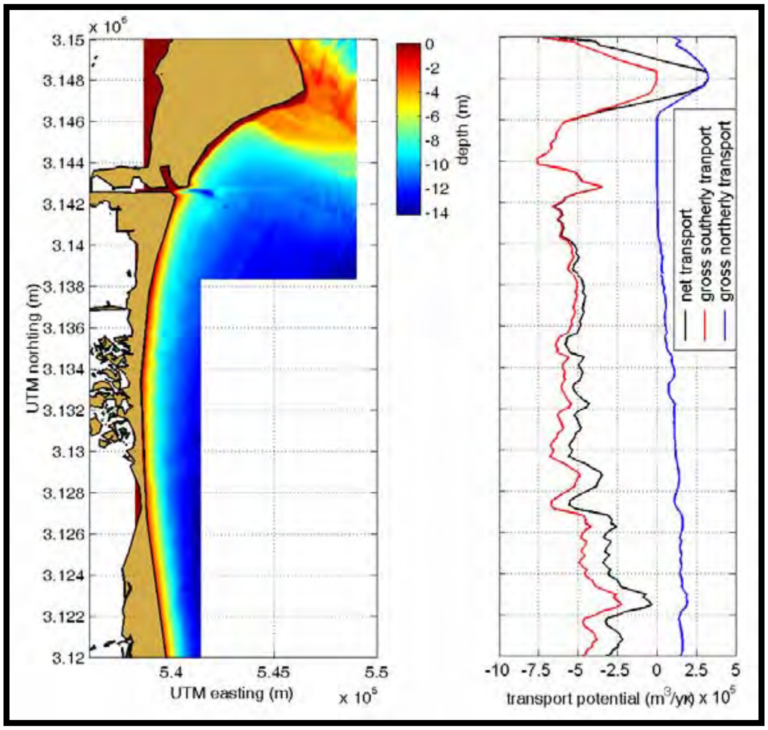

Figure 15. Average net transport potential (black line) with gross southerly- and northerly-directed transport potential (red and blue lines, respectively) for the shoreline landward of Area A1.

Canaveral Shoals, the complex of ridges and troughs that extend southeast from Cape Canaveral, caused significant increases in wave height as waves propagated over this area. As 1.0 m, 7.7 sec waves from the east-southeast (Case 3A) refracted around the shoals, wave heights increased by 0.5 m over offshore wave conditions. In the shoal field northeast of the Cape, wave heights increased by about 0.3 m above offshore wave heights. Wave direction changes also were observed in these areas. A greater degree of wave refraction was illustrated for longer period waves. For a 1.6 m, 14.3 sec wave propagating from the east-northeast (Case 6A), wave direction for some nearshore regions adjacent to the Cape changed more than 45 degrees, following the gradient in bathymetric contours. Largest waves in the model domain occurred at shoals northeast of Port Canaveral (1.3 m higher than offshore waves). At shoals in the vicinity of the borrow site in Area A1, wave heights increased to a maximum of 2.8 m, 1.2 m above offshore conditions. Shoals tended to refract wave energy and caused focusing (wave convergence) near the Cape. However, the coast south of the Cape illustrated reduced wave heights (wave divergence).

Post-dredging wave height changes for Case 3A illustrated a maximum wave height increase of 0.2 m and maximum wave height decrease in the shadow zone of the site of 0.3 m. The overall area of influence for the borrow site in Area A1 extended approximately 14 km north of the Cape to about 4 km south of Port Canaveral. Similar wave height differences were illustrated for Case 6A. Maximum change in post-dredging wave heights was 0.7 m, substantially greater than change observed at other sites. The area of greatest wave height increase occurred at the northwest corner of the site. Wave heights did not increase by the same amount at the southwest corner, likely due to local bathymetry and geometry of the site. Deeper excavation depths at the northwest corner cause a greater degree of wave refraction. The longshore extent of influence was similar to that of Case 3A, but its location shifted slightly southward due to the direction of wave propagation. However, for all wave simulation cases, the impact of borrow site excavation on wave height and direction changes was minor relative to natural variability of the local wave climate and transport regime.

In addition to predicted modifications to the wave field, potential sand mining at the offshore borrow site resulted in minor changes in sediment transport pathways in and around potential dredging site. Modifications to bathymetry caused by sand mining only influenced local hydrodynamic and sediment transport processes in the offshore area. Although wave heights changed at the dredged borrow site, areas adjacent to these sites did not experience dramatic changes in wave or sediment transport characteristics.

Initially, it is anticipated that sediment transport at borrow sites will occur rapidly after sand dredging is completed. For water depths at the proposed borrow site, minimal impacts to waves and regional sediment transport are expected during infilling. The characteristics of sediment that replaces borrow material during infilling will vary based on location, time of dredging, and storm characteristics following dredging episodes. The average transport rate for Site A1 was computed to be on the order of about 538,000 m^3/yr, due to its relatively shallow water depth and its large perimeter. Because Site A1 is in shallow water, wave-induced and wind-driven currents tend to be larger than at deeper sites, and more sediment is mobile in the proximity of the borrow site. Furthermore, sites that have a larger surface area generally trap more sediment in a given time period.

Comparisons of average annual sediment transport potential were performed for existing and post-dredging conditions to indicate the relative impact of dredging to longshore sediment transport processes. Mean sediment transport potential calculated for the shoreline south of Port Canaveral indicated strong net southerly transport of approximately 500,000 m^3/yr, which gradually reduced to approximately 300,000 m^3/yr at the southern limit of the model grid. The transport significance envelope was largest (approximately ±300,000 m^3/yr) north of Cape Canaveral and in the southern half of the modeled area.

The significance of changes to longshore transport along the modeled shoreline resulting from dredging proposed borrow sites to their maximum design depths was determined using the method described in Kelley et al, 2001 and Kelley et al, 2004. Model output for the region south of Cape Canaveral (Area A) indicated that the significance envelope was approximately 20% of the mean computed net transport potential in the area of greatest impact from the borrow site in Area A1. The maximum modeled decrease in south-directed transport for post-dredging conditions was about a 40,000 m^3/yr (within the transport significance range), just south of Port Canaveral. Overall, it was determined that no significant changes in longshore sediment transport potential would result from the modeled borrow site configuration for the Canaveral Shoals area.

Cumulative Impacts

Cumulative impact as defined in CEQ regulations is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Projects using beach fill from an offshore borrow site are becoming increasingly common in coastal areas as areas of high development become susceptible to the erosive forces present. Numerous beach nourishment projects have been conducted along the east coast of Florida since the 1960's by local, State and Federal agencies as well as private interests. Depending on circumstances such as the methods being utilized to alleviate the coastal erosion and ensuing storm damages and the existing ecological and socio-economic conditions, it is difficult to gauge the net cumulative effects of these actions. The scientific literature generally supports that individual beach fill projects, if planned properly, have short-term and minor adverse ecological effects, however, no studies are known to consider regional or national cumulative impacts of these projects on resources of concern.

The potential cumulative impacts of dredging operations for beach renourishment within this section are examined in light of other activities in the immediate dredge area and surrounding area that yield incremental impacts of various magnitudes and durations. These include: commercial fishing, recreational fishing, military activities, natural events and other activities which disturb the benthic communities and which directly impact organisms which utilize the benthos as prey. In addition, impacts on physical processes such as repeated removal of sediments from a shoal and resulting natural processes should be examined.

Table 10 provides a brief summary of the recent past and active projects conducted at the Canaveral Shoals II borrow area and future planned Federal projects, some of which involve 50-year commitments to replenishing the associated beaches. The scope of this table focuses on currently known and completed actions and within the central east coast of Florida that used OCS sand.

Brevard County and PAFB will need sand from Canaveral Shoals II and other prominent shoals on the Federal OCS in the future as current sand sources in State waters are diminished and long-term sand management plans fail to maintain fixed shore lines, requiring nourishment cycles ranging from two to six years over the next 50 years. This does not include emergency nourishments outside the planned nourishment cycle, similar to the projects analyzed in this EA.

The action with the single greatest influence at any one time on Canaveral Shoals II is the removal of sediment from the shoal, resulting in the gradual decrease of the shoals relief and alteration of the habitat provided by the shoal. The 2.0 million yd^3 of sand proposed to be removed from Canaveral Shoals II for placement on the PAFB Shoreline (R53-R75) and the Brevard County North Reach (R1-R53) and South Reach (R118.3-R1.38) represents 12% of the total volume of Canaveral Shoals II current total volume (24.6 $mcyds^3$). Considered in combination with the 2000 PAFB project, which used approximately 650,000 yd^3, and the 2001-2003 nourishment of Brevard County Shoreline Protection Project, North and South Reach, which used in the amount of 4.5 million yd^3, the cumulative volume of sand removed by the Federal and state governments by 2004 will represent 21% of the total volume of useable sand from Canaveral Shoals II. Should Canaveral Shoals be used solely for the remainder of the

Brevard County Shore Protection Project (North and South Reach) nourishment cycle (6 year intervals until 2048), 36% of Canaveral Shoals II total usable volume will be removed.

Table 10. Beach nourishment project conducted, in progress or planned to use Canaveral Shoals II as a sand source.

Project Name	**Constructed Project (R monuments)**	**Miles Constructed**	**Year Constructed/ Last Renourished**	**Quantity of Fill Used Renourishment (Cyds^3)**	**Proposed Renourishment Date**	**Quantity of Sand Fill (Cyds^3)**	**Next Scheduled Renourishment**
Brevard - North Reach*	R1-R53	9.40	2001	2,800,000	2005	952,000	2007
Brevard - South Reach*	R118-R138	3.80	2003	1,100,000	2005	723,000	2008
Patrick Air Force Base	R-53-R70	3.0	2000	560,000	2005	400,000	Unknown

* Project with a 50 year life span.

In 2001, ACRE completed a numerical modeling study, using STWAVE, which examined the potential for negative impacts to coastal and nearshore environments, particularly from alterations to the local wave and sediment transport regime, due to long-term dredging and significant removal of sand from shoals offshore southern New Jersey, southeastern Virginia (Sandbridge Shoal), North Carolina (north of Oregon Inlet), and Cape Canaveral, Florida.

For the Canaveral Shoals borrow site, a total volume of 26 million cubic meters (34 million cubic yards) over an area of 5 million square meters was numerically excavated to a depth of 5.2 meters. Figures 16 and 17 illustrate modeled wave height changes between existing and post-dredging conditions for the modeled excavation. Using this information, sediment transport potential was modeled and calculated (Figure 18).

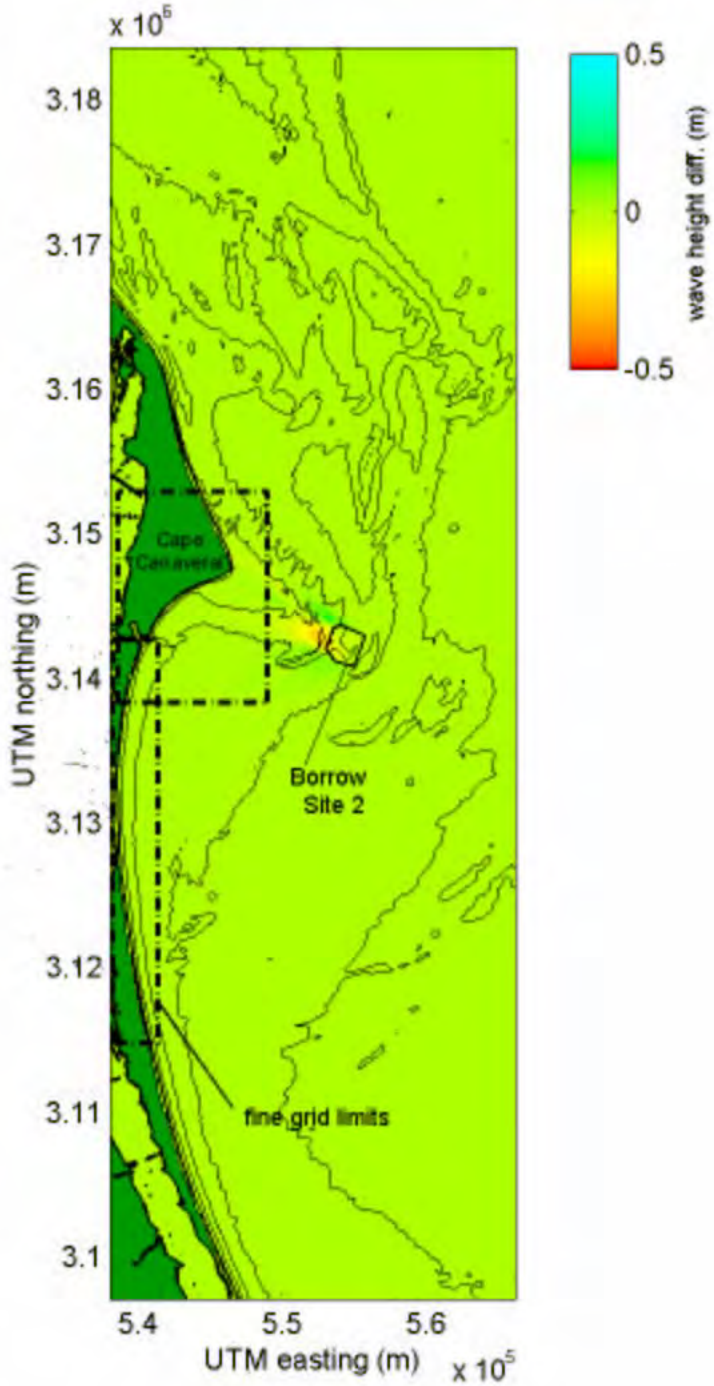

Figure 16. Plot of wave height change between existing and post-dredging (.=*Hpost-Hpre*) conditions at borrow site at Canaveral Shoals, (*Hs*=1.0 m, *Tpeak*=7.7 sec, è*peak*=100 deg).

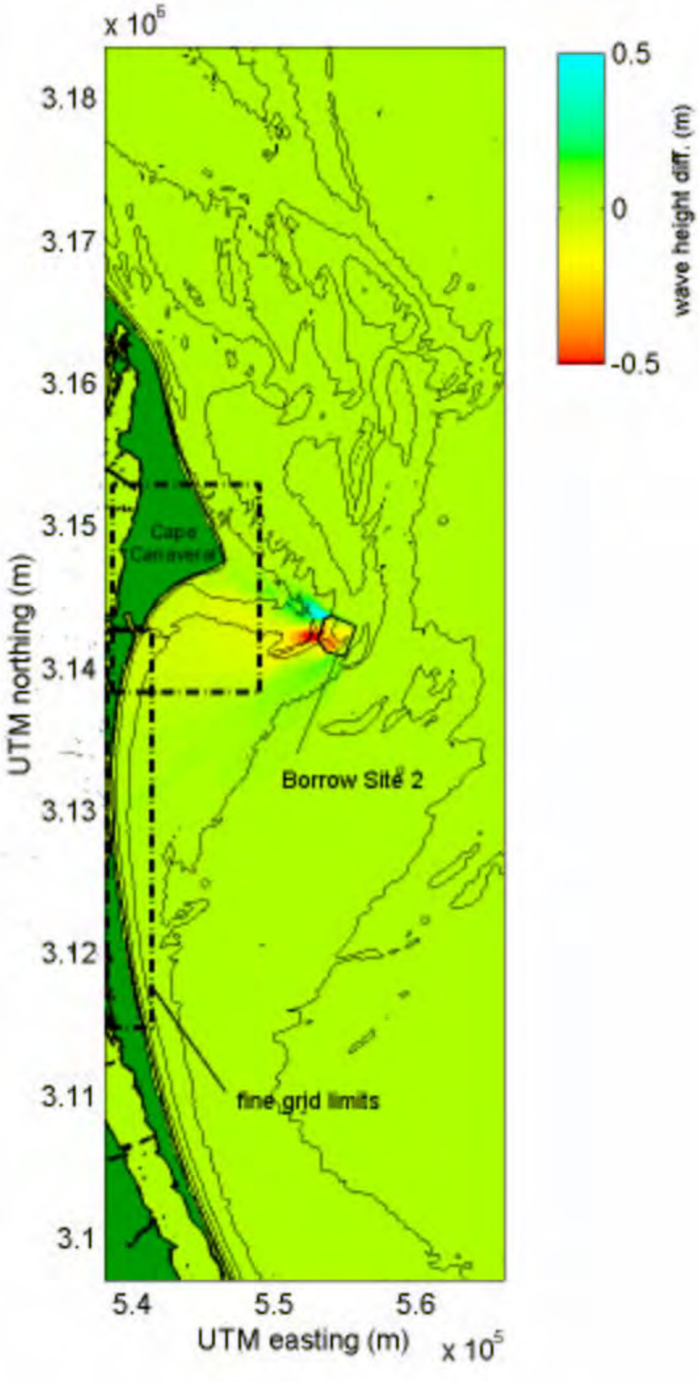

Figure 17. Plot of wave height change between existing and post-dredging (.=*Hpost-Hpre*) conditions at borrow site at Canaveral Shoals, (*Hs*=1.6 m, *Tpeak*=14.3 sec, è*peak*=65 deg).

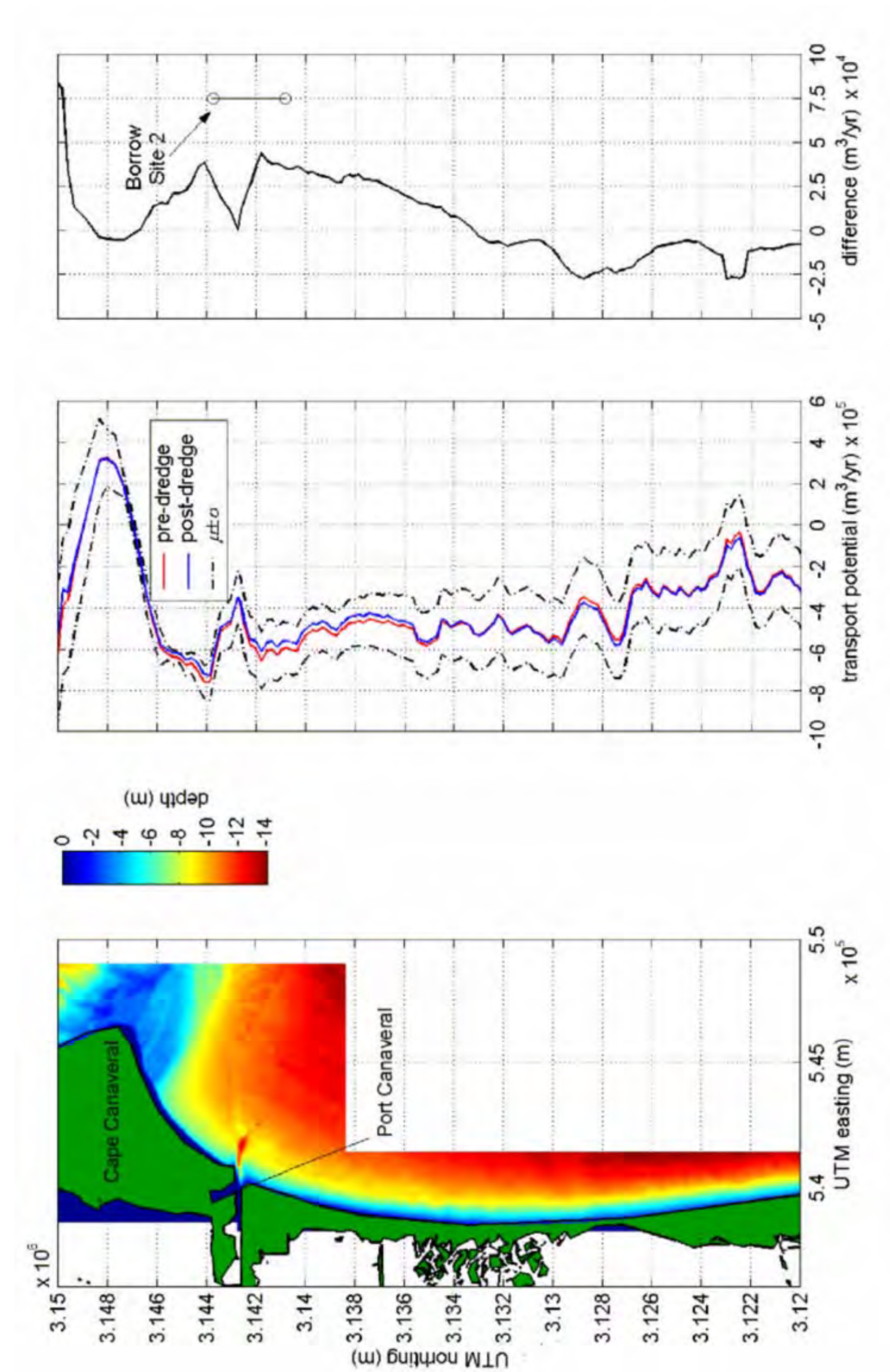

Figure 18. Plot of modeled net transport potential for the area offshore Cape Canaveral, Florida.

For the modeled excavation illustrated in Figure 16, maximum wave height increase resulting from dredging the borrow site is 0.2 m, and the maximum decrease in the shadow zone of the site is 0.3 m. The overall area of influence of this borrow site extends approximately 14 km north of the Cape to about 4 km south of Port Canaveral. Similar wave difference results are illustrated for the wave conditions in Figure 17. Maximum changes in post-dredging wave heights were ±0.7 m, which are substantially greater than changes observed at previous sites. The area of greatest wave height increase occurs at the northwest corner of the site. Wave heights do not increase by the same amount at the southwest corner, likely due to the geometry and bathymetry of the site.

Deeper excavation depths at the northwest corner cause a greater degree of wave refraction. The alongshore extent of influence is similar to that of the earlier case (Figure 16), but it is shifted slightly southward due to the different direction of wave propagation. However, for all wave simulation cases, the impact of borrow site excavation on wave height and direction changes was minor relative to natural variability of the local wave climate and transport regime.

Model output for the region south of Port Canaveral illustrates that in the area of greatest impact from the borrow site, the significance envelope is approximately ±20% of the mean computed net sediment transport potential. The maximum modeled change for post-dredging conditions at the borrow site is about a 40,000 m3/yr *decrease* in south directed transport, just south of Port Canaveral. Thus, the modeled difference is within the sediment transport significance envelope using the criteria developed by Kelley et al, 2001 and Kelley et al, 2004. Overall, it was determined that no significant changes in longshore sediment transport potential would result from the modeled borrow site configuration for the Canaveral Shoals area.

Impacts associated with removing 2.5 million cubic yards of OCS sand for the Brevard County and PAFB proposed projects when added to impacts from past projects and potential effects from planned projects will not likely affect the geomorphologic integrity of Canaveral Shoals II. However, if large-scale borrow projects are undertaken which are not presently planned for and that flattening the shoal or result in pit formations, the shoal's habitat functions may be compromised and could affect fisheries and EFH. Because this prominent shoal habitat will likely serve as the OCS sand source for many of the current and planned future projects, continued dredging may cause some minor and temporary loss of food source and may affect demersal or bottom-feeding EFH species, possibly resulting in moderate impacts. Cumulative loss of these habitats can be avoided by not dredging deep holes, leaving similar sandy substrate (with 6 feet of sand or more) for recruitment, and cycling subsequent renourishments at two to three year intervals.

Some nearshore fishery habitat may be affected over time. Nearshore hardbottom located within the PAFB project area and in the Mid Reach, an area directly north and south of the proposed projects has been designated as EFH. This hard bottom provides habitat for an array of EFH and non-EFH species that could be adversely affected by the migration of sand from the placement site seaward and the longshore transport of sand away from the emplacement area. Such transport could potentially cover part or all of any hard bottom within the nearshore areas. Cumulative loss of hard bottom outcrops is being reduced by confining sand placement landward of the mean high water in areas where outcrops existing in the nearshore. Additionally, emplacement of sand will end in a 500 ft taper as it approaches identified rock outcrops. Post construction monitoring surveys of possibly affect hard bottom areas will be performed at one year intervals for seven years to monitoring long-term indirect effects. The additive effects of the past, present and future nourishment projects are expected to be minor to moderate.

Activities associated with commercial and recreational fisheries could affect pelagic resources and benthic environmental associated with Canaveral Shoals II. Mortality of by catch (non-targeted species) associated with gillnet fishing for spiny dogfish and weak fish could affect potentially reduce the population numbers of non-targeted organisms, sublegal-size fish and prey species. Many commercially targeted fish species such as Atlantic croaker are caught by rod and reel or hand line. Associated effects include mortality of catch released because of size limits or species prohibitions. If anchoring takes place in the Canaveral Shoals II area, bottom disturbance could also occur. Trawl fisheries (e.g., seatrout) have used this general area in recent years. Traditional bottom trawls can remove bottom dwelling organisms such as brittle stars and urchins as well as plant-like organisms and colonial worm tubes (Collie et al., 2000). Colonial epifauna have also been shown to be less abundant in areas disturbed by bottom trawling. This epifauna provides habitat for shrimp, polychaetes, and small fish that are potential prey species for commercially desirable fish species. Seafloor areas that have been heavily trawled may bear tracks where trawl doors have gouged into the sediment, changing the sediment surface and in other areas the trawl has flattened the sediment surface reducing habitat for target species and their prey. Traditional trawl techniques are known to be nonselective in their catch thus having the potential to reduce both prey species and year classes of targeted species not yet mature.

Recreational anglers also fish for designated EFH species (e.g., tuna, cobia, mackerel) within the vicinity of the borrow area. Mortality of non-targeted species and sub-legal catch associated with rod and reel and spear fishing activities is expected. Additionally, disruption of bottom habitat can occur from the anchoring of recreational boats as benthos and fish caught by the anchor could be destroyed. Repeated anchoring in the same location can lead to patches void of benthic organisms.

Impacts from natural sources such as large meteorological events can also influence the project area as well. From 1997 to 2004 the project area was influenced by three hurricanes and one tropical storm. Storms can increase turbidity, and destroy bottom habitat used by EFH species and their prey resulting in indirect impacts to finfish through changes in the food web. While the magnitudes of such effects range greatly depending on their intensity, usually they are only temporary in nature.

The additive impacts from the currently proposed, past and future nourishments to Canaveral Shoals II when consider with the currently occurring anthropogenic and naturally induced impacts are expected to be minor to possibly moderate.

ALTERNATIVE TO THE PROPOSED ACTION

The MMS considered the following as an alternative to the proposed action:

Do Not Allow Access to Offshore Sands: Under this alternative, Brevard County and PAFB would be denied access to offshore sands. They could either:

(a) reevaluate the projects to choose another alternative method to restore shorelines, or
(b) locate an onshore source of comparable high-quality sand.

Option A would not minimize overall environmental effects because of need to protect the shorelines associated with the Brevard County and PAFB projects by either constructing new or augmenting existing protection mechanisms for the beaches. As well, even if a sufficient amount of high-quality sand is located onshore, Option B is likely to result in increased environmental disruption/effect from the onshore excavation of and overland transport of 2,350,000 cubic yards of sand.

CONSULTATION AND COORDINATION

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APPENDIX D

Minerals Management Service
Environmental Assessment and
Finding of No Significant Impact
Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project (2009)

FINDING OF NO SIGNIFICANT IMPACT

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations implementing NEPA (40 CFR 1500) and Department of the Interior (DOI) regulations implementing NEPA (43 CFR 46), the Minerals Management Service (MMS) and the U.S. Army Corps of Engineers (USACE), Jacksonville District, as cooperating agencies, prepared an environmental assessment (EA) to determine whether the issuance of a negotiated agreement for the use of OCS sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project would have a significant effect on the human environment and whether an environmental impact statement (EIS) should be prepared. The MMS has reviewed this EA and analyses incorporated by referenced therein and determined that the potential impacts of the proposed action have been adequately addressed.

The MMS's proposed action is the issuance of a negotiated agreement, and its purpose is to authorize use of an offshore borrow area so that the project proponents, the USACE and local sponsor Brevard County, can obtain the necessary sand resources for a beach restoration project. Public Law 103-426 gives the MMS the authority to convey on a noncompetitive basis the rights to OCS sediment resources for use in beach nourishment projects. The project is needed to reduce shoreline erosion and protect valuable property along the South Reach coastline in Brevard County, Florida. The Brevard County Shore Protection Project was authorized for initial and maintenance construction by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303.

In 1996, the USACE programmatically evaluated potential environmental effects resulting from the proposed action and alternatives to the proposed action in its *Brevard County Shore Protection Feasibility and Environmental Impact Statement* (EIS). In 1998, the USACE prepared an *Environmental Assessment: Canaveral Shoals II* to evaluate the potential effects of using the Canaveral Shoals II borrow area, not previously evaluated in the 1996 EIS. In 2005 the MMS prepared an *Environmental Assessment, Issuance of a Non-competitive Lease for Canaveral Shoals II* incorporating additional environmental information, primarily about potential impacts to physical processes and essential fish habitat resulting from. Both EAs tiered from the 1996 EIS and were used by the MMS to support leasing decisions in 2002 and 2005. This EA incorporates by reference those analyses that have been determined to still be valid and augments a subset of analyses in light of new information.

The USACE and MMS identified and reviewed new information to determine if any resources should be re-evaluated, or if the new information would result in significantly different effects determinations. No new information was identified that necessitated a re-analysis of the impacts of proposed action. New information was identified that further supports or elaborates on the analyses or information presented in existing NEPA documents, but it did not change the conclusions of any of those analyses. Based on the analyses in the EA, no new significant impacts were identified that were not already adequately addressed, nor was it necessary to change the conclusions of the types, levels, or locations of impacts described in those documents

Alternatives to the Proposed Action

The only alternative to the MMS's proposed action is no action. However, the potential impacts resulting from the MMS' no action actually depend on the course of action subsequently pursued by the USACE and local sponsor, which could include identification of a different offshore or upland sand source. In the case of the no project alternative, habitat deterioration and coastal erosion continue, and the likelihood and frequency of property and storm damage increases.

Consultations and Public Involvement

The USACE, as the lead Federal agency, and the MMS, as required by statute and regulation, coordinated with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Florida Department of Environmental Protection, and the Florida State Historic Preservation Office in support of this leasing decision. After signature of this Finding of No Significant Impact (FONSI), a Notice of Availability of the FONSI and EA will be prepared and published by the MMS in the Federal Register or by other appropriate means.

Conclusion

The MMS has considered the consequences of the proposed action of entering into a negotiated agreement with the USACE and Brevard County for use of OCS sand from Canaveral Shoals. The MMS jointly prepared and independently reviewed the EA and finds that it complies with the relevant provisions of the CEQ regulations implementing NEPA, DOI regulations implementing NEPA, and other Marine Mineral Program requirements. Based on the NEPA and consultation process coordinated cooperatively by the USACE and MMS, appropriate terms and conditions will be incorporated into the negotiated agreement to avoid, minimize, and/or mitigate any foreseeable adverse impacts.

Based on the evaluation of potential impacts and mitigating measures discussed in the attached EA (Attachment 1), the MMS finds that entering into a negotiated agreement, with the implementation of the mitigating measures, does not constitute a major Federal action significantly affecting the quality of the human environment, in the sense of NEPA Section 102(2)(C), and will not require preparation of an EIS.

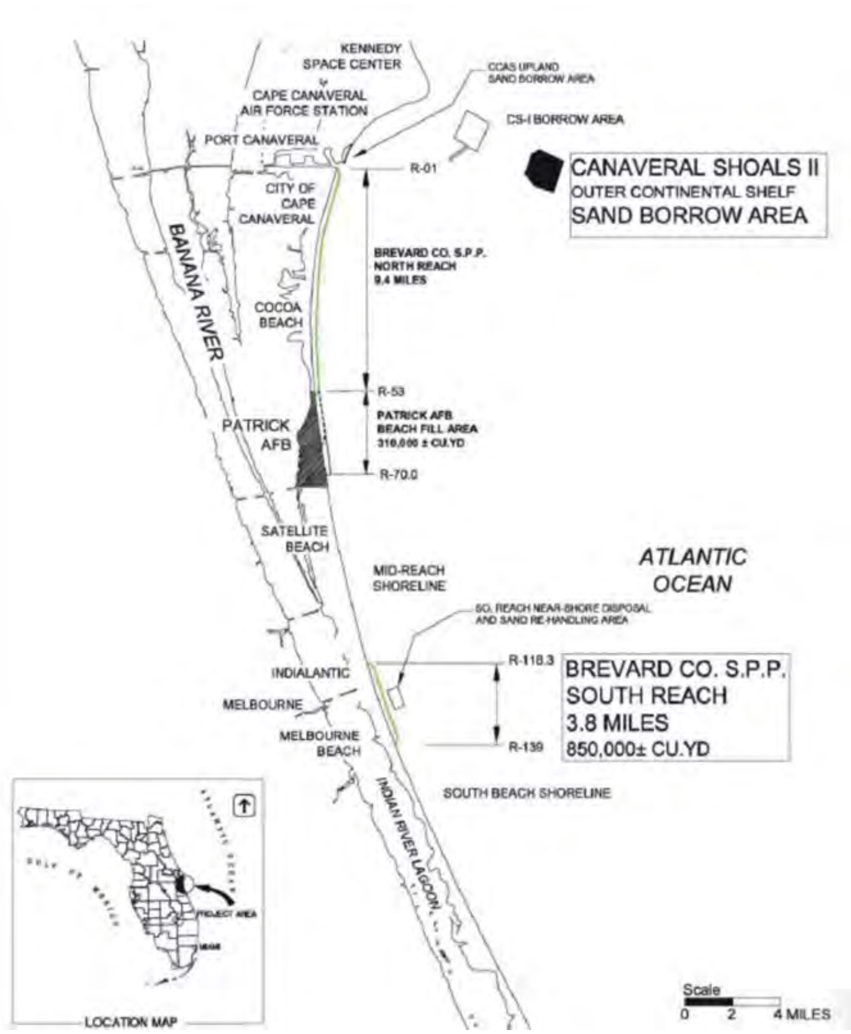
James J. Kendall
Chief, Environmental Division

08/20/09
Date

OCS EIS/EA
MMS 2009-047

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Environmental Assessment



U.S. Department of the Interior
Minerals Management Service
Environmental Division

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Environmental Assessment

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1 INTRODUCTION

This Environmental Assessment (EA) presents an updated evaluation of the potential environmental effects associated with the Minerals Management Service (MMS) authorizing access to 1,300,000 cubic yards of Outer Continental Shelf (OCS) sand from the Canaveral Shoals Borrow Area II (CS II) offshore Cape Canaveral, Florida. The MMS proposes to enter into a noncompetitive agreement with the U.S. Army Corps of Engineers, Jacksonville District and Brevard County, Florida, so that they can extract, transport, and place sand from CS II along 3.8 miles of eroded shoreline known as the South Reach (Figure 1).

Pursuant to the National Environmental Policy Act of 1969 (NEPA), the USACE described the affected environment, evaluated potential environmental effects resulting from the proposed action, and developed and described alternatives to the proposed action in its *Brevard County Shore Protection Feasibility and Environmental Impact Statement* (EIS) (USACE 1996; Appendix A). The USACE prepared an *Environmental Assessment: Canaveral Shoals II* (1998; Appendix B) to evaluate the potential impacts of using the CS II borrow area, not considered in the 1996 EIS. In 2005 the MMS prepared an *Environmental Assessment, Issuance of a Non-competitive Lease for Canaveral Shoals II* (Appendix C) incorporating additional environmental information developed through its Environmental Studies Program. Both EAs tiered from the 1996 EIS and were used by the MMS to support leasing decisions in 2002 and 2005. This EA, prepared by the USACE and MMS as cooperating agencies, supplements these existing environmental analyses. Its purpose is to update potential environmental effects resulting from the issuance of a new negotiated agreement, and to determine if the proposed action, in light of new information, would have a significant effect on the human environment and whether an EIS must be prepared.

The USACE and MMS identified and reviewed new information to determine if any resources should be re-evaluated or if the new information would alter effects determinations. No new information was identified that would necessitate a re-analysis of the impacts of proposed action. This EA further supports or elaborates on the analyses or information presented in existing NEPA documents, but it does not change the conclusions of any of those analyses. Pursuant to 43 CFR 46, the analyses are deemed valid and are incorporated by reference.

The MMS has integrated the process of NEPA compliance with other environmental requirements, including the Coastal Zone Management Act (CZMA), Endangered Species Act (ESA), Magnuson-Stevens Fishery Management and Conservation Act (FCMA), and National Historic Preservation Act (NHPA). The USACE has served in the role of lead federal agency for environmental compliance activities, while the MMS has acted in a cooperating role. Pursuant to Subpart D of the implementing regulations for the CZMA (15 CFR 930), Brevard County provided a consistency concurrence from the Florida Department of Environmental Protection, dated October 8, 2001, indicating the proposed action is consistent with the Florida's Coastal Zone Management Program (Appendix D). The USACE submitted the draft EA in lieu of a biological assessment to the National Marine Fisheries Service (NMFS) on May 14, 2009 to initiate informal consultation for the recently listed smalltooth sawfish. The potential impacts on sea turtles, North Atlantic right whales, and humpback whales were previously coordinated with NMFS and are covered under 1997 Regional Biological Opinion. On July 30, 2009, NMFS provided written concurrence that the proposed action may affect, but is not likely to adversely affect smalltooth sawfish (Appendix E). The draft EA was also submitted to the U.S. Fish and Wildlife Service (FWS) on May 15, 2009 to re-initiate formal consultation with regard to nesting sea turtles and the West Indian manatee. No critical habitat for piping plover or beach mouse is documented in the highly-developed South Reach project area. On June 18, 2009, the FWS issued a biological opinion, concurring with the USACE's effects determination on nesting sea turtles and manatee (Appendix F). The USACE consulted with NMFS concerning Essential Fish Habitat in late 2004 using existing NEPA documents; a supporting detailed assessment of Essential Fish Habitat was provided in the MMS EA (2005). NMFS issued Conservation Recommendations on January 12, 2005 focusing on protecting sensitive nearshore rock habitat and communities (Appendix G). Post-construction monitoring surveys have been performed annually from 2006 through 2008 to monitor potential impacts. Results indicate that the nearshore rock habitat and communities have not been adversely affected by placement of sand on the South Reach. In its May 14, 2009, correspondence to NMFS, the USACE and local sponsor committed to monitor nearshore rock in post-construction years 1, 2, 3, and 5. The USACE coordinated Section 106 compliance efforts with the Florida State Historic Preservation Officer (SHPO) in 2001. The SHPO confirmed eight targets as debris from Air Force or NASA programs and suggested they could be eligible for listing in the National Register (Appendix H).

2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Brevard County Shore Protection Project is authorized by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303, to reduce damage to structures and shorefront property related to erosion and storms. Initial construction of the South Reach segment was completed in 2002 and 2003 and involved the placement of approximately 1.6 million cubic yards of sand on the beach. The South Reach was last renourished in 2005 under authorization of the Flood Control and Coastal Emergencies Act. Since 2005, storm activity has severely eroded this portion of the Brevard County shoreline. Tropical Storm Fay, in particular, stalled over Brevard County in 2008 and caused extensive beach erosion along the South Reach. The proposed action is needed to authorize access to an additional 1,300,000 cubic yards of OCS sand from CS II to re-nourish the South Reach.

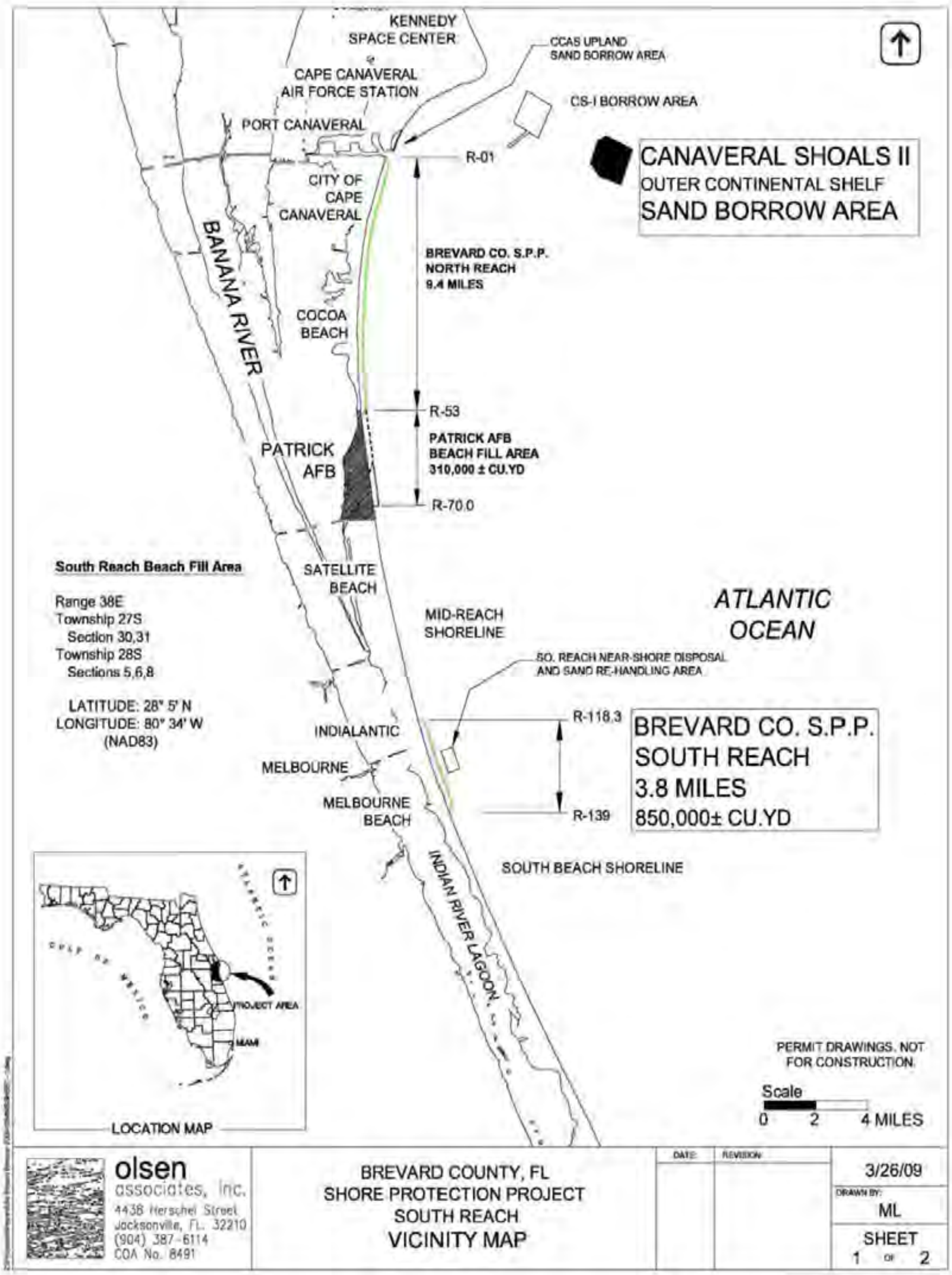
3 DESCRIPTION OF THE PROPOSED ACTION

The MMS's proposed action is the issuance of a negotiated agreement to authorize use of OCS sand from the CS II borrow area. The connected federal action undertaken by the USACE is the maintenance construction, including dredging, transport, and placement of sand. A detailed description of the project and project area can be found in the previous EAs (USACE 1998; MMS 2005). In summary, CS II is an open ocean borrow site, roughly 5 miles from its nearest landward point (Cape Canaveral Air Force Station). It is approximately 6,000 x 6,500 feet with existing depths ranging from -11 to -42 feet. From the core borings and sediment analysis, the substrate of the site consists of beach quality sand (medium sand with a significant shell fraction) which meets the criteria of the Florida Sand Rule. Approximately 20 million cubic yards of sand are currently available in CS II. The South Reach includes 3.8 miles of actively eroding shoreline in the vicinity of Melbourne Beach and Indialantic.

The proposed action would occur between November 1 and April 30 in order to avoid most sea turtle nesting activities. As in the past, the proposed South Reach project would be reconstructed with one or more hopper dredges. Hopper dredging is expected to occur over approximately 163 days to obtain the necessary volume. The time estimated to complete each dredge and placement cycle, including idle time, is approximately 12 hours per load. Hopper dredging would be limited to a relatively small footprint in the designated borrow area. Efficient dredging practice entails excavating sand in 2 to 5 foot thicknesses along relatively straight and adjacent runs along the seabed. The sand dredged from the hydraulic suction heads would be discharged into the vessel's open hopper, and most of the seawater effluent would spill over the sides of the hopper. The hopper dredges would transport the dredged material a distance of approximately 24 miles to pump-outs positioned approximately 0.5 to 1 mile from shore (USACE 1998); the material would be pumped directly from the hopper barge via pipeline to the beach. The placement and relocation of the nearshore mooring buoys used during pump-out may involve the use of tender tugboats and a pipeline hauler or crane. Alternatively, dredged material may be placed by the hopper dredges into previously permitted rehandling areas and henceforth dredged from the rehandling area and pumped onto the beach via a cutterhead pipeline dredge. The permitted 4,500-ft alongshore by 2,450-ft wide rehandling area is located centrally located along the project beach fill area between 2,600- and 5,050-ft from shore. Use of the rehandling area is at the Contractor's option.

The beach construction template would include a 100 foot wide berm with an elevation of +8.1 feet NGVD (with +/- 0.5-ft tolerance) at its seaward edge and elevation +9.6 at its landward edge with a 1V:67H slope. Landward of the sloped segment, the berm (elevation 9.6 feet) is flat and of variable width, depending on the position of the existing beach. The landward end of the template will include a dune feature with crest elevation +10.6 feet with 1V: 10H seaward and landward facing slopes. The landward end of the template toes into the existing beach profile at +8.9 ft. This berm has been designed to be turtle friendly. Unlike a typical beach berm, the seaward elevation of this berm would be lower in order to reduce potential scarping resulting from storm activity or the natural equilibration of the beach. Scarping, the formation of steep slopes, can prevent sea turtles from being able to crawl up onto the beach and nest. This design also reduces ponding of water. The use of up to three bulldozers and/or pipeline movers and two trucks is projected during beach shaping activities.

Figure 1. Brevard County, Florida Federal Shore Protection Project Area



4 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Pursuant to the NEPA, the proposed action is evaluated to determine the potential environmental effects that may result from issuing a noncompetitive agreement to authorize use of OCS sand resources for beach nourishment. As previously stated, this EA supplements the EIS prepared by the USACE in 1996 and EAs prepared by the USACE in 1998 and the MMS in 2005. It provides additional information on the status of and potential effects to archaeology/cultural resources, air quality, and threatened and endangered species (sea turtles, whales, manatees, and smalltooth sawfish). The reasons for providing this additional evaluation include the following: 1) results of diver surveys conducted within CS II and measures proposed to protect identified cultural resource sites were not described in the previous assessments; 2) there was no evaluation of air quality in the 2005 assessment, and the air quality assessment provided in the 1998 EA needs refinement; 3) interactions between sea turtles, whales, manatees and hopper dredges were documented during the 2005 dredging event; 4) new information about as the potential impacts to nesting sea turtles is available and additional protective measures are recommended; and 5) new information on the recently listed smalltooth sawfish is available and new protective measures for this species are recommended.

Previous NEPA documents (USACE 1996; USACE 1998; MMS 2005) evaluated impacts to other resources including aesthetics, beach and coastal habitat, benthic resources, birds and wildlife, fish and essential fish habitat, non-threatened marine mammals, physical oceanography, recreation and tourism, threatened and endangered species, water quality, and cumulative impacts. These evaluations have been determined to be still valid since the project limits and construction methodologies, scope, and timing have remained the same, the information presented in these evaluations is otherwise valid, and relevant Federal laws have not changed in a manner that would require re-evaluation of these resources. The existing analyses adequately address most of the potential environmental effects of the proposed action and are incorporated by reference and summarized in Table 1.

Table 1: Summary of Environmental Impacts and Mitigation

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	MITIGATION (See 8.0 for Proposed Mitigation Measures)
AESTHETICS	Temporary adverse visual impact from construction equipment; long-term positive visual impact from restored beach (5.27)	Not evaluated.	Not evaluated.	Not evaluated.	
AIR QUALITY	Temporary and localized decrease in air quality from construction-equipment emissions. (5.33)	Temporary and localized decrease in air quality from construction-equipment emissions. (5.1)	Not evaluated.	Temporary and localized decrease in air quality from construction-equipment emissions. Estimated emissions within national ambient air quality standards.	
ARCHAEOLOGY/ CULTURAL RESOURCES	No historic or cultural properties identified in the placement area along South Reach. (5.19)	Sixteen targets detected within CS II. No effect with designation of protective buffer zones. (5.10)	No effect since investigations indicate no prehistoric sites within CS II or immediate placement area (p. 4)	Diver investigation revealed 8 space debris sites of cultural significance within or in the vicinity of CS II. No effect with designation of protective buffer zones.	Implement 200 foot avoidance buffer on 8 identified space debris sites; implement chance find clause as necessary. Implement dredge with positioning equipment.
BEACH COMPATIBILITY / COASTAL HABITAT	Stabilization of eroding beach and dune habitats (5.01).	No adverse impacts are anticipated. (5.4)	Not evaluated.	Not evaluated.	Implement best construction practices, beach sampling, and beach profiling requirements of Florida DEP Consistency Certification.
BENTHIC RESOURCES	Short-term and localized reduction in beach infaunal invertebrates. (5.01)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevation turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals. Recolonization expected to occur. (5.5)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevated turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals and highly adaptive benthic assemblages. Recolonization of physically dominated	Not evaluated.	

			environment expected to occur within 2-3 years. (p. 5-9)		
BIRDS AND WILDLIFE	Short and localized disruption of feeding, foraging, and nesting during construction activities. (5.01) See U.S. FWS Coordination Act Report (1995).	Not evaluated.	Not evaluated.	Not evaluated.	
FISH AND ESSENTIAL FISH HABITAT (EFH)	Short and localized disturbance of surf zone habitat and fish during pump-out and sand re-distribution from elevated noise and Turbidity levels, as well as burial. Potential burial of nearshore coquina and scattered worm rock outcrops by longshore transport. (5.01)	Fish and EFH would be temporarily and locally impacted by dredge activity including sub-lethal and lethal effects related to turbidity, prey availability, and dredge entrainment or burial. Long term disruption not expected due to fish mobility and dredging intervals. (5.9)	Possible entrainment and sub-lethal effects from turbidity, noise, and burial. Effects are expected to be minor because of species mobility, avoidance behavior, and widespread occurrence of comparable habitat. Possible trophic effects from benthic disturbance and locally reduced prey. EFH could be temporarily and locally physically disturbed by dredging or beach shaping activity. Long term suppression not expected due to dredging intervals and widely available habitat. Minor impact to nearshore rock habitat (Habitat of Particular Concern) from burial may be avoided or mitigated with protective measures. (p. 9-24)	Not evaluated.	No beach fill within 50 feet of any coquina or worm rock outcrops and continue monitoring program per NMFS Conservation Recommendations.
NON-THREATENED MARINE MAMMALS	Not evaluated.	No adverse impacts are anticipated because of species avoidance mechanisms, but strikes are possible. (5.8)	Not evaluated.	Not evaluated.	See mitigation for Threatened and Endangered Species.
PHYSICAL OCEANOGRAPHY	Not evaluated.	Minor effects anticipated to incident wave field and longshore transport due to bathymetric modification. Infilling of dredge cuts likely from southerly sediment	Modification of offshore bathymetry may result in minor effects in offshore sediment transport pathways, incident wave field, and longshore transport. Infilling	Not evaluated.	Conduct pre- and post-construction bathymetric surveys to monitor physical changes in borrow area.

		transport. (5.2)	anticipated over long-term. (p.24-39)		
RECREATION AND TOURISM	Significantly increased area for beach recreation; temporary and localized visual and noise impact from construction activities. (5.30)	Local and short-term disruption to navigation. Recreational opportunities and tourism would benefit from beach nourishment. (5.11)	Not evaluated.	Not evaluated.	Publish Local Notice to Mariners.
THREATENED AND ENDANGERED SPECIES	Potential increase of nesting habitat for sea turtles; potential disturbance and take of sea turtles, right whales, and related to beach scarping, lighting, dredge entrainment, and vessel strike. (5.09)	Possible entrainment dredge may lead to injury and mortality sea turtles (5.6). Noise and vessel collision may lead to injury and mortality of marine mammals (5.7). Effects to marine turtles and marine mammals may be avoided or minimized with protective measures.	Dredging may affect, but not likely to adversely affect smalltooth sawfish with approved protective measures. No effect to Johnson’s seagrass or Southeastern beach mouse since no critical habitat in project area. (p.21-24)	Hopper dredging and beach placement may adversely affect marine turtles. Adverse effects to sea turtles, marine mammals, and smalltooth sawfish may be avoided or minimized with protective measures.	Implement terms and conditions of 1) NMFS 1995/1997 Regional Biological Opinions, 2) NMFS 2009 Concurrence, and 3) 2009 FWS BO.
WATER QUALITY	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) in placement area. (5.24)	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) to the water column in borrow area. Accidental spills or toxic materials are not expected. (5.3)	Not evaluated.	Not evaluated.	Monitoring water quality conditions per requirements of Florida DEP Consistency Certification. Implement marine pollution control plan. Ensure compliance with U.S. Coast Guard requirements and U.S. EPA Vessel General Permit as applicable.
CUMULATIVE IMPACTS	Restore beach and ecosystem and prevent property damage. (5.37)	Not evaluated.	Currently proposed, past and future use of CS II and beach nourishments expected to be minor to possibly moderate. Of primary concern are long-term impacts to nearshore hardbottom located north of South Reach. (p.39-46)	Not evaluated.	See mitigation for Fish and Essential Fish Habitat

4.1 Archaeology/Cultural Resources

Underwater surveys and diver identifications have been conducted in the proposed borrow area. This effort is documented in a number of reports dating from 1994, and all of these reports were coordinated with the Florida SHPO.

The 1994 report "*A Cultural Resources Survey of Proposed Borrow Area, Vicinity of Cape Canaveral, Brevard County, Florida*" (DHR file No. 942533) identified six potentially significant targets within CS II. The 1999 report "*A Submerged Cultural Resources Remote Sensing Survey of Four Proposed Borrow Areas and Archaeological Diver Identification and Evaluation of Eight Potentially Significant submerged Targets for the Brevard County Shore Protection Project, Brevard County, Florida*" (DHR Nos. 992156 and 2000-02415) determined that the targets identified in 1994 were not significant, but identified eight additional potentially significant targets in an expanded borrow area. In 2001, a diver investigation was conducted in order to identify these eight targets. The State of Florida asked that an additional six anomalies also be investigated. The results of the diver evaluations revealed that some of these objects were products of the United States space and/or missile programs, one was the remains of a modern fishing vessel, and another was identified as a section of steel cable. The space or missile debris consisted of cylinders of various lengths, some of which were capped with shallow convex-shaped objects. Motor components and ferrous objects were also discovered which were associated with the space program. In one case, a partial label was identified on a motor with information on the manufacturer. It was determined that the motor was a component of a Delta II rocket which was launched on 14 February 1989. The objective of this particular mission was to place a NAVSTAR II-1 satellite into orbit. All of these findings are documented in the 2001 report "*Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project*" (DHR file No. 2001-316). The USACE has determined that these space and missile program objects are potentially significant cultural resources. Additional areas were surveyed in 2002 which is documented in "*A Cultural Resources Marine Remote Sensing Survey of the Offshore Borrow and Re-Handling Areas South Reach Brevard County Shore Protection Project, Brevard County, Florida*" (DHR file No. 2002-06980); however, no anomalies were identified.

In 2001, the SHPO concurred with the USACE determination that the space debris discovered within CS II, while modern, are potentially significant cultural resources. Their association with NASA and the U.S. Air Force missile program suggests that these objects may be potentially eligible for listing in the National Register. As during previous dredging events, these resources shall be protected by requiring the dredging contractor to maintain a buffer zone around each of these sites. Therefore, significant impacts to cultural resources in the borrow area are not anticipated provided the mitigation below is implemented:

<u>Onshore Prehistoric or Historic Resources</u>

If the USACE discovers any previously unknown historic or archeological property, the USACE must immediately notify the MMS of any finding. The USACE will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

Offshore Historic Resources

The eight anomalies shall be avoided during dredging operations by at least 200 feet, as described in Table 2.

Table 2: Archaeological avoidance areas

Target	Area/Block	Amplitude (gammas)	Duration (ft)	FL East State Plane Coordinates NAD 1927 (X /Y Coordinate)	Avoidance Radius (ft)
C2-01	Canaveral Shoals II	422	120	667682/1487363	200
C2-02	Canaveral Shoals II	330	85	670907/1485875	200
C2-08	Canaveral Shoals II	147	140	675523/1482444	200
C2-12	Canaveral Shoals II	51	125	679892/1482496	200
C2-13	Canaveral Shoals II	36	110	681022/1480316	200
C2-14	Canaveral Shoals II	61	165	681364/1480843	200
C2-16	Canaveral Shoals II	52	100	676571/1481617	200
C2-17	Canaveral Shoals II	65	75	670297/1486107	200

If the USACE determines that the anomalies listed in Table 2 cannot be avoided during dredging operations, the USACE shall notify the MMS. The USACE, subject to the availability of appropriations and in accordance with the requirements of applicable law, may conduct further investigations to assess the significance of the objects producing the signatures in accordance with the criteria at 36 CFR Part 60.4, "Criteria for evaluation."

The proposed investigation procedures shall be discussed with the MMS archaeologist prior to commencing fieldwork. At a minimum, this assessment must include an analysis of the age, physical composition, and structural integrity of the object (i.e., wood or metal, intact or dispersed). Measured drawings and/or underwater video or still photographs of the feature shall be made for documentation and submitted with the final "Report of Findings." A "Report of Findings" prepared in accordance with the archaeological report writing standards specified in the MMS Notice To Lessees (NTL) 2005-G07 must be submitted to the MMS for approval within ten work days of the completion of fieldwork.

Offshore Chance Finds Clause

In the event that the dredge operators, discover any archaeological resource while conducting dredging operations in the CSII Borrow Area, the USACE shall require that dredge operations will be halted immediately within the borrow area. The USACE shall then immediately report the discovery to the MMS. If investigations determine that the resource is significant, the parties shall together determine how best to protect it.

4.2 Air Quality

Criteria air pollutant emissions were estimated for the proposed dredging of Federal sand from CS II and placement along the South Reach using estimates of power requirements, duration of operations, and emission factors for the various equipment types. Multiplying horsepower rating, activity rating factor (percent of total power), and operating time yields the energy used. The energy used multiplied by an engine-specific emission factor yields the emission estimate. Operational data from the 2005 nourishment cycle was used to estimate power requirements and duration for each phase of the proposed hopper dredging activity. The horsepower rating of the dredge plant was assumed for each activity as follows: propulsion (3500 hp), dredging (2000 hp), pumping (2000 hp), and auxiliary (1165 hp). Different rating or loading factors were used for dredging, propulsion, and pumping. The estimated duration of dredging was approximately 163 days. The estimated time to complete each dredge cycle, including idle time, was approximately 12 hours per load. It was assumed that about 3,983 yd^3 of material would be moved in each cycle, requiring about 326 loads to excavate enough material to place 1.048 million yd^3 of sand on the beach. The placement and relocation of the nearshore mooring buoys used during pump-out may involve up to two tender tugboats, and a pipeline hauler / crane would also be used. It was assumed that the buoy would need to be moved at most five times during the project, with each move taking approximately 12 hours. It was assumed that a crew/supply vessel would operate daily for four hours as well.

All dredging was assumed to occur at CS II, whereas 60% of hopper transport and crew/supply vessel activities were assumed to occur over state waters or at the placement site. The beach fill related estimates assumed the use of up to three bulldozers/pipeline movers and two trucks, each operating eighty percent of the time for the duration of the project.

Emission factors for the diesel engines on the hopper dredge, barge, tugboats were obtained from EPA's *Compilation of Air Pollutant Emissions Factors, AP-42, Volume 1* (2002). Emission factors for tiered equipment used in beach construction were derived from NONROAD model (5a) estimates. Total project emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter (PM) are presented in Table 3.

The proposed action may result in small, localized, temporary increases in concentrations of NOx, SO_2, CO, VOC, and PM. Since the project is located in an attainment area, there is no requirement to prepare a conformity determination. Nonetheless, estimates were tallied to determine the portion of total emissions that would occur within state limits. Since the Federal waters attainment status is unclassified, there is no provision for any classification in the Clean Air Act for waters outside of the boundaries of state waters. Calculating the increase in emissions that may occur within the state limits was done by subtracting out the dredging-related and 40% of transport emissions, since those activities would take place entirely over Federal waters.

Table 3: Estimated emissions for the preferred alternative (tons per year)

Activity	Emissions (tons)					
	NOx	**SO2**	**CO**	**VOC**	**$PM_{2.5}$**	**PM_{10}**
Dredge Plant (Hopper)						
Dredging/Operation	64.2	1.1	14.7	1.7	1.0	1.1
Turning/Sail	37.7	0.6	8.6	1.0	0.6	0.6
Pump-out	8.7	0.1	2.0	0.2	0.1	0.1
Idle / Connect-Disconnect	9.1	0.2	2.1	0.2	0.1	0.2
Supporting Offshore Activities	3.9	0.1	0.9	0.1	0.1	0.1
Beach Fill	12.4	2.3	5.9	0.9	1.0	1.0
Total Emissions	135.9	4.3	34.2	4.1	3.0	3.0
Total Emissions within State	53.5	3.0	15.3	1.9	1.7	1.7
Total Emissions at CS II	82.4	1.4	18.9	2.2	1.4	1.4
2002 Brevard County Emissions Nonpoint + Mobile (Point and Nonpoint + Mobile)	34,251 (46,403)	10,318 (25,865)	216,995 (218,319)	44,902 (45,561)	5,548 (6,712)	11,989 (13,350)
Brevard County 2002 emissions from EPA National Emission Inventory http://www.epa.gov/air/data/						

Emissions associated with the dredge plant would be the largest contribution to the inventory. However, the total increases are relatively minor in context of the existing point and nonpoint and mobile source emissions in Brevard County (Table 3). Projected emissions from the proposed action would not adversely impact air quality given the relatively low level of emissions and the likelihood for prevailing offshore winds. With the proposed action, the criteria pollutant levels would be well within the national ambient air quality standards.

4.3 Threatened and Endangered Species

Sea turtles - Offshore

In 2005 the Weeks Marine hopper dredges *BE Lindholm* and *RN Weeks*, as well as the subcontracted Bean Stuyvesant hopper dredge *Stuyvesant*, were used to excavate Federal sand from CS II and transport it to the South Reach placement area. The dredging was performed in compliance with the 1997 NMFS regional biological opinion (RBO) concerning the use of hopper dredges in channels and borrows areas along the Southeast U.S. Atlantic coast. Terms and conditions within the RBO include the use of rigid turtle deflectors, which are installed on the dragheads of the dredge. The deflectors move, or deflect, turtles which may be resting on the bottom away from the draghead. All dredge activities were monitored by two endangered species observers which were approved by the NMFS. The observers periodically checked the intake screens leading to the hopper for entrained sea turtles and their parts.

A total of 128 “dredge days” were observed in 2005. During this time frame, three loggerhead sea turtle (*Caretta caretta*) mortalities, or take, were documented. All occurred on the dredge *Lindholm*. Given the efficiency of the screening on the dredges, it is unlikely that additional turtle mortalities went unrecorded. According to the observers, the take numbers were not considered particularly high given the location, season, and number of turtle observations. Each of the mortalities were coordinated with NMFS and were applied to the USACE-South Atlantic Division authorized annual incidental take limit of 35 loggerhead sea turtles associated with hopper dredging.

The USACE has previously determined that the use of a hopper dredge may affect sea turtles (USACE 1998). NMFS has concurred with this determination in their 1997 RBO and July 30, 2009, concurrence, and determined that take resulting from hopper dredging activity will not jeopardize the continued existence of any sea turtle species (Appendix E). In compliance with the NMFS RBO, the following protective measures, in summary, shall be implemented to minimize the risk of taking sea turtles during proposed hopper dredging activities at CS II:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as sea turtles, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the Endangered Species Act. The Contractor may be held responsible for any threatened and endangered species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of sea turtles.

- Any take concerning a sea turtle or sighting of any injured or incapacitated sea turtle shall be reported immediately to the USACE contracting officer.

- Hopper dredge drag heads shall be equipped with rigid sea turtle deflectors which are rigidly attached. No dredging shall be performed by a hopper dredge without an installed turtle deflector device approved by the USACE contracting officer.

- The Contractor shall install baskets or screening over the hopper inflow(s) with no greater than 4" x 4" openings. The method selected shall depend on the construction of the dredge used and shall be approved by the contracting officer prior to commencement of dredging. The screening shall provide 100% screening of the hopper inflow(s). The screens and/or baskets shall remain in place throughout the performance of the work.

- The Contractor shall install and maintain floodlights suitable for illumination of the baskets or screening to allow the observer to safely monitor the hopper basket(s) during non-daylight hours or other periods of poor visibility. Safe access shall be provided to the inflow baskets or screens to allow the observer to inspect for turtles, turtle parts or damage.

- The Contractor shall operate the hopper dredge to minimize the possibility of taking sea turtles and to comply with the requirements stated in the Incidental Take Statement provided by the NMFS in their RBO.

- The turtle deflector device and inflow screens shall be maintained in operation condition for the entire dredging operation.

- When initiating dredging, suction through the drag heads shall be allowed just long enough to prime the pumps, and then the drag heads must be placed firmly on the bottom. When lifting the drag heads from the bottom, suction through the drag heads shall be allowed just long enough to clear the lines, and then must cease. Pumping water through the drag heads shall cease while maneuvering or during travel to/from the disposal area.

- Raising the drag head off the bottom to increase suction velocities is not acceptable.

- The Contractor shall keep the drag head buried a minimum of 6 inches in the sediment at all times.

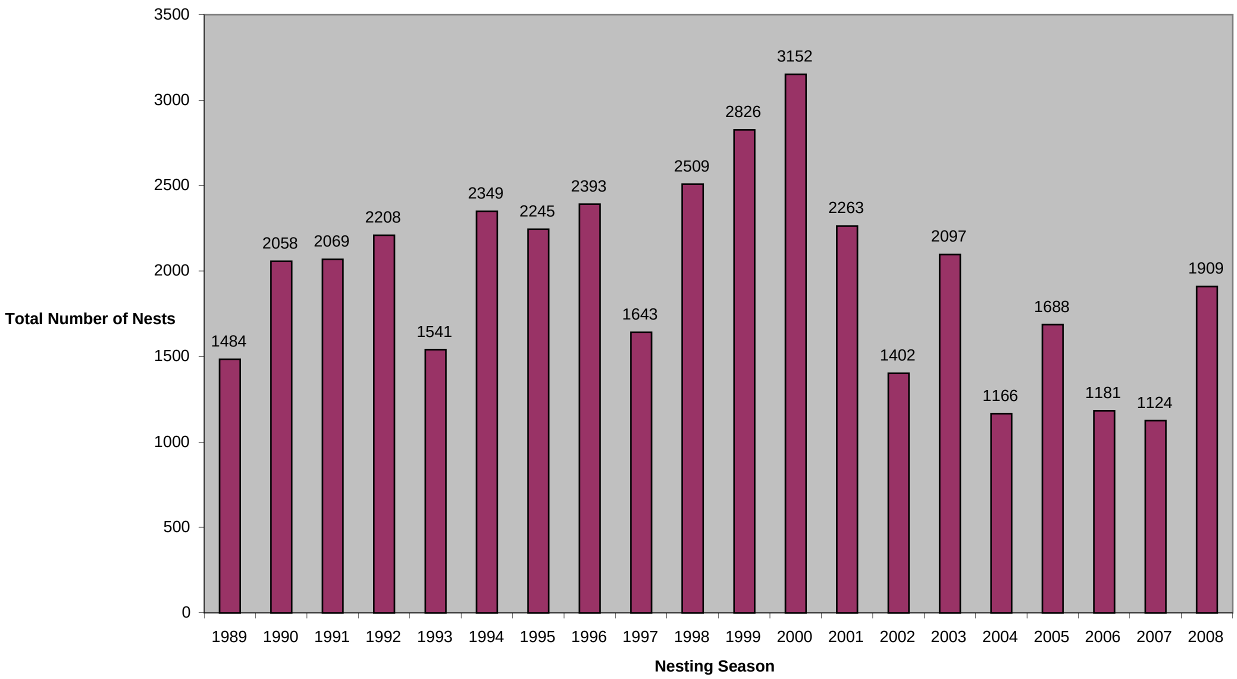
- During turning operations the pumps must either be shut off or reduced in speed to the point where no suction velocity or vacuum exists.

The entire suite of terms and conditions to implement the prudent measures required by NMFS is provided in the NMFS 1995 and 1997 Regional Biological Opinions of Hopper Dredging along the South Atlantic Coast. The 1997 RBO authorized annual incidental take, by injury or mortality, of 35 loggerheads, 7 Kemp's ridley, 7 green turtles, and 2 hawksbill. Any takes will be counted against the regional incidental take statement.

Sea Turtles - Onshore

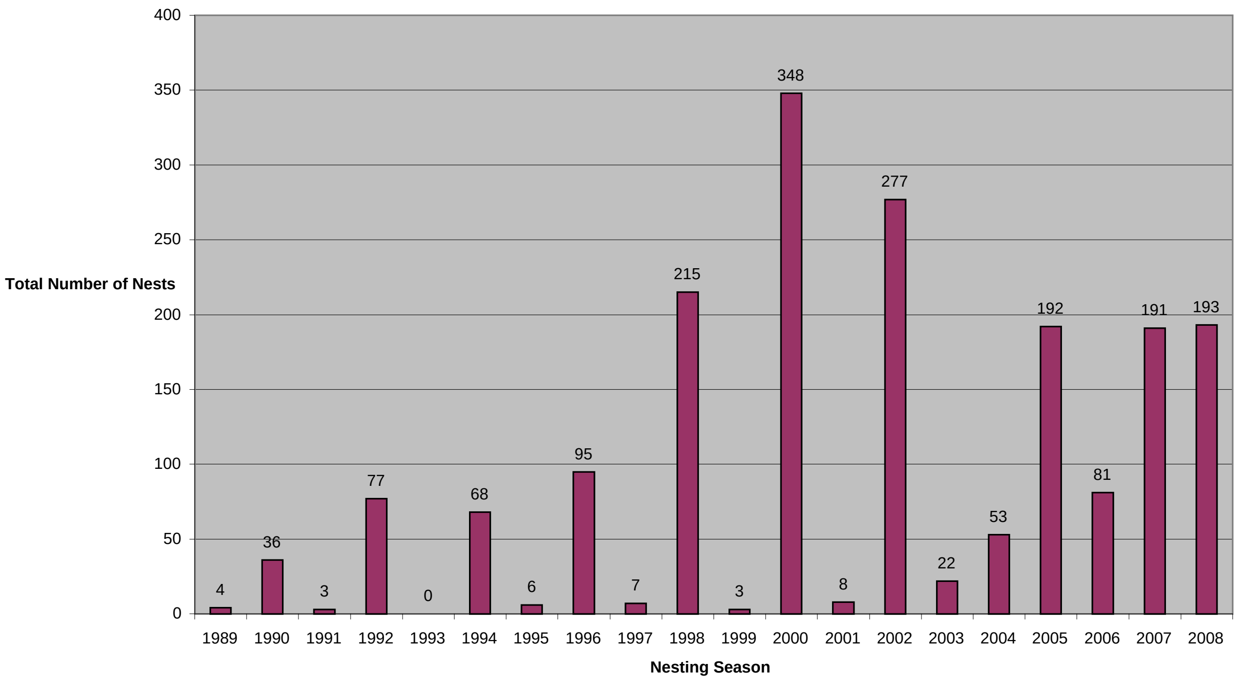
Three sea turtle species are known to nest within the South Reach beach placement area. In order of abundance, they are the loggerhead, green, and leatherback sea turtles. Densities of loggerhead turtle nests reported along the South Reach are shown on Figure 2. Nest densities recorded from the South Reach area ranged from 185 to 518 nests per km between 1989 through 2008 nesting seasons (Ehrhart and Williamson 2009).

Figure 2. Loggerhead Nest Totals for the South Reach, 1989 through 2008



Densities of green turtle nests reported along the South Reach from 1989 through 2008 are shown in Figure 3. Nest densities recorded from the South Reach area ranged from 0 to 57 nests per km during this time frame (Ehrhart and Williamson 2009).

Figure 3. Green Turtle Nest Totals for the South Reach, 1989-2008



Leatherback nests in Brevard County are relatively few in number when compared with Florida beaches to the south, especially Martin and Palm Beach Counties (NMFS and USFWS, 1992; B. Brost 2002, pers. comm.). Leatherback nesting within the South Reach ranged from 0 to 7 between 2005 and 2008 (Ehrhart et al. 2006-2009).

Results of prior annual monitoring of sea turtle nesting activity in Brevard County on beaches nourished in 2000-03 and 2005 with offshore borrow sand from Canaveral Shoals II, as proposed for this project, indicate that the fill material is suitable for sea turtle nesting purposes and compatible with sea turtle nesting behavior and hatching success. The hatchling success ratio in the South Reach study area was similar and reasonably high for loggerheads (78.25%), green turtles (70.55), and leatherbacks (66.23%) (Ehrhart and Hirsch 2008). These results were reported to be comparable to many Florida beaches and exceeded documented statewide means of 50.77% for hatching and 48.03% for hatchling emergence success for loggerhead sea turtles (Geomar 2008). These and prior-year data provide evidence of the overall high quality of the fill material as an incubation medium (Ehrhart and Hirsch 2008) which may be attributed to the relatively coarse sand grain size of the fill material that includes well-graded shell fragments which may have prevented the hydraulically placed fill material from excessive compaction that would otherwise adversely affect sea turtle nesting success (Geomar 2008).

The USACE has determined that the beach placement of dredged material may affect nesting sea turtles, and the U.S. Fish and Wildlife Service (USFWS) issued a biological opinion, dated June 18, 2009, concurring with this determination (Appendix F). The FWS determined that no more than the following types of incidental take may result from the proposed action: (I) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female tunics attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The terms and conditions of the Biological Opinion shall be implemented in order to avoid or minimize take of sea turtles. These conditions, in abbreviated summary, include:

- Use of beach quality sand suitable for sea turtle nesting, incubation and hatchling emergence.
- No construction activity or equipment on the beach from May 1 through October 31.
- Daily early morning nesting surveys and restricted nest relocation and/or avoidance beginning March 1 if beach construction activities occur between March 1 and April 30.
- Daily early morning nesting surveys beginning 65 days prior to construction, through September 30 for beach construction activity from November 1 through 30.
- Measurement of sand compaction and tilling of the nourished beach if required, prior to March 1, after construction and for three subsequent years.
- Visual surveys for escarpments after construction and for three subsequent years, and removal of escarpments prior to March 1 (and thereafter, pursuant to coordination with the USFWS and FWC) that interfere with sea turtle nesting.
- Requisite meetings between the construction contractor, USFWS, FWC and marine turtle State permit holder.
- Minimization of storage of construction equipment upon the beach from March 1 through April 30 and from November 1 through 30.
- Avoidance and minimization of lighting of the beach and nearshore waters, and upon offshore equipment, from March 1 through April 30 and from November 1 through 30.

Whales

Endangered species observers recorded one right whale (*Eubalaena glacialis*) and approximately four humpback whales (*Megaptera novaeanglia*) during hopper dredging activities at CS II in 2005. The sighting of the right whale occurred during the month of March, and the observers felt that this was unusually late in the winter calving season for the species. Information on the sighting was also reported to the USN Whale Sighting Node, and the information was then relayed across the pager system that alerts military and merchant mariners to right whale locations. None of the dredging activities had any adverse effects on these species.

The USACE has previously determined that hopper dredging activities may affect, but is not likely to adversely affect protected species of whales. With implementation of the necessary protective measures, NMFS determined in the July 30, 2009 concurrence that the risk to North Atlantic right whales and humpback whales is discountable (Appendix E). In compliance with the NMFS RBO, during the period December through March, barges or dredges moving through project waters shall implement the following precautionary measures in order to protect whales:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as whales, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing whales, which are protected under the Endangered Species Act and the Marine Mammal Protection Act. The Contractor may be held responsible for any protected species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of whales.

- During the period 1 December through 30 March, daily aerial surveys within 15 nm of the dredging and placement sites will be conducted by others to monitor for the presence of the right whale. Right whale sightings will be immediately communicated by marine radio to the dredging contractor. During evening hours or when there is limited visibility due to fog or sea states greater than Beaufort 3, the tug/barge or dredge operator shall slow down to 5 knots or less when traversing between areas if whales have been spotted within 15 nautical miles (nm) of the vessels path within the previous 24 hours.

- If a right whale or any other species of whale is reported within the area, then the vessel operator will be required to follow the NMFS' Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners. The tug/barge or dredge operator shall maintain a 500-yard buffer between the vessel and any whale.

- If a stranded/injured/incapacitated whale is observed within the construction site, the contractor is requested to immediately contact the NMFS Whale Stranding Network pager number at 305-862-2850.

The entire suite of terms and conditions to implement the prudent measures required by NMFS is provided in the NMFS 1995 and 1997 Regional Biological Opinions of Hopper Dredging along the South Atlantic Coast.

<u>West Indian Manatee</u>

A single West Indian manatee (*Trichechus manatus*) was sighted during dredging activities during the 2005 dredging event. This was not considered unusual as this species prefers inshore grass beds, structures where macro-algae proliferates, sources of freshwater such as creeks and not the open ocean. The manatee was not adversely affected by dredging activities.

The USACE has determined that the proposed project may affect, but is not likely to adversely affect the manatee, and the FWS has concurred with this determination. The terms and conditions of the Biological Opinion shall be implemented in order to avoid or minimize take of manatees (Appendix F). These conditions include the following Standard Manatee Construction Conditions:

- The Contractor shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act and Marine Mammal Protection Act. The Contractor may be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.

- If siltation barriers are used, they shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers shall not block manatee entry to or exit from essential habitat.

- All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom, and vessels shall follow routes of deep water whenever possible. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits. Mooring bumpers shall be placed on all barges, tugs, and similar large vessels wherever and whenever there is a potential for manatees to be crushed between two moored vessels. The bumpers shall provide a minimum standoff distance of 4 feet.

- If a manatee is sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. If a manatee is closer than 50 feet to moving equipment or the project area, the equipment shall be shut down and all construction activities shall cease within the waterway to ensure protection of the manatee. Construction activities shall not resume until the manatee has departed the project area.

- Prior to commencement of construction, each vessel involved in construction activities shall display at the vessel control station or in a prominent location, visible to all employees operating the vessel, a temporary sign at least 8.5 x 11" reading, "CAUTION: MANATEE HABITAT/IDLE SPEED IS REQUIRED IN CONSTRUCTION AREA." In the absence of a vessel, a temporary 3' x 4' sign reading "CAUTION: MANATEE AREA" will be posted adjacent to the issued construction permit. A second temporary sign measuring 8.5 x 11" reading "CAUTION: MANATEE HABITAT. EQUIPMENT MUST BE SHUTDOWN IMMEDIATELY IF A MANATEE COMES WITHIN 50

FEET OF OPERATION" shall be posted at the dredge operator control station and at a location prominently adjacent to the issued construction permit. The Contractor shall remove the signs upon completion of construction.

- Any collisions with a manatee or sighting of any injured or incapacitated manatee shall be reported immediately to the USACE. The Contractor shall also immediately report any collision with and/or injury to a manatee to the Florida Fish and Wildlife Conservation Commission (FWC) "Manatee Hotline" 1-888-404-FWCC (3922) as well as the U.S. Fish and Wildlife Service, Jacksonville Field Office.

In addition, Brevard County with the FWC will continue to conduct sea turtle monitoring for a minimum of two additional nesting seasons after the nourishment event if placed-sand remains.

<u>Smalltooth Sawfish</u>

Smalltooth sawfish (*Pristis pectinata*) is currently listed as endangered by NMFS and may rarely occur within the project area; however, it has not been observed during previous dredging events. The National Sawfish Encounter Database (Simpendorfer and Wiley, 2006) managed by the Florida Museum of Natural History, University of Florida revealed 9 encounters for Brevard County from as far back as 1895. Six of the observations occurred in the Indian River Lagoon and three occurred in the Atlantic coastal waters. Currently, the core of the smalltooth sawfish Distinct Population Segment is surviving and reproducing in the waters of southwest Florida and Florida Bay, primarily within the jurisdictional boundaries of Everglades National Park where important habitat features are still present and less fragmented than in other parts of the historic range. The NMFS proposed critical habitat for the sawfish in 2008, but the project area does not overlap any of these proposed locations.

In their July 30, 2009 concurrence, NMFS determined that the smalltooth sawfish may be affected, but is not likely to be adversely affected by the proposed action. The project area is not a known nursery or foraging area for smalltooth sawfish, and it does not support the type of habitat favored by juvenile sawfish. While adults may move through or forage in the project area, NMFS determined that the project would not impact the sawfish from critical habitat loss or entrainment. The risk of injury was presumed to be discountable due to the species' mobility and implementation of NMFS' Smalltooth Sawfish Construction Conditions. In order to protect this species, the USACE proposes to implement the smalltooth sawfish construction conditions, which include the following:

- The Contractor shall instruct all personnel associated with the project of the potential presence of this species and the need to avoid collisions with smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of sawfish.

- The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing smalltooth sawfish, which are protected under the Endangered Species Act.

- Siltation barriers shall be made of material in which a smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment.

- All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

- If a smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

- Any collision with and/or injury to a smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

5 ALTERNATIVE TO THE PROPOSED ACTION

The MMS considered the following as an alternative to the proposed action:

<u>Do Not Authorize Use of OCS Sands</u>: Under this alternative, the USACE and Brevard County would not be authorize to access offshore sands in the CSII borrow area. The project proponents could either:

(a) Re-evaluate the project to choose another alternative method or sand source to restore the South Reach, or
(b) locate an onshore source of comparable high-quality sand.

Option A would not minimize overall environmental effects because of the need to protect the shoreline associated with the Brevard County project by either constructing new or augmenting existing protection mechanisms for the beaches. Option is B is not considered to be viable as sources of approved onshore sand are limited. Plus, even if a sufficient amount of high-quality sand is located onshore, Option B is likely to result in increased environmental disruption/effect from the onshore excavation of and overland transport.

6 CONSULTATION AND COORDINATION

List of agencies and persons consulted:
National Marine Fisheries Service, Southeast Regional Office
U.S. Fish and Wildlife Service, North Florida Ecological Services Office
Paul E. Stodola, Biologist, USACE, Jacksonville, FL
Kevin Bodge, Coastal Engineer, Olsen and Associates, Jacksonville, FL
Virginia Barker, Environmental Scientist, Brevard County, Viera, FL
Michael McGarry, Environmental Scientist, Brevard County, Viera, FL
David Snyder, Marine Biologist, Continental Shelf and Associates International Inc., Stuart, FL
Grady Caulk, Archaeologist, USACE, Jacksonville, FL
Jason Engle, Coastal Engineer, USACE, Jacksonville, FL
Geoffrey Wikel, Oceanographer, MMS, Herndon, VA

Preparers:
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Reviewers:
Keely Hite, Environmental Protection Specialist, MMS, Herndon, VA
Michelle Morin, Environmental Protection Specialist, MMS, Herndon, VA
Kim Skrupky, Marine Biologist, MMS, Herndon, VA
Poojan Tripathi, Environmental Protection Specialist, MMS, Herndon, VA
Sally Valdes, Aquatic Ecologist, MMS, Herndon, VA

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Watts, G.P. 2001. “Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Targets for the Brevard County Shore Protection Project, Brevard County, Florida.” Prepared for the U.S. Army Corps of Engineers, Jacksonville District.

8 PROPOSED MITIGATION MEASURES

The following mitigation measures are proposed to avoid, reduce, or eliminate environmental impacts associated with the proposed action (herein referred to as the "Project"). Mitigation measures in the form of terms and conditions are added to the negotiated agreement and are shall be considered enforceable as part of the agreement. Application of terms and conditions will be individually considered by the Director or Associate Director of the MMS. Minor modifications to the proposed mitigation measures may be made during the noncompetitive negotiated agreement process if comments indicate changes are necessary or if conditions warrant.

Plans and Performance Requirements

The USACE will provide the MMS with a copy of the Project's "Construction Solicitation and Specifications Plan" (herein referred to as the "Plan"). No activity or operation authorized by the negotiated agreement (herein referred to as the Memorandum of Agreement or MOA) at the CSII Borrow Area shall be carried out until the MMS has had an opportunity to review and comment on the Plan, thus ensuring that each activity or operation is conducted in a manner that is in compliance with the provisions and requirements of the MOA. The USACE will ensure that all operations at the CSII Borrow Area are conducted in accordance with the final approved Plan and all terms and conditions in this MOA, as well as all applicable regulations, orders, guidelines, and directives specified or referenced herein.

The preferred method of obtaining and conveying sediment from the CSII Borrow Area involves the use of a hopper dredge. The USACE will allow MMS to review and comment on any modifications to the Plan, including the use of a cutterhead dredge, or submerged or floated pipelines to convey sediment, that may affect the project area, before implementation of the modification. Said comments shall be delivered in a timely fashion in order to not delay the Corps' construction contract.

The USACE, at the reasonable request of the MMS, shall allow access, at the site of any operation subject to safety regulations, to any authorized Federal inspector and shall provide the MMS any documents and records that are pertinent to occupational or public health, safety, or environmental protection as may be requested.

Notification of Activity in or near the Borrow Area

The USACE will notify the MMS at dredgeinfo@mms.gov of the commencement and termination of operations at the CSII Borrow Area within 24 hours after the USACE receives such notification from its contractor(s) for the Project. The MMS will notify the USACE in a timely manner of any OCS activity within the jurisdiction of the DOI that may adversely affect the USACE's ability to use OCS sand for the Project.

Environmental Responsibilities and Environmental Compliance

The USACE is the lead agency on behalf of the Federal government to ensure the Project complies with applicable environmental laws.

The USACE will serve as the lead federal agency for Endangered Species Act (ESA) Section 7 compliance concerning protected species under the purview of U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS). The USACE will instruct its contractor to implement the mitigation terms, conditions, and measures required by the FWS, NMFS, and MMS pursuant to applicable federal laws and regulations. The required mitigation terms, conditions, and measures are reflected in the attached Biological Opinions, Conservation Recommendations, and Consistency Determination.

Dredge Positioning

During all phases of the Project, the USACE will ensure that the dredge and any bottom-disturbing equipment is outfitted with an onboard global positioning system (GPS) capable of maintaining and recording location within an accuracy range of no more than plus or minus 3 meters. The GPS must be installed as close to the cutterhead or draghead as practicable.

During dredging operations, the USACE will immediately notify the MMS at dredgeinfo@mms.gov if dredging occurs outside of the approved borrow area. Anchoring, spudding, or other bottom disturbing activity is to be avoided outside the authorized borrow area.

Local Notice to Mariners

The USACE shall require its contractor(s) for the Project to place a notice in the U.S. Coast Guard Local Notice to Mariners regarding the timeframe and location of dredging and construction operations in advance of commencement of dredging.

Marine Pollution Control and Contingency Plan

The USACE will require its contractors and subcontractors to prepare for and take all necessary precautions to prevent discharges of oil and releases of waste and hazardous materials that may impair water quality. In the event of an occurrence, notification and response will be in accordance with applicable requirements of 40 C.F.R. 300. All dredging and support operations shall be compliant with U.S. Coast Guard regulations and the Environmental Protection Agency's Vessel General Permit, as applicable. The USACE will notify the MMS of any occurrences and remedial actions and provide copies of reports of the incident and resultant actions at dredgeinfo@mms.gov.

Encounter of Ordinance

If any ordinance is encountered while conducting dredging activities at the CSII Borrow Area, the USACE will report the discovery within 24 hours to Ms. Renee Orr, Chief, MMS Leasing Division, at (703) 787-1215 and dredgeinfo@mms.gov.

Cultural Resources

Onshore Prehistoric or Historic Resources

If the USACE discovers any previously unknown historic or archeological remains while accomplishing activity in Brevard County, FL authorized by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303, the USACE must immediately notify the MMS of any finding. The USACE will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

Offshore Historic Resources

An archaeological survey was conducted in 2001 and was reported "Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project" (DHR file No. 2001-316). Eight anomalies, from a 1999 survey, were identified as debris from the space program and potentially significant, and avoidance was recommended. The eight anomalies shall be avoided during dredging operations by at least 200 feet, as described in the table below.

Table: Archaeological avoidance areas

Target	Area/Block	Amplitude (gammas)	Duration (ft)	FL East State Plane Coord. NAD 1927 (X /Y Coordinate)	Avoidance Radius (ft)
C2-01	Canaveral Shoals II	422	120	667682/1487363	200
C2-02	Canaveral Shoals II	330	85	670907/1485875	200
C2-08	Canaveral Shoals II	147	140	675523/1482444	200
C2-12	Canaveral Shoals II	51	125	679892/1482496	200
C2-13	Canaveral Shoals II	36	110	681022/1480316	200
C2-14	Canaveral Shoals II	61	165	681364/1480843	200
C2-16	Canaveral Shoals II	52	100	676571/1481617	200
C2-17	Canaveral Shoals II	65	75	670297/1486107	200

If the USACE determines that the anomalies listed in Table 2 cannot be avoided during dredging operations, the USACE shall notify the MMS. The USACE, subject to the availability of appropriations and in accordance with the requirements of applicable law, may conduct further investigations to assess the significance of the objects producing the signatures in accordance with the criteria at 36 CFR section 60.4, "Criteria for evaluation."

The proposed investigation procedures shall be discussed with the MMS archaeologist prior to commencing fieldwork. At a minimum, this assessment must include an analysis of the age, physical composition, and structural integrity of the object (*i.e.*, wood or metal, intact or dispersed). Measured drawings and/or underwater video or still photographs of the feature shall be made for documentation and submitted with the final "Report of Findings." A "Report of Findings" prepared in accordance with the archaeological report writing standards specified in the MMS Notice To Lessees (NTL) 2005-G07 must be submitted to the MMS for approval within ten work days of the completion of fieldwork.

Offshore Chance Finds Clause

In the event that the dredge operators, discover any archaeological resource while conducting dredging operations in the CSII Borrow Area, the USACE shall require that dredge operations will be halted immediately within the borrow area. The USACE shall then immediately report the discovery to Ms. Renee Orr, Chief, MMS Leasing Division, at (703) 787-1215. If investigations determine that the resource is significant, the parties shall together determine how best to protect it.

Bathymetric Surveys

The USACE and the County will provide the MMS with pre- and post-dredging bathymetric surveys of the CSII Borrow Area. The pre-dredging survey will be conducted within 30 days prior to dredging. The post-dredging survey will be conducted within 30 days after the completion of dredging. Additional bathymetry surveys are recommended at 1 year and 3 years following the completion of dredging. Hydrographic surveys will be performed in accordance with the U.S. Army Corps of Engineers Hydrographic Surveying Manual EM 1110-2-1003 unless specified otherwise. Survey lines of the specific dredge area, within the CSII Borrow Area, will be established at no greater than 50 m intervals perpendicular to a baseline. Three equidistant cross-tie lines will be established parallel to the same baseline. Survey lines will extend at least 50 m beyond the edge of the dredge areas. All data shall be collected in such a manner that post-dredging bathymetry surveys are compatible with the pre-dredging bathymetric survey data to enable the latter to be subtracted from the former to calculate the volume of sand removed, the shape of the excavation, and nature of post-dredging bathymetric change.

Copies of pre-dredging and post-dredging hydrographic data will be submitted to MMS within thirty (30) days after each survey is completed. The delivery format for data submission is an ASCII file containing x,y,z data. The horizontal data will be provided in the North American Datum of 1983 (NAD '83) Florida State Plane East Zone, U.S. survey feet. Vertical data will be tidally corrected and provided in the North American Vertical Datum of 1988 (NAVD '88), U.S. survey feet. An 8.5x11" plan view plot of the pre- and post-construction data will be provided showing the individual survey points, as well as contour lines at appropriate elevation intervals. These plots will be provided in PDF format. All data will be submitted to dredgeinfo@mms.gov within 30 days of completion.

Submittal of Production and Volume Information

The USACE, in cooperation with the dredge operator, shall submit to the MMS and the County on a biweekly basis a summary of the dredge head track lines, outlining any deviations from the original Plan. A color-coded plot of the cutterhead or drag arms will be submitted, showing any horizontal or vertical dredge violations. This map will be provided in PDF format. The USACE will provide a biweekly update of the construction progress including estimated volumetric production rates to MMS. The biweekly deliverables will be provided electronically to dredgeinfo@mms.gov. The project completion report, as described in paragraph 13 below, will also include production and volume information.

Project Completion Report

A project completion report will be submitted by Brevard County to MMS within 90 days following completion of the activities authorized under this MOA. This report and supporting materials should be sent to Ms. Renee Orr, Chief, MMS Leasing Division, 381 Elden Street, MS 4010, Herndon, Virginia 20170 and dredgeinfo@mms.gov. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (for USACE, the engineering firm (if applicable), and the contractor), including contact information (phone numbers, mailing addresses, and email addresses);
- the location and description of the project, including the final total volume of material extracted from the borrow area and the volume of material actually placed on the beach or shoreline (including a description of the volume calculation method used to determine these volumes);
- ASCII files containing the x,y,z and time stamp of the cutterhead or drag arm locations;
- a narrative describing the final, as-built features, boundaries, and acreage, including the restored beach width and length;
- a table, an example of which is illustrated below, showing the various key project cost elements;

	Project Cost Estimate ($)	Cost Incurred as of Construction Completion ($)
Construction		
Engineering and Design		
Inspections/Contract Administration		
Total		

- a table, an example of which is illustrated below, showing the various items of work construction, final quantities, and monetary amounts;

Item No.	Item	Estimated Quantity	Unit	Unit Price	Estimated Amount	Final Quantity	Bid Unit Price	Final Amount	% Over/ Under
1	Mobilization and Demobilization								
2	Beach Fill								
3	Any beach or offshore hard structure placed or removed								

- a listing of construction and construction oversight information, including the prime and subcontractors, contract costs, etc.;
- a list of all major equipment used to construct the project;
- a narrative discussing the construction sequences and activities, and, if applicable, any problems encountered and solutions;
- a list and description of any construction change orders issued, if applicable;
- a list and description of any safety-related issues or accidents reported during the life of the project;
- a narrative and any appropriate tables describing any environmental surveys or efforts associated with the project and costs associated with these surveys or efforts;
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by the USACE;
  digital appendices containing the as-built drawings, beach-fill cross-sections, and survey data; and any additional pertinent comments.

9 APPENDICES

Appendix A. Army Corps of Engineers Environmental Impact Statement (1996)

Appendix B. Army Corps of Engineers Environmental Assessment (1998)

Appendix C. Minerals Management Service Environmental Assessment (2005)

Appendix D. Florida Dept. of Environmental Protection Consistency Certification (2001)

Appendix E. National Marine Fisheries Service (NMFS) Concurrence (2009)

Appendix F. U.S. Fish and Wildlife Service Biological Opinion (2009)

Appendix G. NMFS Essential Fish Habitat Conservation Recommendations (2005)

Appendix H. Florida State Historic Preservation Officer Coordination (2001)

APPENDIX E

Florida Department of Environmental Protection Consistency Determination (2013)

April 22, 2013

olsen associates, inc.
Coastal Engineering

Ms. Charlotte Hand, JCP Compliance Officer
Bureau of Beaches and Coastal Systems
Florida Department of Environmental Protection
3900 Commonwealth Blvd.
MS 300
Tallahassee, FL 32399-3000

Re: Brevard County Shore Protection Project, NORTH REACH
Post-Hurricane Sandy Renourishment (2013)
FDEP Permit 0134869-002-JC (Brevard)
Permittee: Brevard County Office of Natural Resource Management

Dear Ms. Hand:

By way of this letter, Brevard County requests the Department's NOTICE TO PROCEED to construct renourishment of the North Reach segment of the Brevard County Shore Protection Project (BCSPP), in accordance with the above-referenced permits, to commence on or after 1 October 2013 as described below.

Through approvals granted by the Department of the Army, dated 28 March 2013, the U. S. Army Corps of Engineers (USACE), Jacksonville District, proposes placement of approximately 1,019,200 cubic yards of renourishment sand along all or parts of the 9.8-mile long North Reach segment of the BCSPP, between FDEP monuments R1 and R53 along the City of Cape Canaveral, Cocoa Beach, and unincorporated sections of Brevard County, with south taper extending up to R54.5 in Patrick AFB as applicable. The sediment source shall be the permitted offshore borrow areas of Canaveral Shoals I and/or Canaveral Shoals II, located in State and Federal waters, respectively.

Beach placement and construction will commence on or after November 1, 2013 and continue through April 30, 2014 or the prevailing expiration date of the permit during construction. If the Contractor elects to use the North Reach Nearshore Disposal and Sand Rehandling Area (NR-NDSRA), then dredging and construction (sand placement) within the borrow areas and NR-NDSRA will commence on or after October 1, 2013, with rehandling (placement) to the beach on/after November 1, 2013. All construction and monitoring will be in accordance with the project permit.

Construction will be contracted and managed by the USACE, Jacksonville District, with input and participation by Brevard County. It is the District's intention to solicit the construction contract by approximately 15 August 2013 and to award the contract before 15 September 2013.

A federal lease from the Bureau of Ocean Energy Management (BOEM) for the use of sand from Canaveral Shoals II is required prior to solicitation. To prepare that lease, BOEM requires affirmation of the FDEP's Notice-to-Proceed (or equivalent approval) for the work, and/or completion of any associated permit modifications issued by FDEP for the work.

Use of the Canaveral Shoals I borrow area may entail disposal of material from the access lane to the Nearshore Disposal Area (NDA) and/or the Offshore Dredged Material Disposal Site (ODMDS), if/as applicable, as described in the permit.

The limits and extents of sand placement along the shoreline will be within those of the prior nourishment activity as described the permit. The ultimate distribution (limits) of the sand placement along the North Reach is yet to be determined by the Corps, pursuant to completion of current surveys. The Corps' final plans and specifications for construction shall be provided to the Department upon receipt and public release (i.e., after advertisement begins).

The approved Corps plan for North Reach renourishment is to place 111,600 cy of sand through Flood Control and Coastal Emergency (FCCE) rehabilitation plus 907,600 cy of sand through supplemental funding, for a total of 1,019,200 cy sand renourishment (approximate), all at 100% federal cost of construction. The total offshore dredge quantity associated with the North Reach segment of the project may be on the order of up to 1.46 Mcy, more or less. This volume includes allowances for contingencies, losses, and elective use of the NR-NDSRA including provision of a 2-ft buffer of sediment above the ambient seabed for placement and rehandling of sand to the beach (if used).

Previous construction of the project under this permit included (1) the initial placement of approximately 3.14 Mcy (total) of sand placed from R1-R54.5 in November 2000 through April 2001, and (2) the post-hurricane renourishment of approximately 754,600 cy placed from R7.8-R19 and R33-R54.5 between March 20 and May 18, 2005, from the Canaveral Shoals II borrow area. The 2005 activity was the first and most recent renourishment of the project, excepting sand bypass placement from Canaveral Harbor which is conducted under separate permit and federal authority along the northern 2.5 miles of the project area.

Since its initial construction in 2000-01, project performance has matched or exceeded pre-project design predictions and expectations. Requisite annual, or biennial, monitoring surveys and reports have been conducted since 2001. The most recent monitoring reports include the (1) Year-7 North Reach post-renourishment project report dated October 2012 and, (2) an overall update of the Canaveral Harbor Inlet Management Plan performance and sediment budget, including the North Reach and Patrick AFB shorelines, through 2011, dated April 2012.

There are otherwise no significant changes to the project area or project description. There are no hardbottom or other sensitive environmental resources in or near the project area. The nearest hardbottom resources are nearshore rock outcrops that begin along the southern mile of Patrick Air Force Base, approximately 3 miles south of the North Reach project limits.

The **Sediment QA/QC Plan** is attached to this letter, dated 18 April 2013. I do not believe that a QA/QC Plan was previously developed specific to the North Reach (i.e., for the prior renourishment in 2005). For this purpose, the attached QA/QC Plan is reproduced from the QA/QC Plan most recently developed and approved for the South Reach project segment (dated 11 August 2009, per Permit 0137212-005-JC), with changes to the Project Description. The requirements for post-construction sand sampling and analysis follow those stipulated in the North Reach permit (0134869-002-JC, Hydrographic Monitoring, Par. 2c).

A **Physical Monitoring Plan** is additionally attached to this letter, dated 18 April 2013. Like the QA/QC Plan, I do not believe a specific Physical Monitoring Plan was previously developed for the North Reach. So, for this purpose, I adapted that of the most recently approved Physical Monitoring Plan for the South Reach (dated 11 August 2009, per Permit 0137212-005-JC).

Lastly, the proposed **Construction Template** for the work, updated to NAVD'88, is attached to this letter. It is identical to that approved in prior permit modification 0134869-005-EM (dated 20 December 2004) with the exception that the minor berm slope element adopted by the prior modification is increased from about 1(v):62.5(h) slope to 1(v):40(h) slope, with the back berm elevation increasing by ½-ft from +8.9 ft to +9.6 ft (NGVD'29). This minor modification better emulates natural post-project conditions, increases additional upland protection from storm surge and wave overtopping, and it reduces backshore ponding and scarping which helps to improve marine turtle nesting and emergence. This is based upon observed performance of the project (North and South Reach project segments) since the innovative adoption of a mild berm slope and increased backshore elevation through prior construction & renourishment. This minor modification does not alter (increase) the nourishment volume. Instead, it configures the objective renourishment volume (computed by the Corps based upon a low, flat berm) in a template that better conforms with the prevailing, natural beach profile geometry.

The renourishment (construction) template is thus described as "a berm commencing at the existing beach elevation of approximately +8.2 ft NAVD'88 or significant limit of dune vegetation, whichever is furthest seaward, and extending seaward up to 80-feet in width at elevation +8.2 ft, thence sloping mildly seaward at approximately 1(v):40(h) to an elevation of +6.7 ft, thence sloping at 1(v):15(h) to intersection with the existing seabed."

Alternately, the berm is described as follows: "From the seaward edge of the berm at elevation of +8.1 ft NGVD'29 (+6.7 ft NAVD'88), the berm height will increase to +9.6 ft NGVD'29 (+8.2 ft, NAVD'88) over a distance of 60 feet, increasing the mild berm slope from 1:62.5 to 1:40, and extend shoreward at elevation +9.6 ft until the berm intersects the existing profile."

Because of the accelerated schedule required by the Corps to implement these Post-Storm projects in 2013/14, we would appreciate receiving in advance any comments or observations you have regarding this request for a Notice-to-Proceed with the pending renourishment of the North Reach segment of the Brevard County Shore Protection Project. We are prepared to provide additional information to supplement this request, if required, in response to the Department's informal correspondence, in advance of a formal Request for Additional Information or other indication of Departmental action.

Accordingly, please do not hesitate to contact me at kbodge@olsen-associates.com or (904) 387-6114, or Mr. Mike McGarry (Beach Project Manager Brevard County) at (321) 631-2016, ext. 52696 or Mike.Mcgarry@brevardcounty.us, if you have any questions regarding this submittal. Meantime, we appreciate your attention in this matter. Thank you.

Sincerely,

Kevin Bodge, Ph.D., P.E.
Senior Vice President & Principal Engineer, II

Att: Sediment QA/QC Plan (18 April 2013)
Physical Monitoring Plan (18 April 2013)
Construction Template (18 April 2013)

CC: Mike McGarry, Beach Project Manager, Brevard County Natural Res. Mgt. Office
2725 Judge Fran Jamieson Way, Bldg. A-219; Viera, FL 32940

Cynthia Perez, U.S. Army Corps of Engineers, Jacksonville District, Project Manager;
701 San Marco Boulevard; Jacksonville, Florida 32207

Geoffrey Wikel, Office of Environmental Programs, Bureau of Ocean Energy
Management; 381 Elden Street, HM3107, Washington DC 20240

David Courson, Project Manager, FDEP/BBCS; 3900 Commonwealth Blvd. M.S. 300
Tallahassee, FL. 32399-3000

olsen associates, inc. Coastal Engineering

April 22, 2013

Ms. Charlotte Hand, JCP Compliance Officer
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Florida Department of Environmental Protection
3900 Commonwealth Blvd.
MS 300
Tallahassee, FL 32399-3000

Re: Brevard County Shore Protection Project, SOUTH REACH
Post-Hurricane Sandy Renourishment (2013)
FDEP Permit 0137212-005-JC (Brevard)
Permittee: Brevard County Office of Natural Resource Management

Dear Ms. Hand:

By way of this letter, Brevard County requests the Department's NOTICE TO PROCEED to construct renourishment of the South Reach segment of the Brevard County Shore Protection Project (BCSPP), in accordance with the above-referenced permits, to commence on or after 1 October 2013 as described below.

Through approvals granted by the Department of the Army, dated 28 March 2013, the U. S. Army Corps of Engineers (USACE), Jacksonville District, proposes placement of approximately 585,500 cubic yards of renourishment sand along all or parts of the 3.8-mile long South Reach segment of the BCSPP, between FDEP monuments R118.3 and R139 along the City of Indialantic, Melbourne Beach, and unincorporated sections of Brevard County. The sediment source shall be the permitted offshore borrow areas of Canaveral Shoals I and/or Canaveral Shoals II, located in State and Federal waters, respectively.

Beach placement and construction will commence on or after November 1, 2013 and continue through April 30, 2014. If the Contractor elects to use the South Reach Nearshore Disposal and Sand Rehandling Area (SR-NDSRA), then dredging and construction (sand placement) within the borrow areas and SR-NDSRA will commence on or after October 1, 2013, with rehandling (placement) to the beach on/after November 1, 2013. All construction and monitoring will be in accordance with the project permit.

Construction will be contracted and managed by the USACE, Jacksonville District, with input and participation by Brevard County. It is the District's intention to solicit the construction contract by approximately 15 August 2013 and to award the contract before 15 September 2013.

A federal lease from the Bureau of Ocean Energy Management (BOEM) for the use of sand from Canaveral Shoals II is required prior to solicitation. To prepare that lease, BOEM requires affirmation of the FDEP's Notice-to-Proceed (or equivalent approval) for the work, and/or completion of any associated permit modifications issued by FDEP for the work.

Use of the Canaveral Shoals I borrow area may entail disposal of material from the access lane to the Nearshore Disposal Area (NDA) and/or the Offshore Dredged Material Disposal Site (ODMDS), if/as applicable, as described in the permit.

The limits and extents of sand placement along the shoreline will be within those of the prior nourishment activity as described in the permit and previously conducted. The ultimate distribution (limits) of the sand placement along the South Reach is yet to be determined by the Corps, pursuant to completion of current surveys; but it is presently anticipated that sand will be placed along the entire project length. The Corps' final plans and specifications for construction shall be provided to the Department upon receipt and public release (i.e., after advertisement begins).

The approved Corps plan for South Reach renourishment is to place approximately 585,500 cy of sand through Flood Control and Coastal Emergency (FCCE) rehabilitation, at 100% federal cost of construction. Additional supplemental fill (beyond the FCCE project) is not proposed. The total offshore dredge quantity associated with the North Reach segment of the project may be on the order of up to 950,000 cy, more or less. This volume includes allowances for contingencies, losses, and elective use of the NR-NDSRA including provision of a 2-ft buffer of sediment above the ambient seabed for placement and rehandling of sand to the beach (if used).

Previous construction of the project under this permit included (1) the initial placement of approximately 1.6 Mcy of sand in two seasons between January 2002 and April 2003, (2) the post-hurricane renourishment of approximately 580,000 cy placed in April 2005, and (3) routine periodic renourishment of approximately 650,000 cy in February-April 2010. All of the renourishment sand was from the Canaveral Shoals II borrow area, excepting a portion of the initial construction (2002) which was dredged from Space Coast Shoals II (now depleted). The 2010 activity was the most recent renourishment of the project.

Since its initial construction in 2002-03, project performance has matched or exceeded pre-project design predictions and expectations. Requisite annual, or biennial, monitoring surveys and reports have been conducted since 2002. The most recent monitoring reports include the (1) Year-2 South Reach post-renourishment project report dated October 2012.

Accounting for (subtracting) the volume of placed sand, the project fill area exhibited an average annual net loss of between about 92,000 and 102,000 cy/yr. This is nearly identical to the pre-project prediction of 100,000 cy/yr. These values include severe erosion from the 2004 hurricane season, but do not include erosion from Hurricane Sandy in October 2012.

There are otherwise no significant changes to the project area or project description. There are no hardbottom or other sensitive environmental resources along or within the project area. The nearest hardbottom resources are nearshore rock outcrops that begin north of the South Reach and increase in spatial occurrence further northward along the Mid Reach toward Patrick Air Force Base.

Stormwater outfall improvements have been completed along the project area in conjunction with the County's Plan of Improvements (Revised Oct. 2, 2009; per FDEP permit 0254479-001-JC). Annual status reports of the beach outfalls have been completed, including the most recent dated September 2012.

The updated **Sediment QA/QC Plan** for the South Reach is attached to this letter, dated 22 April 2013. It is adapted from the QA/QC Plan most recently developed and approved for the South Reach project segment (dated 11 August 2009). Revisions are limited to (1) update of the Project Description, (2) correction of the compliance grain size values from median to mean measure, and (3) increase in allowable carbonate content from 45% to 50%. The requirements for post-construction sand sampling and analysis remain the same and are consistent with the monitoring requirements of the permit.

The updated **Physical Monitoring Plan** is additionally attached to this letter, dated 22 April 2013. It is adapted from the previously approved Plan for the South Reach (dated 11 August 2009). Revisions are limited to an update of the calendar schedule for monitoring.

The **Construction Template** for the work is also attached to this letter. It is identical to that approved in prior permit modification 0137212-009-EM (dated 20 December 2004) and constructed in 2005 and 2010. This states that the landward edge of the construction berm will be +9.6 ft NGVD (equal to +8.2 ft NAVD'88), while the elevation of the seaward edge of the construction berm would be +8.1 ft NGVD (equal to +6.7 ft NAVD'88). This is consistent with the attached drawing, which depicts this mild berm slope as varying between 1(v):40(h) and 1(v):67(h). The drawing has been updated to NAVD'88. The mild berm slope, initially introduced to the project in 2003, has been demonstrated to better emulate natural post-project conditions and to increase upland protection from storm surge and wave overtopping, and it reduces backshore ponding and scarping which helps to improve marine turtle nesting and emergence.

Because of the accelerated schedule required by the Corps to implement these Post-Storm projects in 2013/14, we would appreciate receiving in advance any comments or observations you have regarding this request for a Notice-to-Proceed with the pending renourishment of the South Reach segment of the Brevard County Shore Protection Project. We are prepared to provide additional information to supplement this request, if required, in response to the Department's informal correspondence, in advance of a formal Request for Additional Information or other indication of Departmental action.

Accordingly, please do not hesitate to contact me at kbodge@olsen-associates.com or (904) 387-6114, or Mr. Mike McGarry (Beach Project Manager Brevard County) at (321) 631-2016, ext. 52696 or Mike.Mcgarry@brevardcounty.us, if you have any questions regarding this submittal. Meantime, we appreciate your attention in this matter. Thank you.

Sincerely,

Kevin Bodge, Ph.D., P.E.
Senior Vice President & Principal Engineer, II

Att: Sediment QA/QC Plan (22 April 2013)
Physical Monitoring Plan (22 April 2013)
Construction Template (22 April 2013)

CC: Mike McGarry, Beach Project Manager, Brevard County Natural Res. Mgt. Office
2725 Judge Fran Jamieson Way, Bldg. A-219; Viera, FL 32940

Cynthia Perez, U.S. Army Corps of Engineers, Jacksonville District, Project Manager;
701 San Marco Boulevard; Jacksonville, Florida 32207

Geoffrey Wikel, Office of Environmental Programs, Bureau of Ocean Energy Management; 381 Elden Street, HM3107, Washington DC 20240

David Courson, Project Manager, FDEP/BBCS; 3900 Commonwealth Blvd. M.S. 300
Tallahassee, FL. 32399-3000

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARJORY STONEMAN DOUGLAS BUILDING
3900 COMMONWEALTH BOULEVARD
TALLAHASSEE, FLORIDA 32399-3000

RICK SCOTT
GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

April 26, 2013

Mike McGarry, Beach Project Manager
Brevard County
Natural Resources Management Office
2725 Judge Fran Jamieson Way
Building A-219
Viera, FL 32940

c/o

Kevin Bodge, Ph.D., P.E.
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204

NOTICE TO PROCEED
Permit No. 0134869-002-JC, Brevard County
Permittee: Brevard County
Project: Brevard County Shore Protection Project, NORTH REACH

Dear Mr. Bodge:

The Permittee has complied with the permit conditions required to issue the Notice to Proceed. All construction or other activities are strictly limited to those described in the final order and approved permit drawings.

A preconstruction conference is required by Specific Condition No. 4. If you have not already made arrangements for the preconstruction conference, please notify the Department. Commencement of construction is not authorized until the preconstruction conference has been held.

Please read the permit and permit conditions including both the General and Specific Conditions closely before starting construction. General Condition 11 requires submittal of a written statement of completion and certification by a licensed professional engineer registered in the state of Florida within a reasonable time after completion of construction.

Your cooperation in ensuring compliance with all conditions of the permit is appreciated. If I may be of any further assistance, please contact me at the letterhead address (add Mail Station 300), or by telephone at (850) 413-7765.

Sincerely,

Kristina Evans

Kristina Evans
Environmental Specialist III
Beaches, Inlets & Ports Program
Division of Water Resource Management

Attachment: Notice to Proceed Posting

cc: JCP Compliance Officer
Kristina Evans, DWRM
Marty Seeling, DWRM
Bobby Halbert, DWRM
Bob Brantly, DWRM
David Courson, DWRM
David Herbster, DEP Central District
Irene Sadowski, U.S. Army Corps of Engineers
marineturtle@myfwc.com
FWCconservationplanningservices@myfwc.com

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOTICE TO PROCEED

PERMITTEE:
Brevard County
Natural Resources Management Office
2725 Judge Fran Jamieson Way
Building A-219
Viera, FL 32940

PROJECT:
Brevard County Shore Protection Project, NORTH REACH

PERMIT NUMBER: 0134869-002-JC

PERMIT EXPIRES: February 1, 2014

You are hereby granted final authorization to proceed with the construction or activities authorized by the permit number referenced above. Authorized work must conform with the detailed project description, approved permit drawings, and all conditions including preconstruction requirements included in the permit. A brief description of the authorized work follows:

ACTIVITY DESCRIPTION:
The project is to construct a beach restoration project along 9.8 miles of shoreline commencing immediately south of the Port Canaveral entrance between the Department of Environmental Protection's reference monuments R-1 and R-54.5. Approximately 2.5 million cubic yards of sand will be dredged from either the offshore borrow area referred to as "Canaveral Shoals Borrow Area I" or from the offshore borrow area referred to as "Canaveral Shoals Borrow Area II". The project will also utilize a 2,750 ft. by 9,500 ft. Nearshore Disposal and Sand-Rehandling Area (NDSRA) located between R-28 and R-38 about 4,200-ft. from the shoreline, between the –32 ft. and –38 ft. (NGVD) contours.

ACTIVITY LOCATION:
Located in Sections 11-15, 22, 23, 26 and 35, Township 24 South, Range 37 East; Sections 2, 3, 10, 11, 14, 15, 22 and 23, Township 25 South, Range 37 East; and Sections 26, 27, 35, Township 25 South, Range 37 East; Brevard County, within the Atlantic Ocean, Class III Waters.

Questions regarding the permit or this notice should be directed to the undersigned at:

04-26-2013 / Kristina Evans
Date of Notice

Beaches, Inlets & Ports Program
Division of Water Resource Management
3900 Commonwealth Blvd., M.S. 300
Tallahassee, FL 32399-3000
Telephone (850) 413-7765

Post Conspicuously on the Site

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARJORY STONEMAN DOUGLAS BUILDING
3900 COMMONWEALTH BOULEVARD
TALLAHASSEE, FLORIDA 32399-3000

RICK SCOTT
GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

April 26, 2013

Mike McGarry, Beach Project Manager
Brevard County
Natural Resources Management Office
2725 Judge Fran Jamieson Way
Building A-219
Viera, FL 32940

c/o

Kevin Bodge, Ph.D., P.E.
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204

NOTICE TO PROCEED
Permit No. 0137212-005-JC, Brevard County
Permittee: Brevard County
Project: Brevard County Shore Protection Project, SOUTH REACH

Dear Mr. Bodge:

The Permittee has complied with the permit conditions required to issue the Notice to Proceed. All construction or other activities are strictly limited to those described in the final order and approved permit drawings.

A preconstruction conference is required by Specific Condition No. 6. If you have not already made arrangements for the preconstruction conference, please notify the Department. Commencement of construction is not authorized until the preconstruction conference has been held.

Please read the permit and permit conditions including both the General and Specific Conditions closely before starting construction. General Condition 11 requires submittal of a written statement of completion and certification by a licensed professional engineer registered in the state of Florida within a reasonable time after completion of construction.

Your cooperation in ensuring compliance with all conditions of the permit is appreciated. If I may be of any further assistance, please contact me at the letterhead address (add Mail Station 300), or by telephone at (850) 413-7765.

Sincerely,

Kristina Evans

Kristina Evans
Environmental Specialist III
Beaches, Inlets & Ports Program
Division of Water Resource Management

Attachment: Notice to Proceed Posting

cc:	JCP Compliance Officer	David Courson, DWRM
	Kristina Evans, DWRM	David Herbster, DEP Central District
	Marty Seeling, DWRM	Irene Sadowski, U.S. Army Corps of Engineers
	Bobby Halbert, DWRM	marineturtle@myfwc.com
	Bob Brantly, DWRM	FWCconservationplanningservices@myfwc.com

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOTICE TO PROCEED

PERMITTEE:
Brevard County
Natural Resources Management Office
2725 Judge Fran Jamieson Way
Building A-219
Viera, FL 32940

PROJECT:
Brevard County Shore Protection Project, SOUTH REACH

PERMIT NUMBER: 0137212-005-JC

PERMIT EXPIRES: November 22, 2014

You are hereby granted final authorization to proceed with the construction or activities authorized by the permit number referenced above. Authorized work must conform with the detailed project description, approved permit drawings, and all conditions including preconstruction requirements included in the permit. A brief description of the authorized work follows:

ACTIVITY DESCRIPTION:
The project is to construct a beach restoration project along 3.4 miles of shoreline commencing at about Flug Avenue in the Town of Indialantic and extending to Spessard Holland Park in the Town of Melbourne Beach (between the Department of Environmental Protection's reference monuments R-118.3 and R-139). Approximately 1.6 million cubic yards of sand will be dredged from one of three offshore borrow areas, including: Canaveral Shoals Borrow Areas I and II, and Space Coast Borrow Area II. The project will also utilize a 2,450 ft. by 4,500 ft. Nearshore Disposal and Sand-Rehandling Area (NDSRA) located between R-126 and R-130.5 about 3,400-ft. from the shoreline, between the –34 ft. and –44 ft. (NGVD) contours.

ACTIVITY LOCATION:
Located in Brevard County, Sections 25, 30, 31, Township 27 South, Range 38 East; Sections 5, 6, 7, 8, Township 28 South, Range 38 East; within the Atlantic Ocean, Class III Waters.

Questions regarding the permit or this notice should be directed to the undersigned at:

04-26-2013 / Kristina Evans
Date of Notice

Beaches, Inlets & Ports Program
Division of Water Resource Management
3900 Commonwealth Blvd., M.S. 300
Tallahassee, FL 32399-3000
Telephone (850) 413-7765

Post Conspicuously on the Site

APPENDIX F

Correspondence between U.S. Army Corps of Engineers
and the
National Marine Fisheries Service
on Endangered Species Act Section 7 Consultations (2013)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

17 MAY 2013

Dr. Roy Crabtree
NOAA-National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701-5505

Dear Dr. Crabtree:

The U.S. Army Corps of Engineers (Corps), Jacksonville District, and the Bureau of Ocean Energy Management request informal consultation regarding potential effects to smalltooth sawfish from the Brevard County (Florida) Federal Shore Protection Project (North and South Reach). The Corps is serving as lead agency for this Endangered Species Act (ESA) Section 7 consultation. Although five species of sea turtles (loggerhead, green, hawksbill, Kemp's ridley, and leatherback), the North Atlantic right whale, and humpback whale can be found in or near the action area and may be affected by the proposed action, any effects to and incidental take of those species are already covered by the 1997 South Atlantic Regional Biological Opinion. Subsequent to completion of the Regional Biological Opinion, the smalltooth sawfish was federally listed in 2003. The Corps and Minerals Management Service, a predecessor to BOEM, informally consulted with the National Marine Fisheries Service (NMFS) on the smalltooth sawfish for maintenance construction of Brevard County, South Reach in 2009 (I/SER/2009/02797). We have not previously concluded a consultation on the smalltooth sawfish for the North Reach segment of the Brevard County Federal Shore Protection Project. Please note that the re-initiated South Atlantic Regional Biological Opinion, re-initiated in April 2007, would cover this project if it were concluded.

The Corps proposes to place approximately 1,605,000 cubic yards (cy) of beach-compatible sand along portions of the Brevard County, Florida Atlantic Ocean shoreline to restore sand eroded from (Enclosure). Approximately 585,500 cy of sand will be placed along all or parts of the 3.8-mile South Reach segment of the Brevard County Federal Shore Protection Project (BCSPP) between Melbourne Beach and Indialantic Beach. Approximately 1,020,000 cy of sand will be placed along all or parts of the 9.8-mile North Reach segment of the BCSPP between the City of Cape Canaveral and Cocoa Beach. The south-end will transition another 1500-ft. The proposed action will involve the use of a hopper dredge to dredge sand from one or both of two offshore borrow areas south of Cape Canaveral and east of Port Canaveral: Canaveral Shoals I, located in State of Florida waters, and/or Canaveral Shoals II, located in Federal waters on the Outer Continental Shelf. Any dredging in Canaveral Shoals II will be authorized by BOEM. The dredged sand will be directly placed on the beach, or a portion may be placed in nearshore rehandling areas for later rehandling by a cutterhead dredge. The project area is located within a known calving area for the North Atlantic right whale. The project area is not located in critical habitat for the smalltooth sawfish. There is no hardbottom in the borrow area or in the immediate vicinity of rehandling areas, pipeline corridors, or the placement area.

The proposed action will occur between October 1 and April 30 in order to avoid sea turtle nesting activities. Dredge activity may commence as early as October 1 if the dredge contractor elects to use a rehandling area. Sand placement and upland construction activity will occur only after October 31. It is anticipated that construction of the North and South Reach segments of the project will be built concurrently. Hopper dredging is expected to occur over approximately 180 to 210 days to obtain the necessary volume. The hopper dredge will transport the dredged material a distance of approximately 10 or 22 nautical miles, for the North Reach and South Reach respectively, to pump-out mooring buoys positioned approximately 0.5 to 1 mile from shore, from which the material will be pumped directly via pipeline to the beach. Alternatively, dredged material may be placed by the hopper dredges into previously permitted rehandling areas and dredged from the rehandling area and pumped onto the beach via a cutterhead pipeline dredge. The placement and relocation of the nearshore mooring buoys used during pump-out, or emplacement and retrieval of submerged pipeline, may involve the use of tender tugboats and a pipeline hauler or crane.

The beach construction template is identical to that previously constructed. The landward template along the South Reach will include a dune feature. The beach template will include an approximate 60 to 100-ft wide berm. The berm has been designed to be turtle friendly. Unlike a typical beach berm, the seaward elevation of the proposed berm is lower in order to reduce potential scarping resulting from storm activity or the natural equilibration of the beach and to reduce ponding of water. The use of up to three bulldozers and/or pipeline movers and two trucks is anticipated on the beach during construction to distribute and grade the hydraulically placed sand.

The Corps will require the contractor(s) to follow the Terms and Conditions in NMFS' 1997 Regional Biological Opinion on Hopper Dredging along the South Atlantic Coast. The 1997 Regional Biological Opinion incorporates by reference NMFS' 1995 Biological Opinion on hopper dredging of channels and beach nourishment activities in the southeastern United States from North Carolina through Florida East Coast. The Corps will place material on the beach between November 1 and April 30 to avoid sea turtle nesting activities to the extent possible. The Corps will also require the contractor(s) to follow NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions.

The Corps has determined that the proposed action may affect, but is not likely to adversely affect the smalltooth sawfish. Effects on smalltooth sawfish include the risk of injury or harassment associated with dredging, rehandling, and pipeline emplacement and retrieval activities activities. Due to the location of the project, the species' mobility, and the implementation of NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions, the risk of injury and harassment is discountable. If smalltooth sawfish are in the project area, they are likely to be adults. Smalltooth sawfish are associated with a number of habitats. Juveniles (<1m) are often closely associated with mangroves and shallow, euryhaline waters close to shore, while adults have been observed in various habitats and water depths. The project area is not a known nursery or foraging area for smalltooth sawfish. Further, the project area does not support the type of habitat (i.e., mangroves and shallow, euryhaline waters close to shore) that is favored by juvenile sawfish. While adults may move through the area or forage there, no adverse effects are expected related to habitat loss.

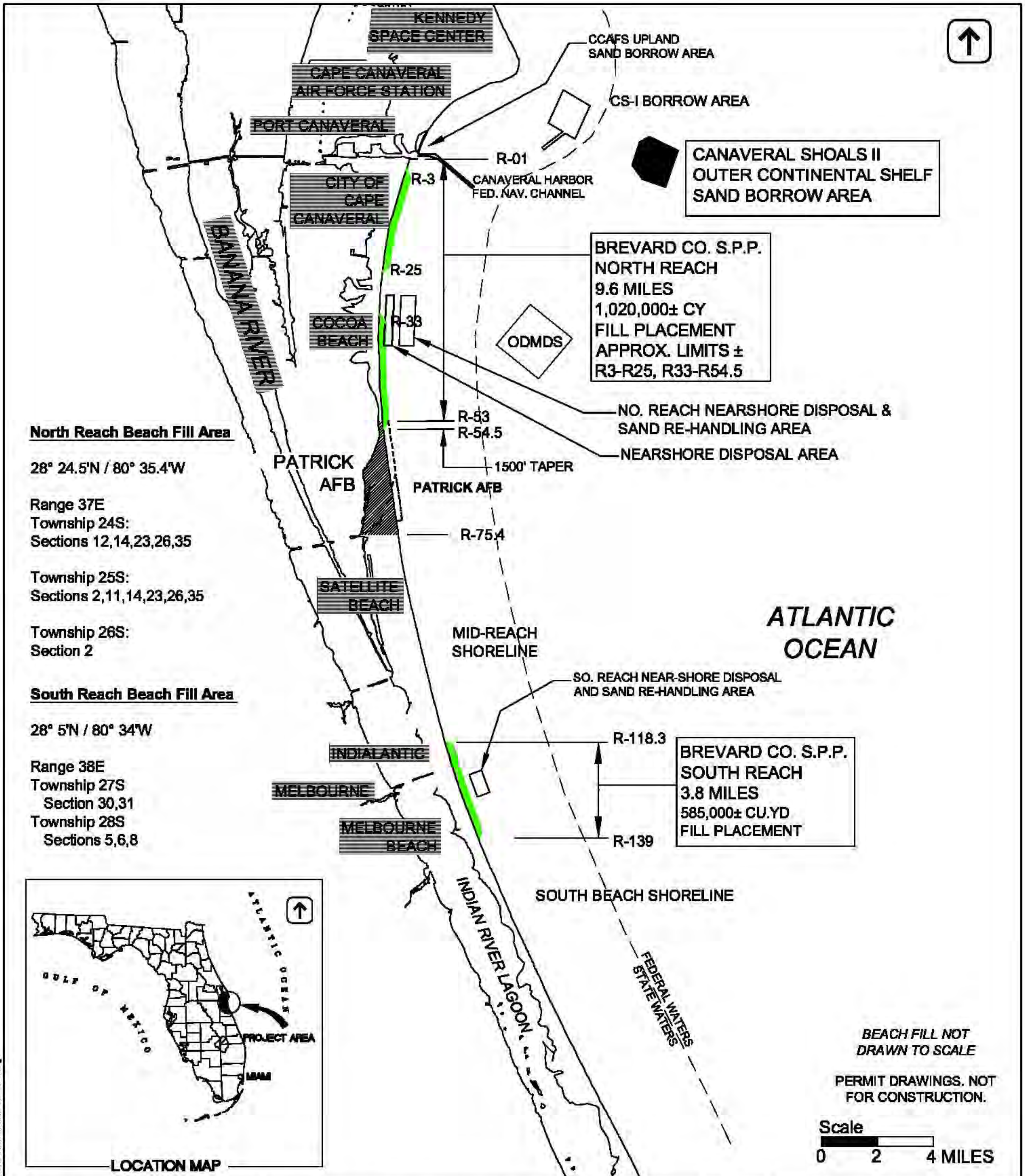
We request your concurrence in this matter. If you have questions, please contact Mr. Paul DeMarco at 904-232-3271.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

Enclosure (Map)

cc:
Dr. Jennifer Culbertson
Bureau of Ocean Energy Management
381 Elden Street
Herndon, VA 20170



olsen associates, inc.
2618 Herschel Street
Jacksonville, FL 32204
(904) 387-6114
COA No. 3491

BREVARD COUNTY, FL
SHORE PROTECTION PROJECT
NORTH & SOUTH REACH
2013/14 RENOURISHMENT

DATE:	REVISION:

05/03/13

DRAWN BY: ML

SHEET 1 OF 2

APPENDIX G

United States Fish and Wildlife Service Biological Opinion (2013)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

0 4 APR 2013

Mr. Larry Williams
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, FL 32960-3559

Dear Mr. Williams:

The U.S. Army Corps of Engineers (Corps) is pursuing Hurricane Sandy Flood Control and Coastal Emergency (FCCE) beach placement projects that fall within the scope of the Statewide Programmatic Biological Opinion (SPBO). The Corps proposes to conduct renourishment of the beach projects listed below. See the enclosed "Project Information and Screening Checklist" for additional details.

- Brevard County – North Reach
- Brevard County – South Reach
- Palm Beach - Jupiter Carlin
- Palm Beach – Delray
- Palm Beach - North Boca Raton
- Palm Beach - Ocean Ridge
- Broward County - Segment 2

The proposed activities may not fall within the scope of the SPBO because they may be located within 1 mile of an inlet. In all other respects, the activity would comply with the scope and terms and conditions of the SPBO of April 2011 (revised August 2011).

Since they involve placement of sand on the beach, the proposed activities may affect nesting sea turtles. The dredging activities will not occur in an IMA nor in a warm water aggregation area and all in-water activities will follow the standard manatee protection measures. Therefore the proposed activities may affect but are not likely to adversely affect manatees. Since the proposed activities will not alter the on-going management of the shoreline and migratory bird protection measures will be observed during construction, the piping plover is not likely to be adversely affected. Finally, the proposed actions will not adversely affect beach mice because beach mouse habitat will not be impacted.

If you determine that the proposed FCCE activities fall within the scope of the SPBO, please consider this letter as the initiation of the 30-day coordination required by the Terms and Conditions of that document. If you determine that the proposed activities do not fall within the scope of the SPBO, please consider this letter (along with the documents referenced and the enclosures herein) a biological assessment initiating consultation. If you have any questions, please contact me at 904 232-1665 or Paul DeMarco, the technical point of contact at 904 232-1897.

Sincerely,

Eric R. Summa
Chief, Environmental Branch

Enclosures

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 49

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Brevard County, FL

Project Event: Brevard County North, 2012 FCCE

Project Number: 113619 Application #:

Sponsor/ Applicant: Brevard County

Quantity (CY): 111,600 FCCE, 1,019,200 with CG Length (Feet): 52,000

County(ies): Brevard Location R-Monuments: R1-R53

Lat °: 28 Lat': 20 Lat'' 23.82 Long° -80 Long': 36 Long'': 20.83

Borrow or Dredge Site(s): Offshore, Canaveral Shoal II on Outer Continental Shelf, BOEM

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☑ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat: Adjacent to Port Canaveral, otherwise highly developed shoreline, no evidence of potential or actual washover fan

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 50

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Brevard County, FL

Project Event: Brevard County South, 2012 FCCE

Project Number: 113619

Application #:

Sponsor/ Applicant: Brevard County

Quantity (CY): 585,500 FCCE only

Length (Feet): 17,500

County(ies): Brevard

Location R-Monuments: R119-R137.5

Lat °:	Lat':	Lat"	Long°	Long':	Long":
28	04	48.13	-80	33	39.46

Borrow or Dredge Site(s): Canaveral Shoal II on Outer Continental Shelf, BOEM

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☐ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat:

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record #: 52
Prepared by: Dugger, Kenneth R SAJ
Date Entered: 4/3/2013

Project Name: Palm Beach County, FL (Reimb)

Project Event: Jupiter-Carlin 2012 FCCE

Project Number: 113167 Application #:

Sponsor/ Applicant: Palm Beach County

Quantity (CY): 86,700 FCCE, 822,000 with CG Length (Feet): 5800

County(ies): Palm Beach Location R-Monuments: R13-R19

Lat °: 26 Lat': 56 Lat" 09.10 Long° -80 Long': 04 Long": 10.28

Borrow or Dredge Site(s): Off Shore

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☐ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☑ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat: Encompases Jupiter Inlet, Jupiter Beach Park, Carlin Park

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.
2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.
3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 53

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Palm Beach County, FL (Reimb)

Project Event: Delray 2012 FCCE

Project Number: 113167

Application #:

Sponsor/ Applicant: City of Delray

Quantity (CY): 150,000 FCCE, 1,358,000 with CG

Length (Feet): 14,800

County(ies): Palm Beach

Location R-Monuments: R175-R188

Lat °: 26 Lat': 27 Lat" 26.19 Long° -80 Long': 04 Long": 10.28

Borrow or Dredge Site(s): Off Shore

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☐ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat: Aerial photography indicates no inlets and no potential or existing washover fans, highly developed shoreline

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 54

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Palm Beach County, FL (Reimb)

Project Event: North Boca Raton 2012 FCCE

Project Number: 113167

Application #:

Sponsor/ Applicant: City of Boca Raton

Quantity (CY): 234,000 FCCE, 614,400 with CG

Length (Feet): 11,000

County(ies): Palm Beach

Location R-Monuments: R202-R212

Lat °: 26 Lat': 23 Lat" 01.78 Long° -80 Long': 03 Long": 59.35

Borrow or Dredge Site(s): Off shore

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☐ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat:

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 55

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Palm Beach County, FL (Reimb)

Project Event: Ocean Ridge 2012 FCCE

Project Number: 113167 Application #:

Sponsor/ Applicant: Palm Beach County

Quantity (CY): 73,300 FCCE; 519,300 with CG

Length (Feet): 7,400

County(ies): Palm Beach

Location R-Monuments: R152-R159

Lat °: 26 Lat': 31 Lat" 58.87 Long° -80 Long': 02 Long": 45.69

Borrow or Dredge Site(s):

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☑ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☑ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat: Abuts South Lake Worth Inlet, Ocean Inlet Park, Ocean Ridge Park, Ocean Front Park; Aerial photo shows little potential for washover fan or intertidal flat

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

Statewide Programmatic Biological Opinion (SPBO)
Beach Placement and Shore Protection
Coast of Florida
U.S. Fish and Wildlife Service (FWS)

New Record | Save Record | Print Record | Close

Record # 48

Prepared by: Dugger, Kenneth R SAJ

Date Entered: 4/3/2013

Project Name: Broward County, FL

Project Event: Broward County, Segment II, FCCE

Project Number: 113072

Application #:

Sponsor/ Applicant: Broward County

Quantity (CY): 106,400 FCCE, 286,400 with CG

Length (Feet): 27,000

County(ies): Broward

Location R-Monuments: R26-R53

Lat °: 26 | Lat': 13 | Lat'' 10.00 | Long° -80 | Long': 05 | Long'': 23.86

Borrow or Dredge Site(s): Upland Sand Mine (probably Ortona or Witherspoon)

Beach Placement from Navigation Dredging: ☐ O and M ☐ Deepen, Widen, or Expand

Beach Nourishment/Shore Protection Project: ☐ Initial Nourishment ☑ Renourishment

Nature of Activity: ☐ Beach Placement ☐ Beach Placement Below MLW

☐ Dune Placement or Planting ☐ Nearshore Placement (material remains below MLW)

☐ Sand Bypassing ☐ Sand Back-Passing ☐ Sand Transfer ☐ Groin Repair or Replacement

☐ Jetty Repair or Replacement ☐ *Other Activity (list in comment Box)

Area with Sea Turtle Window: ☐ SE Florida (Broward through Brevard) ☐ Manasota Key

☐ Gulf Co (St Joe Peninsula St Pk, St. Joe Peninsula, Cape San Blas) ☐ Franklin Co (St George Is)

*Piping Plover Critical Habitat ☑ *Other Piping Plover Habitat ☐ *30-day Coordination Still Pending

PP Crit Hab 1:

PP Crit Hab 2:

☐ *No Pre-Project Survey for Actual or Potential Washover Fan

Beach Mouse Habitat (use drop-down box below) ☐ Other Beach Mouse Habitat (list in comment box)

Beach Mouse Habitat:

☐ *Important Manatee Area ☐ *Beach Jacquemontia Habitat (including pipeline, access, storage, staging, etc.)

☐ *Roseate Term Colon, May-June (Pelican Shoal, Vaca Rock, Truman Annex, Marathon Gov Center)

☐ *Snowy Plover Breeding Area, Mar-Sep (Gulf Coast: Caladesi Is, Fort DeSoto Park, Cayo Costa, isolated peninsulas)

*These items may be outside the scope of the SPBO and/or require additional coordination w/FWS (see next page)

Responsible for Post Construction Monitoring/Corrective Measures (Compaction/Escarpments, 3 yrs post construction

Responsible for Post Contruction Monitoring (Sea Turtle Nesting, 2-yrs post construction)

Responsible for Post Construction Monitoring (2 Beach Lighting Surveys, early May and late July):

☐ *Any Other Term and Condition not Followed

Describe Other TC:

Comment, Habitat: Adjacent to Hillsboro Inlet, Otherwise along highly developed shoreline

Comment, Other:

-Instructions-

General: Text fields are limited to 255 characters to accommodate a consolidated report in which the form's data is exported to an Excel spreadsheet. There are 2 "Comment" fields to allow about 500 characters total.
Project Name: Use official project name from P2 for Corps projects.
Project Activity/Event: Identify the dredging or renourishment event (e.g., reach, segment, year, sequence)
Project Number: Use project number from P2 for Corps projects.
Application #: Use Corps permit application number where applicable.
Quantity/Length: Normally use cubic yards and linear feet for beach placement.
Location and R-monuments: Brief phrase for location. Use state R-monuments.
Latitude and Longitude: Enter for approximate center of shoreline project/activity (not for the borrow/dredge site). For example, Jacksonville District Office would be Latitude 30° 19' 04.91" Longitude -81° 39' 36.48".
Borrow or Dredge Sites: Brief phrase or name for borrow area or dredge site.
Piping Plover Critical Habitat: Use the 2 drop-down boxes (only one critical habitat unit per drop-down box).
See PBO or Federal Register of July 10, 2001, pages 36070 to 36073 for additional details on Piping Plover critical habitat.
Other Piping Plover Habitat: List in the comment box any additional critical habitat units and any other important Piping Plover habitat. Refer to SPBO for additional information.

1. For projects located: (a) In piping plover critical habitat, initiation of formal consultation is necessary. (b) In or within one mile of a critical habitat unit, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining potential indirect effects to biological constituent elements within a critical habitat unit. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely. (c) In or within one mile of an inlet, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in formal consultation. (d) On or adjacent to public lands (county, state, federal, etc), the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have ended informally but depending on the latest information, formal consultation may be likely.

2. For jetty and groin repairs/replacement project, the Corps shall contact the Service with the project description. The Service will aid the Corps in determining whether there will be any effects to the piping plover. The Service will respond within 30 days. Previous consultations in these areas have resulted in informal consultation.

3. In all other areas, the Corps shall contact the Service with the project description and location. The Service will be the Corps' key source of information to provide technical assistance, including known locations or the latest survey information on piping plovers within 30 days. Previous consultations in these areas have resulted in informal consultation.

Beach Mouse Habitat: Geographic range of species is shown in drop-down box. Note that species is limited to areas of suitable habitat within that range. Refer to the SPBO for additional information.
Important Manatee Areas (IMA): Activities within IMAs are not within the scope of the SPBO and require separate consultation.
Beach Jacquemontia Habitat: Impacts to this species are not within the scope of the SPBO. Within the range of this species a survey and avoidance is required (see SPBO for additional information).
Roseate Tern Nesting Colony, May-June: Activities affecting such colonies during nesting season are not within the scope of the SPBO.
Snowy Plover: In addition to migratory bird protection, is a candidate for listing as threatened. Breeding occurs along Gulf Coast at indicated parks and on isolated coastal peninsulas. If listing is imminent, Section 7 consultation may be appropriate.
Responsible for Post Construction Monitoring and Corrective Measures: The activity is not within the scope of the SPBO if there is no formal acceptance of responsibility for post-construction monitoring and corrective measures. A separate consultation with FWS is required. L:\group\pde\dugger\PBO\ProjInfoSheet4.pdf

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:

RECEIVED

SEP 01 2011

South Florida ES Office
Vero Beach, FL

Service Log Number: 41910-2011-F-0170

August 22, 2011

Colonel Alfred A. Pantano, Jr. District Engineer
U.S. Army Corps of Engineers
Regulatory Division, North Permits Branch
Atlantic Permits Section
P.O. Box 4970
Jacksonville, Florida 32232-0019

RECEIVED

SEP 06 2011

U.S. FISH AND WILDLIFE SERVICE
JACKSONVILLE, FLORIDA

Dear Colonel Pantano:

This document is the U.S. Fish and Wildlife Service's revised Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory sand placement activities in Florida and their effects on loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and the southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and their designated critical habitat. It does not include take for the non breeding piping plover (*Charadrius melodus*) and its designated critical habitat.

Each proposed project will undergo an evaluation process by the Corps to determine if it properly fits within a programmatic approach. The project description will determine if the project is appropriate to apply to this programmatic consultation. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the SPBO are applicable to the project, it will be covered by this programmatic consultation. If not, the Corps will consult separately on individual projects that do not fit within this programmatic approach.

Proposed projects that "may affect" the piping plover or occur within piping plover critical habitat are not included in this SPBO and will be consulted on individually. The Corps should consult on all projects that are in areas where piping plover have been observed, all navigable inlets, washover areas), all projects in or within one mile of piping plover critical habitat, and all projects within public lands (county, state, federal, etc.) where coastal processes are allowed to function, mostly unimpeded.

We will meet annually during the fourth week of August to review the sand placement projects, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this SPBO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions. We will also discuss progress for the future inclusion of piping plovers in the SPBO.

The entire programmatic consultation will be reviewed every five years or sooner if new information concerning the projects or protected species occurs. Reinitiation of formal consultation is also required 10 years after the issuance of this SPBO.

We are available to meet with agency representatives to discuss the remaining issues with this consultation. If you have any questions, please contact Ann Marie Lauritsen at the North Florida Ecological Services Office at (904) 731-3032, Jeffrey Howe at the South Florida Ecological Services Office at (772) 562-3909 ext. 283, or Richard Zane at the Panama City Ecological Services Office at (850) 769-0552 ext. 241.

Sincerely,

/s/

David L. Hankla
Field Supervisor,
Jacksonville Field Office

/s/

Donald W. Imm
Field Supervisor
Panama City Field Office

/s/

Field Supervisor
South Florida Field Office

Shore Protection Activities along the Coast of Florida

Statewide Programmatic Biological Opinion
August 22, 2011

Prepared by:
U.S. Fish and Wildlife Service

TABLE OF CONTENTS

LIST OF FIGURES

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Acronyms

ABM	Alabama Beach Mouse
Act	Endangered Species Act
AFB	Air Force Base
AIBM	Anastasia Island Beach Mouse
ASP	Anastasia State Park
BO	Biological Opinion
CBM	Choctawhatchee Beach Mouse
CBRA	Coastal Barrier Resources Act
CCAFS	Cape Canaveral Air Force Station
CFR	Code of Federal Regulations
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Corps	U.S. Army Corps of Engineers
DOI	U.S. Department of the Interior
DTRU	Dry Tortugas Recovery Unit
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FMNM	Fort Matanzas National Monument

FR	Federal Register
FWC	Florida Fish and Wildlife Conservation Commission
FWC/FWRI	Florida Fish and Wildlife Conservation Commission’s Florida Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
GINS	Gulf Islands National Seashore
GTMNERR	Guana Tolomato Matanzas National Estuarine Research Reserve
HCP	Habitat Conservation Plan
IMA	Important Manatee Areas
INBS	Index Nesting Beach Survey
IPCC	Intergovernmental Panel on Climate Change
ITP	Incidental Take Permit
K	Carrying Capacity
MANLAA	May Affect, but is Not Likely to Adversely Affect
MHW	Mean High Water
MHWL	Mean High Water Line
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial Deoxyribonucleic Acid
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit

NWR	National Wildlife Refuge
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements
PFRU	Peninsular Florida Recovery Unit
PHVA	Population and Habitat Viability Analysis
PKBM	Perdido Key Beach Mouse
PKSP	Perdido Key State Park
PSI	Per Square Inch
PVA	Population Viability Analysis
SABM	St. Andrews Beach Mouse
SAJ	South Atlantic Jacksonville
SAM	South Atlantic Mobile
SAV	submerged aquatic vegetation
SEBM	Southeastern Beach Mouse
Service	U.S. Fish and Wildlife Service
SNBS	Statewide Nesting Beach Survey
SPBO	Statewide Programmatic Biological Opinion
SR	State Road
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
U.S.C.	United States Code

U.S.	United States

August 22, 2011

Colonel Alfred A. Pantano, Jr.
District Engineer
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Re: Service Federal Activity No: 41910-2010-F-0284
Applicant: U.S. Army Corps of Engineers
Date Started: May 30, 2007
Project Title: Shore Protection Activities
Ecosystem: Florida Coastline
Counties: Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia.

Dear Colonel Pantano:

This document is the U.S. Fish and Wildlife Service's (Service) Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities in Florida and their effects on loggerhead (*Caretta caretta*), green (*Chelonia mydas),* leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and designated critical habitat (CH) for the Perdido Key beach mouse (PKBM), Choctawhatchee beach mouse (CBM), and St. Andrews beach mouse (SABM) **(Table 1)**. This SPBO is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Federal Activity number 41910-2010-F-0284 for this consultation.

Table 1. Status of federally listed species within the Action Area that may be adversely affected by the shore protection activities.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH
Mammals		
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered(CH)
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered (CH)
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered (CH)
Birds		
Piping Plover	*Charadrius melodus*	Threatened
Reptiles		
Green sea turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened

The Corps determined that the proposed project "may affect and is likely to adversely affect the above listed species (**Table 1)**. The Corps also has determined that the proposed project "may affect, but is not likely to adversely affect" (MANLAA) the West Indian (Florida) manatee (*Trichechus manatus latirostris*), the roseate tern (*Sterna dougallii dougallii*), the beach jacquemontia (*Jacquemontia reclinata*), and the Garber's spurge (*Chamaesyce garberi*) **(Table 2)**. Based on our review of the project plans and the incorporation of the minimization measures listed in the final Programmatic Biological Assessment (PBA) as conditions of the projects where these species are known to exist, we concur with these determinations.

Table 2. Species and critical habitat evaluated for effects and those where the Service has concurred with a "may affect, not likely to adversely affect (MANLAA)" determination.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH	PRESENT IN ACTION AREA	MANLAA
Florida manatee	*Trichechus manatus latirostris*	Endangered (CH)	Yes	Yes
Roseate tern	*Sterna dougallii dougallii*	Threatened	Yes	Yes
Beach jacquemontia	*Jacquemontia reclinata*	Endangered	Yes	Yes
Garber's spurge	*Chamaesyce garberi*	Threatened	Yes	Yes

Piping Plover

The Corps should consult on all projects that are in areas where piping plover have been observed, all projects in or within one mile of an inlet (includes but not limited to streams, coastal dune lake outfalls, navigable inlets), all projects in or within one mile of piping plover critical habitat, and all projects within public lands (county, state, federal, etc.) where coastal processes are allowed to function, mostly unimpeded. Contact via electronic mail is recommended although contact may be made via telephone or regular mail. The Corps and the Service have agreed to the following interim section 7 consultation procedures.

1. The Corps shall contact the Service with the project description and location (include a map of any optimal habitat features that may be present within the project area). The Corps will also provide a "determination" based on available information.

2. The Service shall provide a response within 30 days. Based on additional information on the piping plover and other factors, the Service shall concur or not concur with the Corps' "determination".

In the final PBA, the Corps listed the following commitments to reduce impacts on piping plovers:

1. Adhere to appropriate windows to the maximum extent possible;
2. Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the "surveys" must be limited to the term of the construction unless they are otherwise authorized and funded (as used in Section 9.00 of the PBA, "funded" means subject to availability and allotment);
3. Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;

4. Avoid impacts to the primary constituent elements of piping plover critical habitat to the maximum extent possible;
5. Pre-project surveys will be performed to assess the presence of and/or potential for washover fan formation;
6. The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (*i.e.*, washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose; and
7. The Corps will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (*i.e.*, emergent spits, sand bars, etc.) within each inlet's management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex.

Florida Manatee

Dredging activities offshore associated with submerged borrow areas and navigational channels maintenance

The Corps has determined that the proposed project "may affect, but is not likely to adversely affect" the Florida manatee. The Service has reviewed the draft PBA and concurs that, for dredging activities offshore, if the July 2009 Standard Manatee In-water Construction Conditions are implemented; these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Dredging activities adjacent to the shore, inlet, and channels associated with submerged borrow areas and navigational channels maintenance

For dredging activities adjacent to the shore, inlets, and/or inshore areas, based on the incorporation of the following additional conditions into the proposed projects and made a condition of the issued permit or Corps project plan and implemented, the Service would be able to concur with a determination by the Corps that these activities may affect, but are not likely to adversely affect the Florida manatee:

1. Barges shall install mooring bumpers that provide a minimum 4-foot standoff distance under maximum compression between other moored barges and large vessels, when in the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate.

2. Pipelines shall be positioned such that they do not restrict manatee movement to the maximum extent possible. Plastic pipelines shall be weighted or floated. Pipelines transporting dredged material within the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate shall be weighted or secured to the

bottom substrate as necessary to prevent movement of the pipeline and to prevent manatee entrapment or crushing.

3. In the event that such positioning has the potential to impact submerged aquatic vegetation (SAV) or nearshore hardbottom, the pipeline may be elevated or secured to the bottom substrate to minimize impacts to SAV.

Important Manatee Areas

Important Manatee Areas (IMAs) are areas where increased densities of manatees occur due to the proximity of warm water discharges, freshwater discharges, natural springs, and other habitat features that are attractive to manatees. These areas are heavily utilized for wintering, resting, feeding, drinking, transiting, nursing, etc., as indicated by aerial survey data, mortality data, and telemetry data. A current list of warm water IMAs that may occur within the project area includes:

Brevard County (Indian River) - Reliant and FP&L Power Plants
Hillsborough County (Tampa Bay)
Port Sutton Power Plant
Tampa Electric Big Bend Power Plant
Pinellas County (Old Tampa Bay)
Bartow Electric Generating Plant

A current map of all the IMAs or areas of inadequate protection can be found at the following Corps' website: http://www.saj.usace.army.mil/Divisions/Regulatory/sourcebook.htm.

Dredging activities within the IMA sites (both warm and other aggregation sites) are not included in this SPBO. For dredging activities within IMA sites (both warm water and other aggregation sites), the Corps shall contact the appropriate Service Field Office for project specific conditions (Table 3).

Table 3. Service Field Offices and County jurisdictions.

County	Service Field Office	Address	
Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Manatee, Pinellas, and Hillsborough	North Florida Ecological Services Office	7915 Baymeadows Way, Suite 200 Jacksonville, FL 32256-7517	(904) 731-3336
Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, and Sarasota	South Florida Ecological Services Office	1339 20th Street Vero Beach, FL 32960	(772) 562-3909
Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia	Panama City Ecological Services Office	1601 Balboa Avenue Panama City, FL 32405	(850) 769-0552

Although this does not represent a biological opinion for the manatee as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required regarding manatees. It also fulfills the requirements of the MMPA. If modifications are made in the programmatic action or additional information becomes available, reinitiation of consultation may be required.

Migratory Birds

In order to comply with the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq.*) and potential for this project to impact nesting shorebirds, the Corps' or the Applicant should follow Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

Consultation History

<u>1980s and 1990s</u>	Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s. During that time, sea turtle protection measures were developed based on research findings available at that time. These measures addressed sand compaction, escarpment formation, and timing restrictions for projects in six south Florida counties with high nesting densities. In the mid-1990s, a sea turtle Biological Opinion (BO) template was developed that included protection measures and information on the status of sea turtles. In 1995, an expanded version of the sea turtle template BO was developed to incorporate new guidance on the required format for BOs and a biological rationale for the Terms and Conditions to be imposed. This document underwent review by four State conservation agencies and the Corps, and was subsequently revised. The primary purposes of the template BO were to: (1) incorporate a standardized format and language required for use in all BOs based on guidance from the Service's Washington Office, (2) assist Service biologists in the preparation of BOs, (3) increase consistency among Service field offices, and (4) increase consistency between the Service and the State agencies.
<u>March 7 and 8, 2006</u>	The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of that meeting was to begin discussions about a regional consultation for sand placement activities along the coast of Florida and preparation of a PBA for sand placement activities in Florida. In addition to sea turtles, other Federal and state protected species were included in the discussions. At that meeting, the following topics were discussed: 1. Sand placement activities; 2. Sand source and placement methods; 3. Species and habitat; 4. Geographic scope;

5. Information availability; and
6. Minimization of impacts.

<u>July 13, 2006</u> A second meeting was held to further discuss the draft PBA. The Service provided the Corps with copies of the latest BO templates for each species to be considered. The Service held conference calls with the species recovery leads during August 2006.

<u>October 16, 2006</u> The Service received the draft PBA via email from the Corps for sand placement activities along the coast of Florida.

<u>October 27, 2006</u> The Service provided the Corps with draft comments on the PBA via email.

<u>October 31, 2006</u> The Corps provided a response to the Service's comments on the PBA via email.

<u>November 9, 2006</u> The Service and the Corps held a conference call to discuss the comments.

<u>December 20, 2006</u> The Service sent the Corps a letter with the final comments on the draft PBA.

<u>September 18 and 19, 2007</u>
The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of this meeting was to discuss the Terms and Conditions to be included in the BO.

<u>October 5, 2007</u> The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous meeting.

<u>November 1, 2007</u> The Corps provided the Service with comments via email on the revised Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

<u>March 31, 2008</u> The Service revised the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice. The Service also revised the minimization measures for the manatee. The revisions were sent to the Corps.

<u>September 16, 2008</u> The Service sent the Corps via mail the draft SPBO.

<u>October 2, 2008</u> The Corps provided the Service via email with a summary of the remaining issues concerning the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

October 15, 2008 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous email.

March 11, 2009 The Service received via email examples of previous agreements between the Corps and the local sponsor to carry out the Terms and Conditions in previous BOs.

April 7, 2009 The Service sent an email to the Corps with an update of the progress of our analysis of including piping plovers in the SPBO.

August 26, 2009 The Service sent to the Corps via email the latest Terms and Conditions for sea turtles and beach mice.

September 17, 2009 The Corps sent an email to the Service describing the actions to be taken for the completion and submittal of the PBA.

January 6, 2010 The Corps and the Service participated in a meeting to finalize the draft SPBO.

January 21, 2010 The Corps sent to the Service via email the revised draft PBA.

March 25, 2010 The Corps and the Service participated in an implementation meeting and submittal of the final PBA.

February 22, 2011 The Corps submitted the final PBA to the Service.

April 18, 2011 The Service sent the final Statewide PBO to the Corps.

June 21, 20100 The Corps provided written concerns with the final Statewide PBO

June 30, 2011 The Service revised the final Statewide PBO.

July 18, 2011 The Corps provided written agreement with the changes that were made and asked for additional changes.

July 22, 2011 The Service made additional revisions per the Corps request.

July 25, 2011 The Corps provided written agreement with the additional revisions.

This SPBO is based on the PBA, and information provided during meetings and discussions with the Corps' representatives and information from the Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute (FWC/FWRI) sea turtle databases. A complete administrative record of this consultation is on file in the Service's North Florida, Panama City, and South Florida Ecological Services Offices.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida, encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Corps Districts. Additionally, the proposed action includes the replacement and rehabilitation of groins, utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This SPBO includes Corps Regulatory and Civil Works shore protection activities. Corps Regulatory activities may include the involvement of other Federal agencies, such as the Department of Defense, Bureau of Ocean Energy Management, and the Federal Emergency Management Agency (FEMA). The shore protection activities covered in the SPBO encompass the following shore protection activities:

1. Sand placement;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management;
3. Sand washed onto the beach from being placed in the swash zone;
4. Sand by-passing/back-passing;
5. Operations and Maintenance (O&M) dredging of navigation channels with beach disposal; and
6. Groins and jetty repair or replacement.

A detailed description of each activity is found in the final PBA. The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future beach placement actions addressed in this SPBO may include maintenance of these existing projects or beaches that have not experienced a history of beach placement activities.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment and the shoreline updrift and downdrift area.

Corps Commitments as listed in the final PBA

The following paragraph from the final PBA summarizes the Corps Commitments as listed below:

"For Corps projects, please note that "fish and wildlife enhancement" activities (which are beyond mitigation of project impacts) must be authorized as a project purpose or project feature or must be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 Jun 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority (ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)), authorization and funding for such is not expected."

Sea Turtles

1. Avoid sea turtle nesting season to the maximum extent practicable;

2. Except for O&M disposal actions, implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;

3. Except for O&M disposal actions, escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the Service. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;

4. Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized and nest placement is not subject to inundation or washout;

5. Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible;

6. The Corps will continue to work with the FDEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts;

7. Except for O&M disposal actions, Service compaction assessment guidelines will be followed and tilling will be performed where appropriate. For Corps Civil Works projects, assessment of compaction and tilling will be limited to the term of the construction or as otherwise may be authorized and funded; and

8. All lighting associated with project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements.

Beach Mice

1. Pipeline routes for beach construction projects will avoid identified primary constituent elements for beach mouse critical habitat to the maximum extent practicable;

2. Implementation of a trapping and relocation plan if avoidance alternatives are not practical; and

3. Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice during construction.

Action Area

The Service has described the action area to include sandy beaches of the Atlantic Coast of Florida (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) for reasons that will be explained and discussed in the "EFFECTS OF THE ACTION" section of this consultation.

Underlying Dynamics of a Barrier Island

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). The southeast coast of Florida consists of continuous, narrow, sandy barrier islands bordering a narrow continental shelf (Wanless and Maier 2007). The dynamics of the east coast shoreline are due to the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. More erosion events can also occur during late September through March due to nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Northwest (panhandle) and Southwest Florida beaches are considered to be low energy beaches with a gradual offshore slope and low sloped fine grained quartz sand beaches. As along the east coast of Florida, the shoreline dynamics are shaped by tropical storms and hurricanes. Although Gulf beaches may experience winter erosion, they are largely protected from the severe nor'easters.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of seven feet at the Florida-Georgia line to less than two feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than three feet (microtidal) except in the extreme south where it ranges from three to four feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Microtidal coasts have a high vulnerability to sea level rise and barrier islands respond by migrating landward. Migration occurs as a result of overwash from extreme storms that flatten topography and deposit sand on the backside of the island, extending the island landward (Young 2007). Significant widening can occur from a single storm event. For example, Dauphin Island, a barrier island in Alabama, has nearly doubled its width following Hurricanes Ivan and Katrina in 2004 and 2005, respectively.

Sea level has risen globally approximately 7.1 inches in the past century (Douglas 1997). Climate models predict a doubling of the rate of sea level rise over the next 100 years (Pendleton *et al.* 2004). Recent studies indicate a trend toward increasing hurricane number and intensity (Emanuel 2005, Webster *et al.* 2005). Barrier islands need to be able to move and respond to these conditions. By locking in a barrier island's location with infrastructure, the island loses its ability to migrate to higher elevations which can lead to its eventual collapse (Moore 2007).

Overwash from less intense storms can positively affect island topography. Low natural berms can develop along beach fronts, but generally can be exceeded by overwash from frontal storms. The berm is an accretionary feature at the landward extreme of wave influence. Sediment is transported over the berm crest and is deposited in a nearshore overwash fan and in breach corridors. Overwash deposition provides source sand for re-establishing dunes. Onshore winds transport the sediment from overwash fans to the dunes, gradually building back dune elevation during storm-free periods.

The interaction between the biology and geomorphology of barrier islands is complex. Just as the barrier island undergoes a process of continual change, so do the ecological communities present. Vegetation zones gradually re-establish following storms, and in turn affect physical processes such as sand accretion, erosion, and overwash. The beach front, dunes, and overwash areas all provide important habitat components. Many barrier island species are adapted to respond positively to periodic disturbance. As the island widens, new feeding habitat (sand/mud flats) is created for shorebirds such as the piping plover. The beaches provide nesting habitat for sea turtles. Early colonizer plants are favored as a food source by beach mice. These barrier island habitats are becoming increasingly rare as our Nation's coastlines rapidly develop.

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. Five species of sea turtles are analyzed in this SPBO: the loggerhead, green, leatherback, hawksbill, and Kemp's ridley.

Loggerhead Sea Turtle

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 Federal Register [FR] 32800). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders.

Hatchlings are a dull brown color (NMFS 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.
Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2009b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Franklin County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC 2009a).

Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The green turtle is attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 FR 8491). Leatherbacks have the widest distribution of the sea turtles with nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Foraging leatherback excursions have been documented into higher-latitude subpolar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving.

The adult leatherback can reach four to eight feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2009c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. This is the largest, deepest diving of all sea turtle species.

Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world's largest known concentration of nesting leatherbacks.

The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. Along the U.S. Atlantic coast, most nesting occurs in Florida (NMFS and Service 1992). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990, FWC 2009a); and in southwest Florida a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990). Nesting has also been reported in Georgia, South Carolina, and North Carolina (Rabon *et al.* 2003) and in Texas (Shaver 2008).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 Code of Federal Regulations (CFR) 17.95).

<u>Hawksbill Sea Turtle</u>

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

Data collected in the Wider Caribbean reported that hawksbills typically weigh around 176 pounds or less; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2009d).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was federally listed as endangered on December 2, 1970 (35 FR 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland.

Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet. The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 1** (from Bolten 2003).

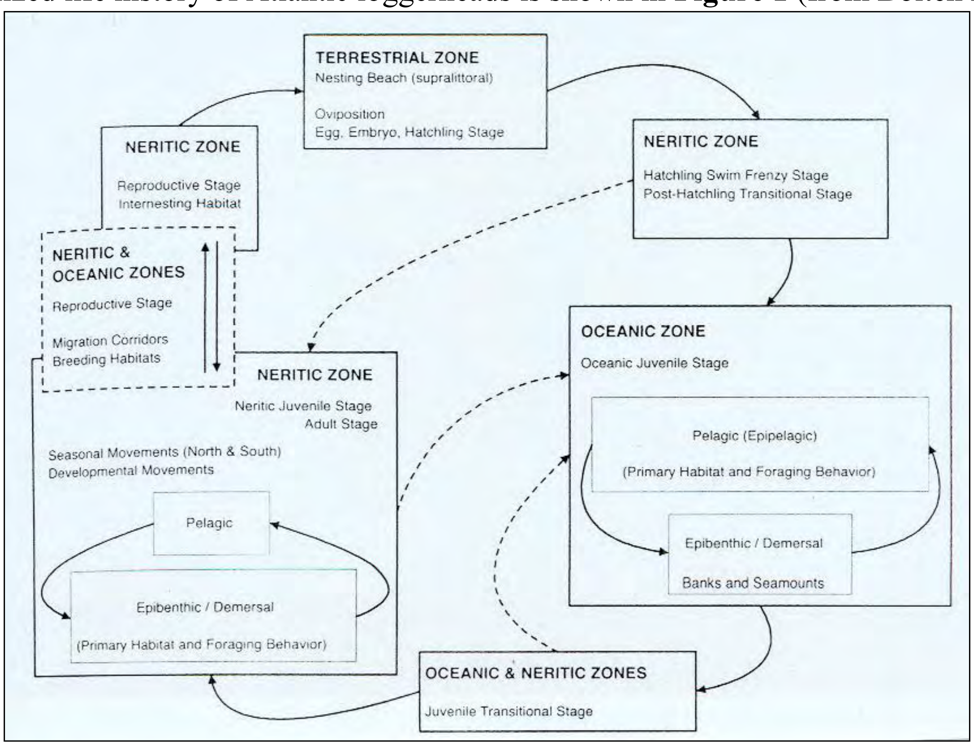

Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002). **Table 4** summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 4. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	**Data**
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	84˚F[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70 percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<34 inches Curved Carapace Length) sex ratio	65-70 percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

1 Dodd (1988).
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).

[4] National Marine Fisheries Service (2001); Foley (2005).
[5] Mrosovsky (1988).
[6] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
[7] Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
[8] Caldwell (1962), Dodd (1988).
[9] Richardson *et al.* (1978); Bjorndal *et al.* (1983).
[10] Snover (2005).
[11] Dahlen *et al.* (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington 1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a one to three day interval and move upward and out of the nest over a two to four day interval (Christens 1990). The time from pipping to emergence ranges from four to seven days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al*. (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Green Sea Turtle

Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and Service 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss *et al.* 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp’s Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as “arribadas or arribazones,” to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal *et al.* 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-Millan 1994, Rostal 2007).

Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan *et al.* 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover *et al*. 2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in the U.S. has fluctuated between 49,000 and 90,000 nests per year from 1999-2008 (FWC 2009a, NMFS and Service 2008). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

About 100 to 1,000 females are estimated to nest on beaches in Florida annually (FWC 2009c). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998b). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila *et al.* (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila *et al.* (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s, but during the 2003-2004 seasons a total of 120 nests was recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007). In Florida, an annual increase in number of leatherback nests at the core set of index beaches ranged from 27 to 615 between 1989 and 2010. Under the Core Index Nesting Beach Survey (INBS) program, 198.8 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. Annually, between 1989 and 2008, these core index zones were monitored daily during the 109-day sea turtle index nesting season (May 15 to August 31). On all index beaches, researchers recorded nests and nesting attempts by species, nest location, and date (FWC/FWRI 2010b).

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (TEWG 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean

Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623. Modeling of the Atlantic Costa Rica data indicated that the nesting population has decreased by 67.8 percent over this time period.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, annual population growth rate was estimated to be 1.10 (TEWG 2007). Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al*. 2005). In the British Virgin Islands, annual nest numbers have increased in Tortola from zero to six nests per year in the late 1980s to 35 to 65 nests per year in the 2000s (TEWG 2007).

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season (Billes *et al*. 2000). Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea) (Fretey *et al*. 2007). .

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 21,144 (Service 2009). In 2010, a total of 13,302 nests were documented in Mexico (Service 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic (**Figure 2**) are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

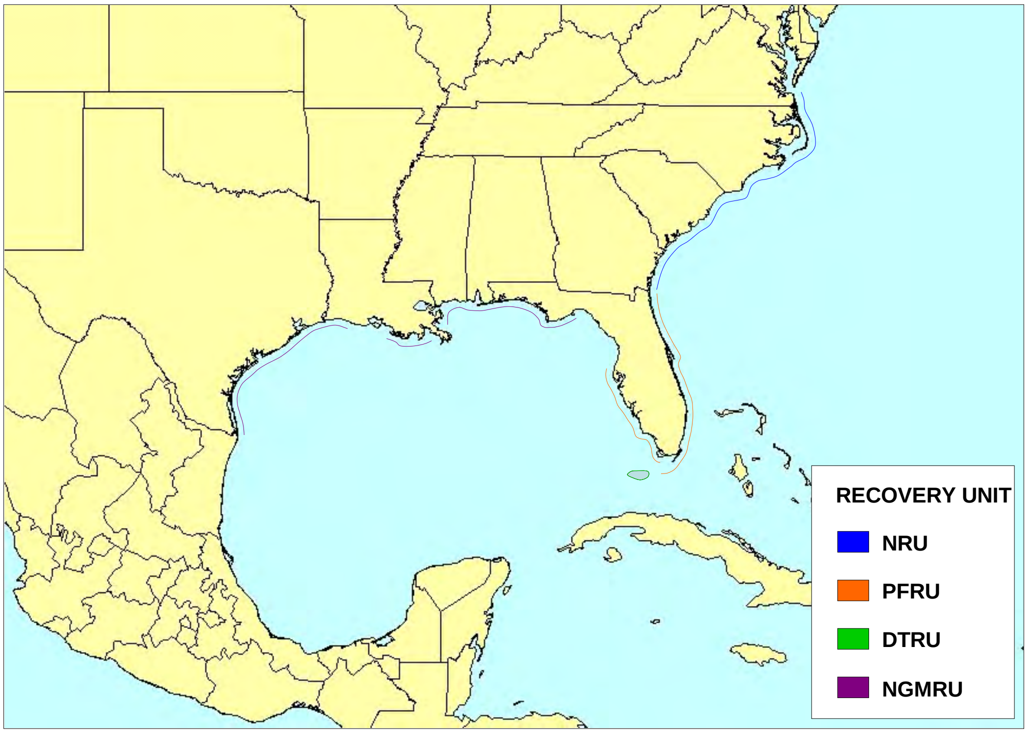

Figure 2. Map of the distribution of the loggerhead recovery units.

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.*, 2000, NMFS 2001, Hawkes *et al.* 2005. Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen *et al*. in press).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (NMFS and Service 2008), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008).

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

INBS nest counts from 1989–2010 show a shallow decline. However, recent trends (1998–2010) in nest counts have shown a 25 percent decline, with increases only observed in the most recent three-year period, 2008–2010 (FWC/FWRI 2010a). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf coast (total length = 14.3 miles). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2010.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984, (FWC 2008d). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-

2008) of Florida INBS data for the NGMRU (FWC 2008d). A log-linear regression showed a significant declining trend of 4.7 percent annually (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (nine years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). Surveys after 2004 did not include principal nesting beaches within the recovery unit (*i.e.*, Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo andYucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NMFS and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, please see NMFS and Service 2008)

1. Number of Nests and Number of Nesting Females
   a. Northern Recovery Unit
      i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and
      ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

   b. Peninsular Florida Recovery Unit
      i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and

ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit
   i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
   A network of in-water sites, both oceanic and neritic across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle was signed in 2008 (NMFS and Service 2008), and the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle was signed in 1998 (NMFS and Service 1998e).

<u>Green Sea Turtle</u>

Annual nest totals documented as part of the Florida SNBS program from 1989-2008 have ranged from 435 nests laid in 1993 to 12,752 in 2007. Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, green turtle nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). Green sea turtle nesting in Florida is increasing based on 19 years (1989-2009) of INBS data from throughout the state (FWC 2009a). The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the Act afforded complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in State waters; (4) the likelihood that the majority of Florida green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys;

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) is in public ownership and encompasses at least 50 percent of the nesting activity;

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for U.S. Population of Atlantic Green Turtle was signed in 1991 (NMFS and Service 1991), the Recovery Plan for U.S. Pacific Populations of the Green Turtle was signed in 1998 (NMFS and Service 1998b), and the Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle was signed in 1998 (NMFS and Service 1998a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al.* (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200, and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC 2009a, Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC 2009b, TEWG Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting if the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Islands, and along the east coast of Florida;

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership; and.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 (NMFS and Service 1992), and the Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle was signed in 1998 (NMFS and Service 1998d).

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument;

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands and Puerto Rico is protected in perpetuity;

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, U.S. Virgin Islands, and Florida; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1993 (NMFS and Service 1993), and the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle was signed in 1998 (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it makes the eggs more susceptible to reduced viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the MMPA, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Continuation of complete and active protection of the known nesting habitat and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national protection project;

2. Elimination of mortality from incidental catch in commercial shrimping in the U.S. and Mexico through the use of TEDs and achievement of full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. Successful implementation of all priority one recovery tasks in the recovery plan.

The Recovery Plan for the Kemp's Ridley Sea Turtle was signed in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been undertaken by the Service and NMFS and is nearing completion. The revised plan will provide updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions.

Common threats to sea turtles in Florida

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion; armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants (*Solenopsis* spp.), feral hogs (*Sus scrofa*), dogs (*Canis familiaris),* and an increased presence of native species (e.g., raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphis virginiana*)), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration, and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit *Deepwater Horizon* MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to the species range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Analysis of the species/critical habitat likely to be affected

The threatened loggerhead sea turtle, the endangered green sea turtle, the endangered leatherback sea turtle, the endangered hawksbill sea turtle, and the endangered Kemp's ridley sea turtle are currently listed because of their reduced population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings on all nesting beaches where shore protection activities (including the placement of compatible sediment, repair or replacement of groins and jetties, and navigation channel maintenance on the beaches of the Atlantic and Gulf coasts of Florida) occur. Other activities, which include military missions and coastal development that have affected the conservation of sea turtles nesting in Florida, are included in the Service's evaluation of the species current status (**Appendix A)**.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

INBS nest counts represent approximately 69 percent of known loggerhead nesting in Florida, 74 percent of known green turtle nesting, and 34 percent of known leatherback nesting (FWC 2009a). The INBS program was established with a set of standardized data-collection criteria to measure seasonal nesting, and to allow accurate comparisons between both beaches and years. The reliability of these comparisons results from the uniformity of beach-survey effort in space and time, and from the specialized annual training of beach surveyors. Under the core INBS program, 178 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. These beaches are monitored daily beginning May 15 and ending August 31. On all index beaches, researchers record nests and nesting attempts by species, the location of each nest, and the date each nest was laid.

Nesting surveys begin at sunrise. Turtle crawls are identified as a true nesting crawl or false crawl (*i.e.*, nonnesting emergence). Nests are marked with stakes and some are surrounded with surveyor flagging tape and, if needed, screened to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatching and emerging success. Nest productivity surveys may continue into mid-November depending on nest incubation periods. All monitoring is conducted in accordance with guidelines provided by the FWC.

Loggerhead Sea Turtle

Five loggerhead sea turtle recovery units have been identified in the Northwest Atlantic (NMFS and Service 2008). Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Foote *et al*. 2000, NMFS 2001, Hawkes *et al*. 2005). However, nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001). The NRU and NGMRU are believed to play an important role in providing males to mate with females from the more female-dominated recovery units.

Two (NGMRU and PFRU) of the five nesting subpopulations occur within the proposed Action Area. Northwest Florida accounts for 92 percent of the NGMRU in nest numbers consists of approximately 234 miles of nesting shoreline. The PFRU makes up 1,166 miles of shoreline and consists of approximately 64,513 recorded loggerhead nests per year (2000 to 2009).

Recovery Units	Nesting Range
NGMRU	Escambia through Franklin Counties
PFRU	Pinellas through Nassau Counties

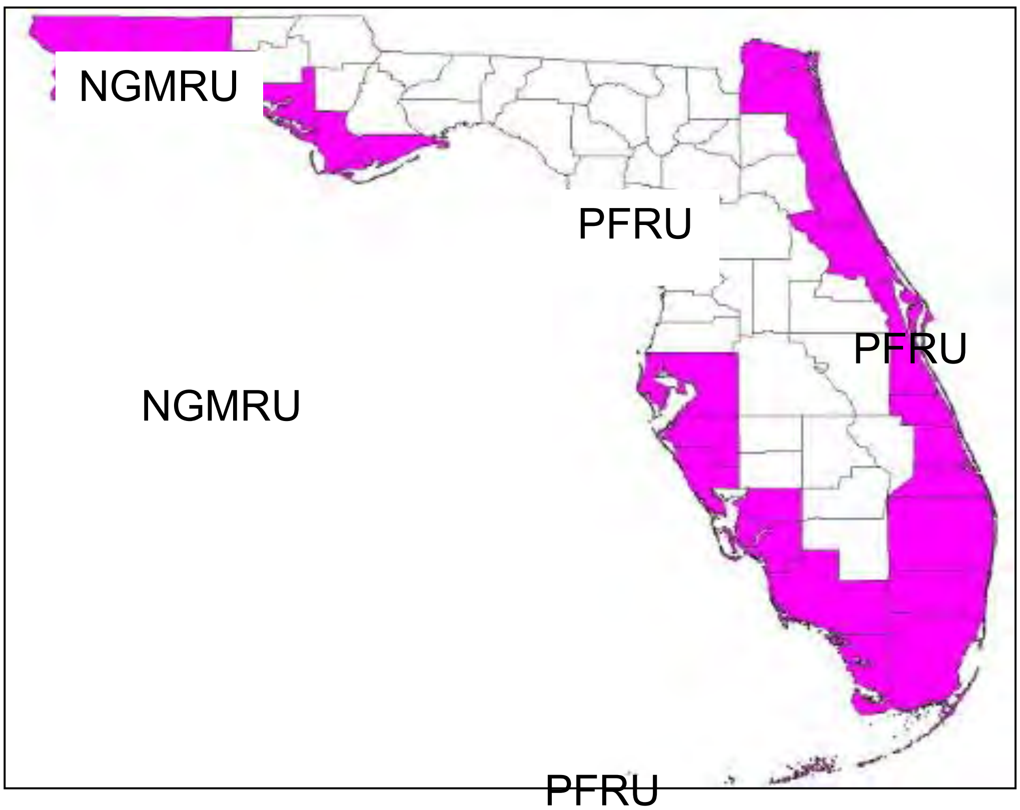

Figure 3. Distribution of loggerhead sea nesting in the PFRU and NGMRU in Florida.

The loggerhead sea turtle nesting and hatching season throughout Florida is shown in **Table 5**.

Table 5. Loggerhead sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	April 1 through November 30
Southern Florida Atlantic	Brevard through Miami-Dade	March 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through November 30

An updated analysis by FWC/FWRI reveals a shallow decline in loggerhead nest numbers around the State of Florida based on INBS nest counts from 1989 through 2010 (FWC/FWRI 2010). However, recent trends in nest counts have shown a 25 percent decline from 1998 to 2010 (FWC/FWRI 2010a).

Sea turtles play a vital role in maintaining healthy and productive ecosystems. Nesting sea turtles introduce large quantities of nutrients from the marine ecosystem to the beach and dune system (Bouchard and Bjorndal 2000). In the U.S., loggerheads play a particularly important role in this regard due to their greater nesting numbers. The nutrients they leave behind on the nesting beaches in the form of eggs and eggshells play an important role for dune vegetation and terrestrial predator populations (Bouchard and Bjorndal 2000). In a study at Melbourne Beach, Florida, Bouchard and Bjorndal (2000) estimated that only 25 percent of the organic matter introduced into nests by loggerheads returned to the ocean as hatchlings. They found that 29-40 percent of all nutrients were made available to detritivores, decomposers, and plants, while 26-31 percent of all nutrients were consumed by nest predators. Thus, all loggerhead recovery units play a vital role in the maintenance of a healthy beach and dune ecosystem within their geographic distribution.

<u>Green Sea Turtle</u>

Green turtle nest numbers are increasing in Florida with a record number of nests being recorded during the 2007 season (FWC 2009a).

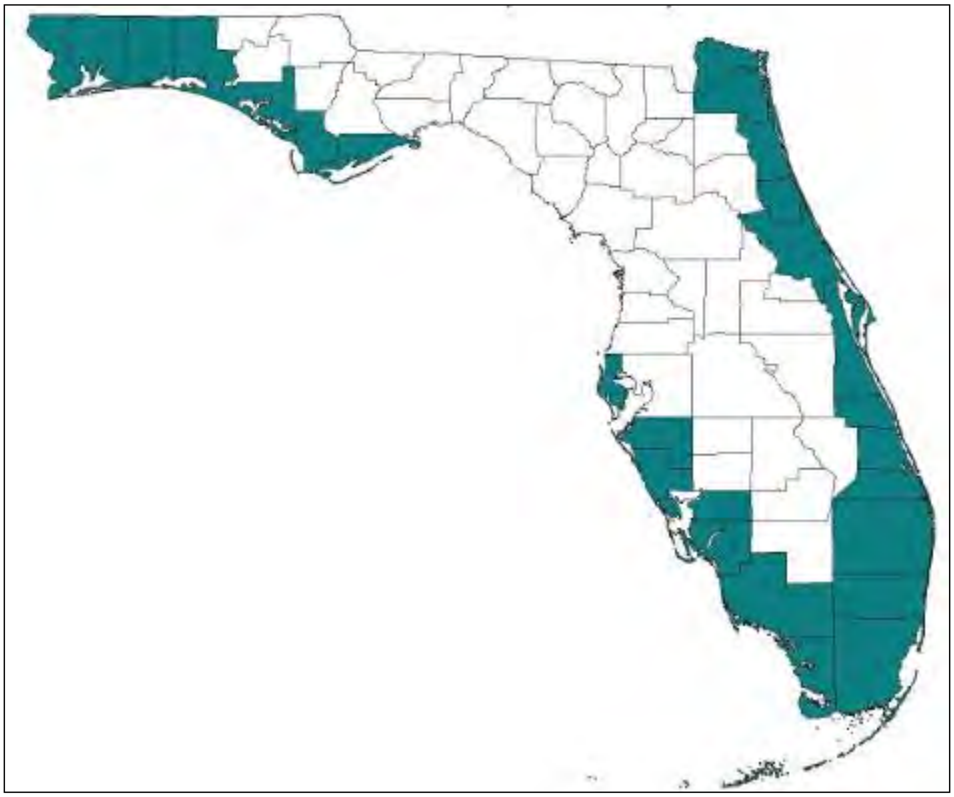

Figure 4. Distribution of green sea turtle nesting in Florida.

The green sea turtle nesting and hatching season throughout Florida is shown in **Table 6**.

Table 6. Green sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 15 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	May 15 through October 31
Southern Florida Atlantic	Brevard through Miami-Dade	May 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	May 15 through November 15

<u>Leatherback Sea Turtle</u>

Leatherback nest numbers are increasing in Florida with a record number of leatherback nests being recorded during the 2009 season (FWC 2009a).

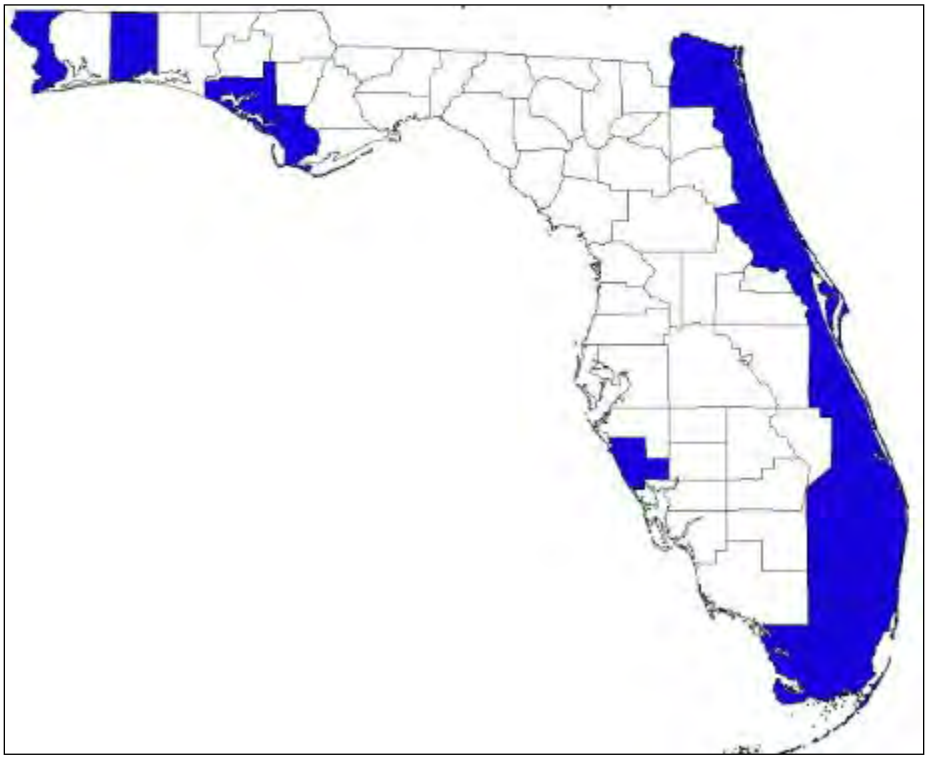

Figure 5. Distribution of leatherback sea turtle nesting in Florida.

The leatherback sea turtle nesting and hatching season throughout Florida is shown in **Table 7**.

Table 7. Leatherback sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through September 30
Southern Florida Atlantic	Brevard through Miami-Dade	February 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through September 30

Hawksbill Sea Turtle

Thirty-nine hawksbill nests have been documented in Florida from 1979-2007 in Volusia, Martin, Palm Beach, Broward, Miami-Dade, Monroe, and Manatee Counties (FWC 2008c).
The hawksbill sea turtle nesting and hatching season throughout Florida is shown in **Table 8**.

Table 8. Hawksbill sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Southern tip of Florida	Monroe	June 1 through December 31
Southern Florida Atlantic	Brevard through Miami-Dade	June 1 through December 31
Northeast Florida	Volusia	June 1 through December 31

Kemp's Ridley Sea Turtle

Twenty-six Kemp's ridley nests have been documented in Florida from 1979-2007 in Volusia, Brevard, Martin, Palm Beach, Lee, Sarasota, Pinellas, Gulf, Walton, Santa Rosa, and Escambia, Counties (FWC 2008c).

Factors affecting species habitat within the action area

In accordance with the Act, the Service completes consultations with all federal agencies for actions that may adversely affect sea turtles. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of Florida's Atlantic Coast (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) (**Appendix A**).

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss of, or impact to the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action, inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no immediate development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

A common question is whether the 2004 and 2005 hurricane seasons contributed to reduced loggerhead nest numbers observed from 2004-2007. Although Florida has been subject to numerous hurricanes in recent years, these storm events cannot account for the recent decline (1998-2010) observed in the number of loggerhead nests on Florida beaches. The hurricanes have a very limited effect on nesting activity of adult female turtles. Because loggerheads that hatch on Florida beaches require some 20 to 30 years to reach maturity, storm impacts would not manifest themselves for many years. Moreover, hurricane impacts to nests tend to be localized and often occur after the main hatching season for the loggerhead is over (FWC 2008a).

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Erosion Control Funding Assistance Program (http://www.dep.state.fl.us/BEACHES/programs/bcherosn.htm). A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2009). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 sea turtle nesting season in Florida, over 64,000 turtle hatchlings were documented as being disoriented (**Table 9**) (FWC 2007a). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (FWC 2007a).

Table 9. Documented disorientations along the Florida coast (FWC 2007a).

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008[1]	1,192	49,623	62

[1]FWC 2008e

Predation

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons, feral hogs, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes

(*Canis latrans*), armadillos, and fire ants (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al*. 1980, Schroeder 1981, Labisky *et al.* 1986). In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward, lowering the trail. Since the vehicles also inhibit plant growth, and open the area to wind erosion, dunes may become unstable, and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause an accelerated rate of overwash and beach erosion (Godfrey *et al.* 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida's beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U.S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007c).

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Florida is one of the areas most vulnerable to the consequences of climate change. Sea level rise and the possibility of more intense hurricanes are the most serious threats to Florida potentially from climate change. Florida has over 1,350 miles of coastline, low-lying topography, and proximity to the hurricane-prone subtropical mid-Atlantic Ocean and Gulf of Mexico.

One of the most serious threats to Florida's coasts comes from the combination of elevated sea levels and intense hurricanes. Florida experiences more landings of tropical storms and hurricanes than any other state in the U.S. Storm surges due to hurricanes will be on top of elevated sea levels, tides, and wave action. As a result, barrier islands and low-lying areas of Florida will be more susceptible to the effects of storm surge. An important element of adaptation strategy is how to protect beaches, buildings and infrastructure against the effects of rising seas and wind, wave action, and storm surge due to hurricanes.

Temperatures are predicted to rise from 1.6^{o}F to 9^{o}F for North America by the end of this century (IPCC 2007a,b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2008).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council 1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the sand placement activities. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the nesting or hatching period, changes in the physical characteristics of the beach from the placement of the sand, and changes in the nest incubation environment from the material.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead, green, leatherback, hawksbill, and Kemp's ridley nesting females, their nests, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, cause reduced hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between three and seven months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success, and hatchling emerging success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of two nesting seasons.

Disturbance intensity and severity: Depending on the need (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings and sea turtle nests. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties and future sand migration.

Equipment

The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al*. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on when the dune project is completed dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, the areas for the truck transport and bulldozer/bobcat equipment to work in should be designated and marked.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976, Mann 1977, FWC 2007a). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to prenourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66 percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 19 have passed beachfront lighting ordinances in addition to 58 municipalities (FWC 2007b). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Increased susceptibility to catastrophic events

Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

Increased beachfront development

Pilkey and Dixon (1996) stated that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas

(National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 6**).

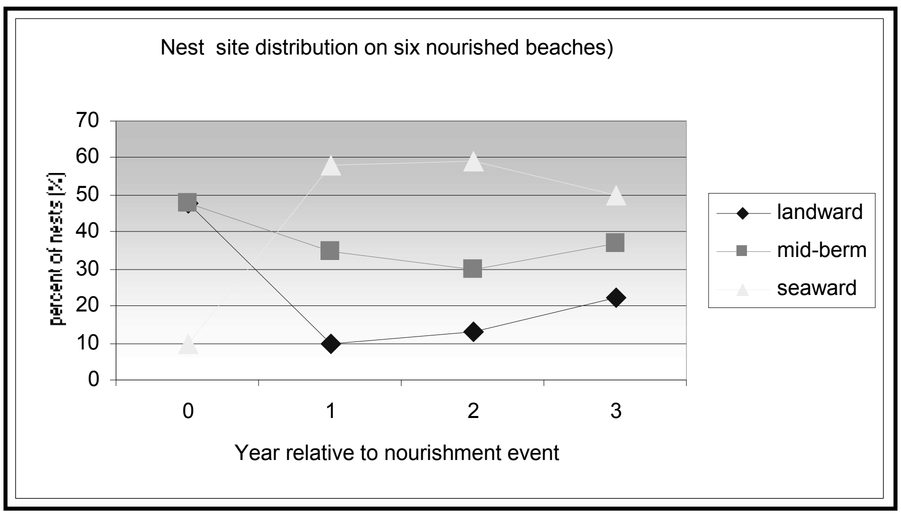

Figure 6. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling would ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Construction of groins and jetties

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979, Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984, National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or prenourished beaches. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

BEACH MICE

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The formal taxonomic classification of beach mouse subspecies follows the geographic variation in pelage and skeletal measurements documented by Bowen (1968). This peer-reviewed, published classification was also accepted by Hall (1981). Since the listing of the beach mice, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) (*i.e.*, each beach mouse group represents a unique and isolated subspecies). Recent research using mitochondrial DNA data illustrates that Gulf Coast beach mouse subspecies form a well-supported and independent evolutionary cluster within the global population of the mainland or inland old field mice (Van Zant and Wooten 2006).

The old-field mouse (*Peromyscus polionotus)* is different in form and structure as well as being genetically diverse throughout its range in the southeastern U.S. (Bowen 1968, Selander *et al.* 1971). Currently there are 16 recognized subspecies of old-field mice (Hall 1981). Eight subspecies occupy coastal rather than inland habitat and are referred to as beach mice (Bowen 1968). Two existing subspecies of beach mouse and one extinct subspecies are known from the Atlantic coast of Florida and five subspecies live along the Gulf coast of Alabama and northwestern Florida.

Rivers and various inlets bisect the Gulf and Atlantic beaches and naturally isolate habitats in which the beach mice live. The outer coastline and barrier islands are typically separated from the mainland by lagoons, swamps, tidal marshes, and flatwood areas with hardpan soil conditions. However, these dispersal barriers are not absolute; sections of sand peninsulas may from time to time be cut off by storms and shift over time due to wind and current action. Human development has also fragmented the ranges of the subspecies. As a consequence of coastal development and the dynamic nature of the coastal environment; beach mouse populations are generally comprised of various disjunct populations.

<u>Atlantic Coast beach mice</u>

The southeastern beach mouse (SEBM) was listed as a threatened species under the Act in 1989 (54 FR 20598). Critical habitat was not designated for this subspecies. SEBM is also listed as threatened by the State of Florida. The original distribution of the SEBM was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Miami-Dade County. It is currently restricted to Volusia, Brevard, and Indian River Counties. Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles, a significant reduction in range (**Figure 7**).

This subspecies uses both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), railroad vine (*Ipomoea pes-caprae*), beach morning-glory (*Ipomoea stolonifera*), and camphorweed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctatus*), pricklypear (*Opuntia humifusa*), saw palmetto (*Serenoa repens)*, wax myrtle (*Myrica cerifera)*, and sea grape (*Coccoloba uvifera*).

Anastasia Island beach mice

The Anastasia Island beach mouse (AIBM), was listed as endangered under the Act in 1989 (54 FR 20598). Critical habitat was not designated for the subspecies. AIBM is also listed as an endangered species by the State of Florida. The distribution of the AIBM has declined significantly, particularly in the northern part of its range. AIBM was historically known from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1996). Included in their range, AIBM populations are found along 14.5 miles of Anastasia Island, mainly on 3.5 miles at Anastasia State Park (ASP) and one mile at Fort Matanzas National Monument (FMNM). AIBM have been found at low densities in remnant dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantazas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River (**Figure 8**).

In 1992 to 1993, the Service funded the reintroduction of AIBM to GTMNERR in St. Johns County where historical habitat for the subspecies existed (Service 1993). GMTNERR-Guana River is nine miles north of the existing population of beach mice at ASP. Fifty-five mice (27 females and 28 males) were trapped at FMNM and ASP from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992. During follow-up trapping conducted in February 1993, beach mice occupied the entire 4.2-mile length of the park; 34 were captured and it was estimated that the population totaled 220. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss from development or alteration from storms.

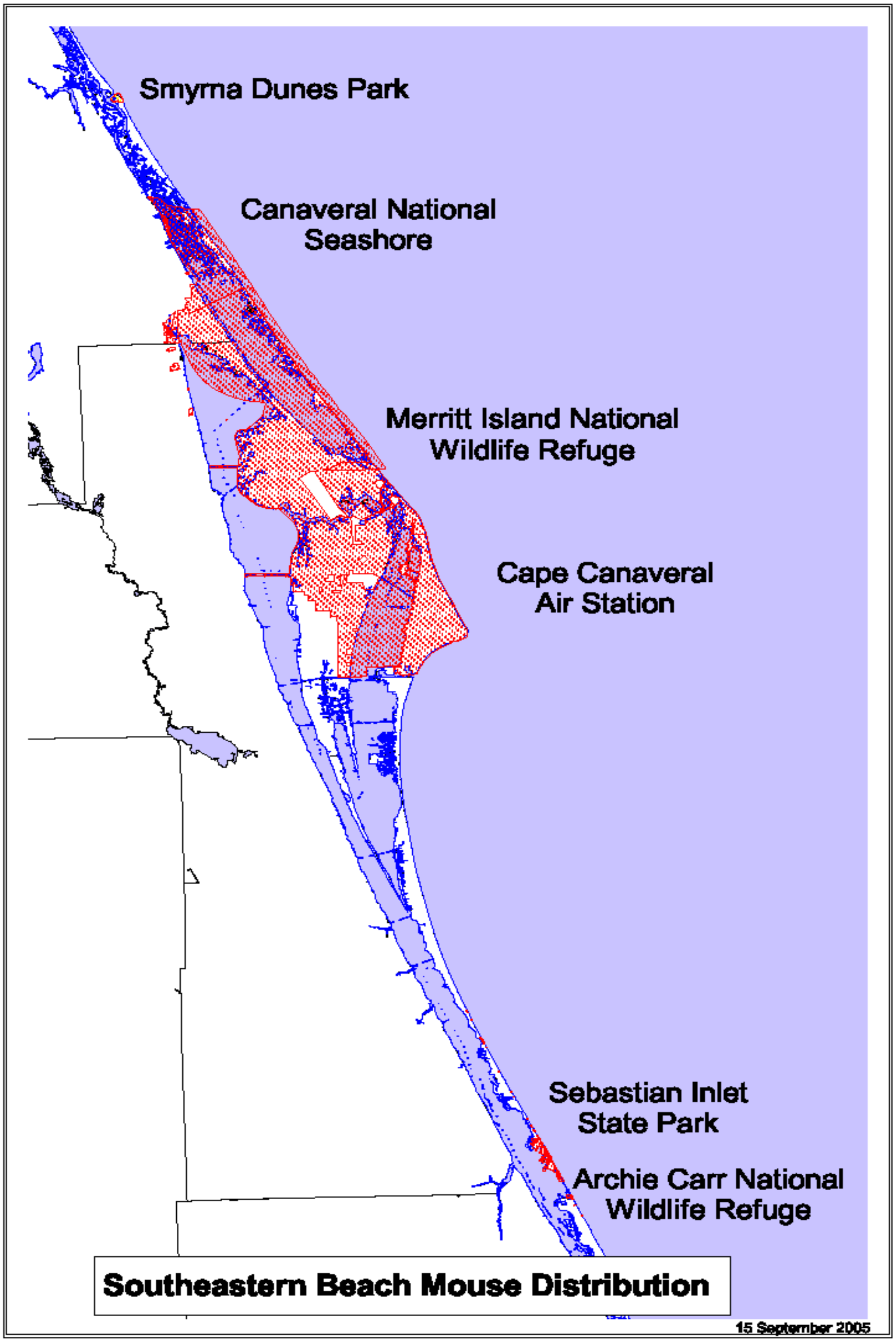

Figure 7. The distribution of the southeastern beach mouse.

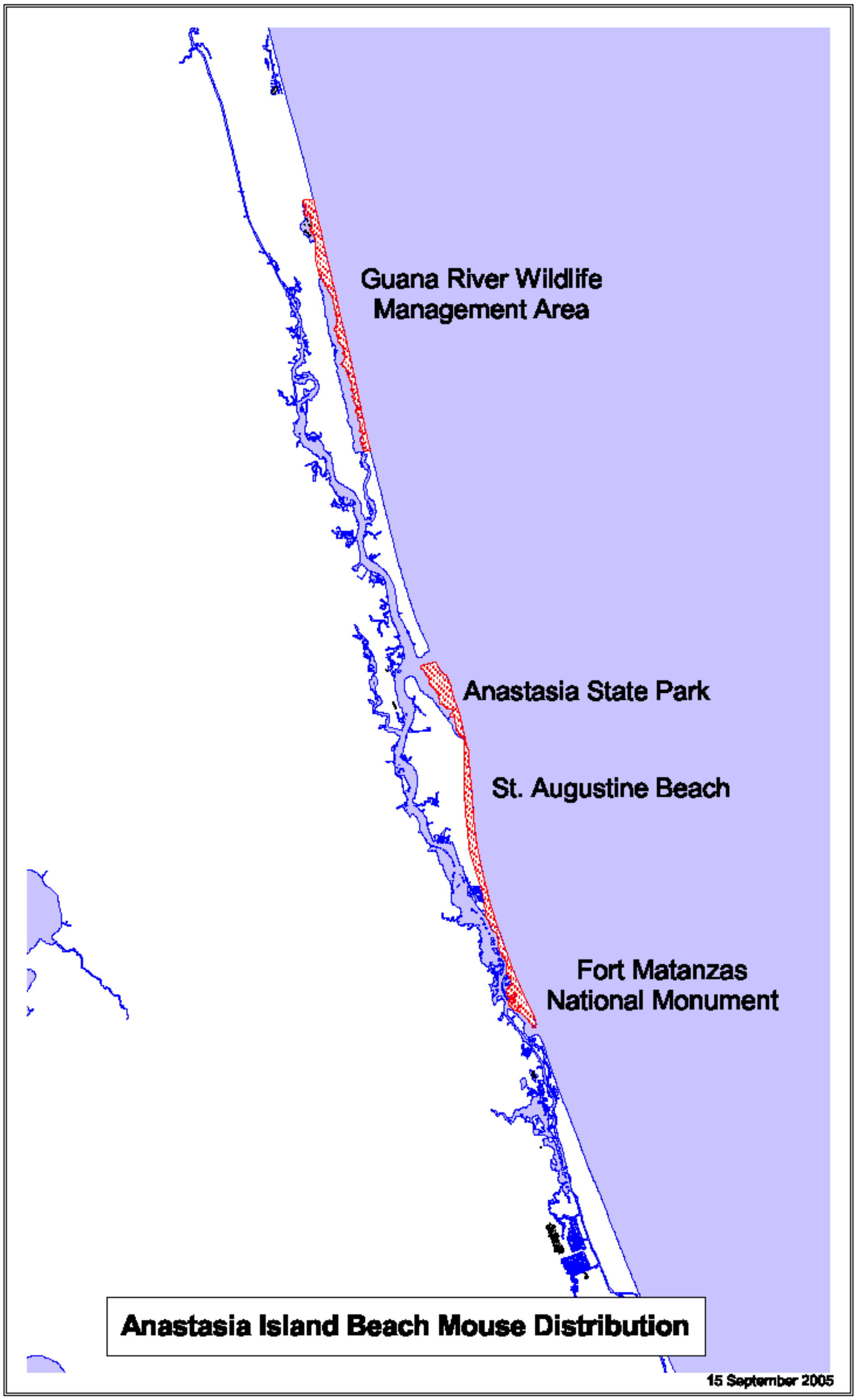

Figure 8. The distribution of the Anastasia Island beach mouse.

Gulf Coast Beach Mice

The CBM and the PKBM were listed with the Alabama beach mouse (ABM) (*Peromyscus polionotus ammobates*), as endangered species under the Act in 1985 (50 FR 23872). The SABM was listed under the Act in 1998 (63 FR 70053). CBM, SABM, and PKBM are also listed as endangered species by the State of Florida (FWC 2010). Critical habitat was designated for the CBM, and PKBM at the time of listing; however, critical habitat was revised in 2006 (71 FR 60238). Critical habitat was also designated for the SABM in 2006 (71 FR 60238).

The historical range of the CBM extended 53 miles between Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County, Florida. PKBM historically ranged along the entire length of Perdido Key for 16.9 miles between Perdido Bay, Alabama (Perdido Pass) and Pensacola Bay, Florida (Bowen 1968). The historical range of the SABM extended 38 miles between Money Bayou in Gulf County, and Crooked Island at the East Pass of St. Andrews Bay, Bay County, Florida including the St. Joseph peninsula and the coastal mainland adjacent to St. Joseph Bay, Florida (**Figure 9**).

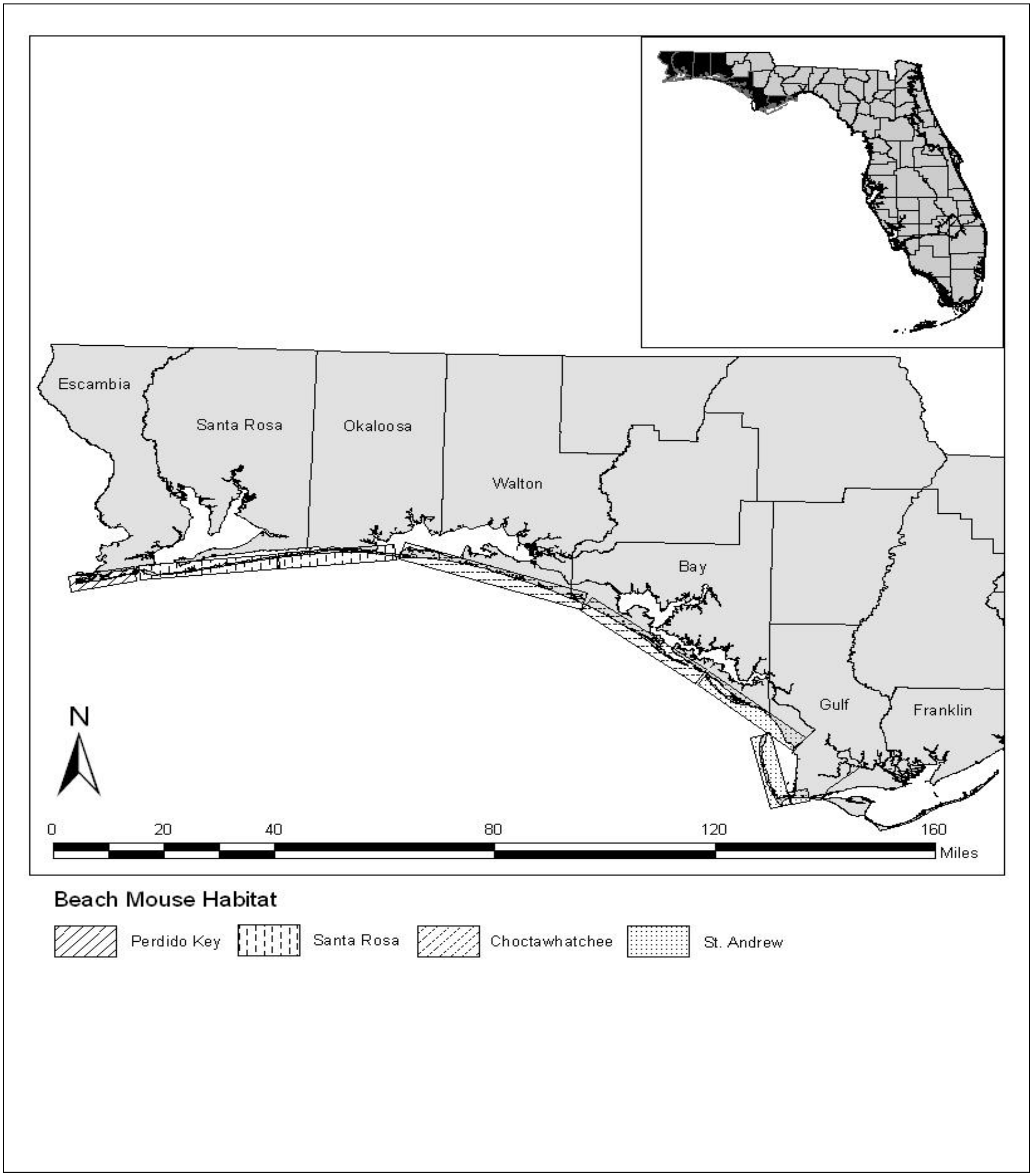

Figure 9. Historical range of Gulf Coast beach mouse subspecies.

Critical habitat

Since the listing of the PKBM and CBM in 1985, research has refined previous knowledge of Gulf Coast beach mouse habitat requirements and factors that influence their use of habitat. Based on the current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions of the subspecies, the primary constituent elements (PCE) of critical habitat for Gulf Coast beach mice consist of:

1. A contiguous mosaic of primary, secondary scrub vegetation, and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites;

2. Primary and secondary dunes, generally dominated by sea oats that despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes provide abundant food resources, burrow sites, and protection from predators;

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge;.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

Thirteen coastal dune areas (units) in southern Alabama and the panhandle of Florida have been determined to be essential to the conservation of PKBM, CBM, and SABM and are designated as critical habitat (**Figures 10 through 12**). These 13 units include five units for PKBM, five units for CBM, and three units for the SABM. These units total 6,194 acres of coastal dunes, and include 1,300 acres for the PKBM in Escambia County, Florida and Baldwin County, Alabama (**Table 10**); 2,404 acres for the CBM, in Okaloosa, Walton, and Bay Counties, Florida (**Table 11**); and 2,490 acres for the SABM in Bay and Gulf Counties, Florida (**Table 12**).

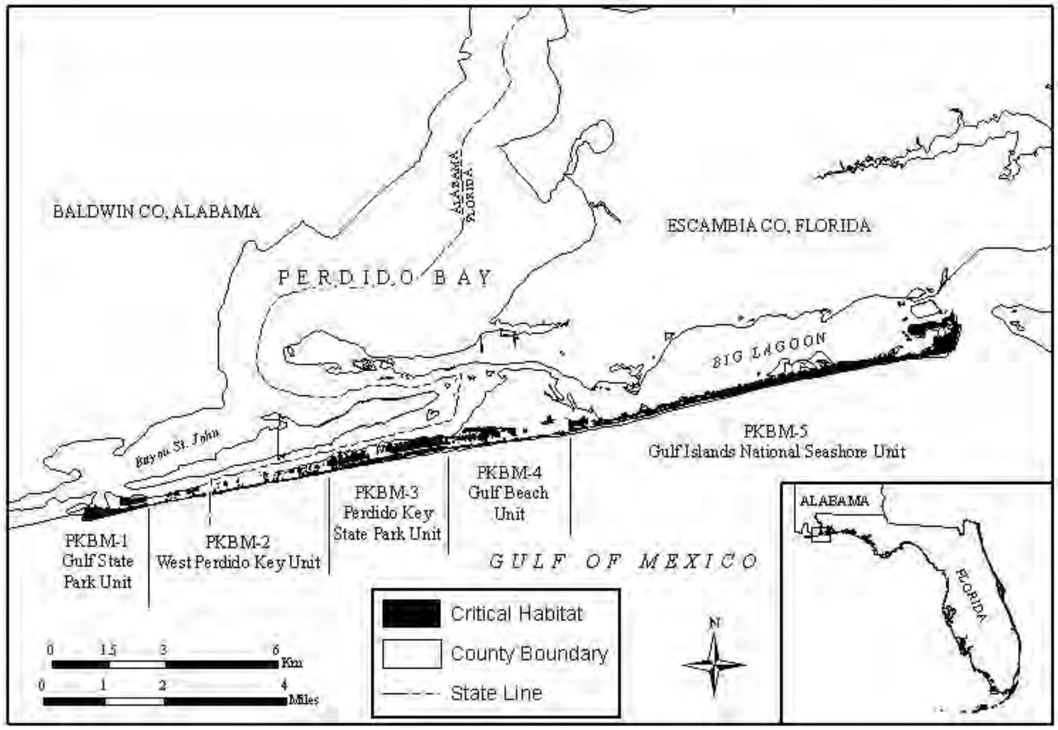

Figure 10. Critical habitat units designated for the Perdido Key beach mouse.

Table 10. Critical habitat units designated for the Perdido Key beach mouse.

Perdido Key Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit	0	115	0	115
2. West Perdido Key Unit	0	0	147	147
3. Perdido Key State Park Unit	0	238	0	238
4. Gulf Beach Unit	0	0	162	162
5. Gulf Islands National Seashore Unit	638	0	0	638
Total	638	353	309	1300

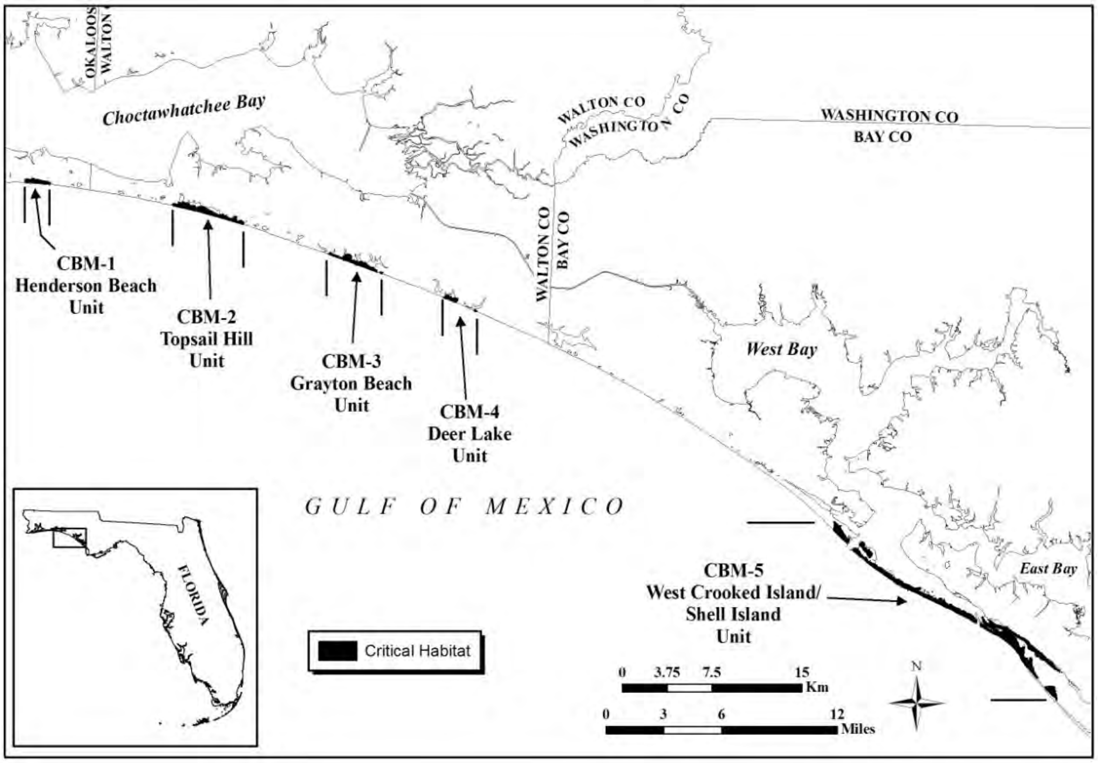

Figure 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Table 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Choctawhatchee Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Henderson Beach Unit	0	96	0	96
2. Topsail Hill Unit	0	277	31	308
3. Grayton Beach Unit	0	162	17	179
4. Deer Lake Unit	0	40	9	49
5. W. Crooked Island/Shell Island Unit	1333	408	30	1771
Total	1333	982	87	2404

Map 1. Critical Habitat Units for St. Andrew Beach Mouse

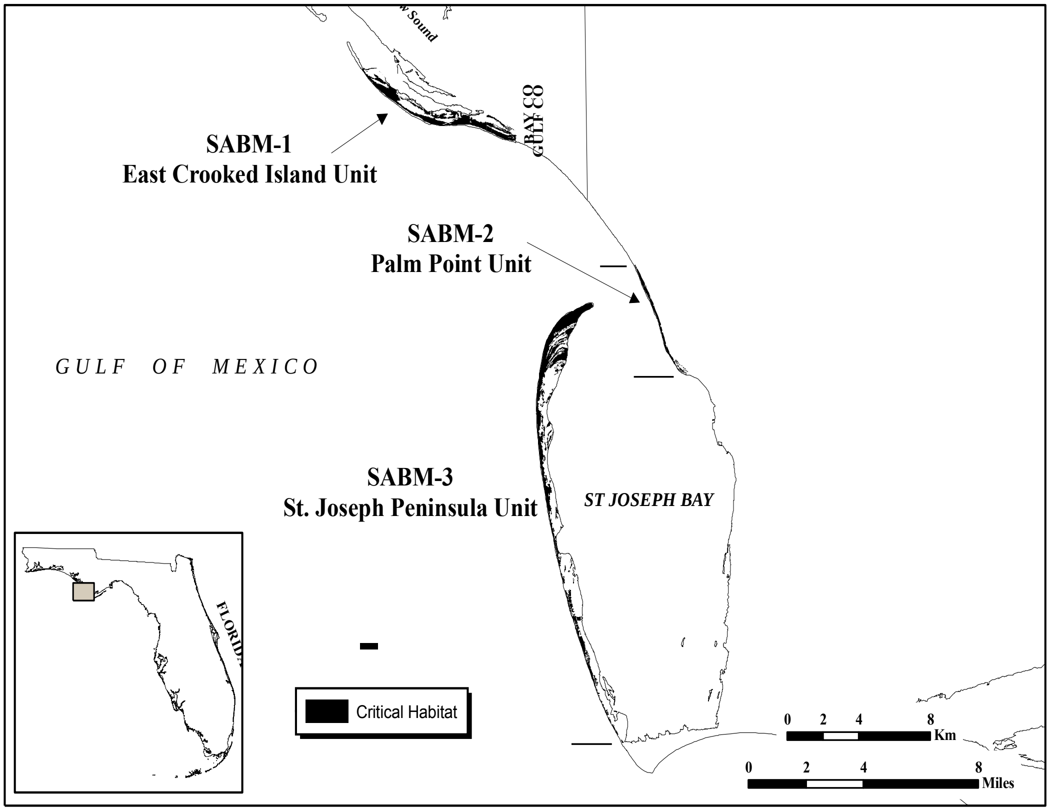

Figure 12. Critical habitat units designated for the St. Andrew beach mouse.

Table 12. Critical habitat units designated for the St. Andrew beach mouse.

St. Andrew Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. East Crooked Island Unit	649	0	177	826
2. Palm Point Unit	0	0	162	162
3. St. Joseph Peninsula Unit	0	1280	222	1502
Total	649	1280	561	2490

The Gulf State Park Unit (PKBM-1) consists of 115 acres in southern Baldwin County, Alabama, on the westernmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf State Park from the west tip of Perdido Key at Perdido Pass east to approximately 1.0 mile west of where the Alabama–Florida State line bisects Perdido Key and the area from the mean high water line (MHWL) north to the seaward extent of the maritime forest. This unit was occupied by the species at the time of listing. PKBM were known to inhabit this unit during surveys in 1979 and 1982, and by 1986 this was the only known existing population of the subspecies (Humphrey and Barbour 1981, Holler *et al.* 1989). This population was a core population and was the donor site for the reestablishment of PKBM into Gulf Islands National Seashore (GINS) in 1986. This project ultimately saved PKBM from extinction as the population at Gulf State Park was considered extirpated in 1998 due to tropical storms and predators (Moyers *et al*. 1999).

Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Because scrub habitat is separated from the frontal dunes by a highway in some areas, the population inhabiting this unit can be especially vulnerable to hurricane impacts, and therefore further linkage to scrub habitat and/or habitat management would improve connectivity. This unit is managed by the Alabama Department of Conservation and Natural Resources and provides PCEs 2, 3, 4, and 5. Threats specific to this unit that may require special management considerations include artificial lighting, presence of free-roaming cats (*Felis catus*) as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as an expansion of the original critical habitat designation (50 FR 23872).

The West Perdido Key Unit (PKBM-2) consists of 114 acres in southern Escambia County, Florida, and 33 acres in southern Baldwin County, Alabama. This unit encompasses essential features of beach mouse habitat from approximately 1.0 mile west of where the Alabama-Florida State line bisects Perdido Key east to 2.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands and ultimately includes essential features of beach mouse habitat between Perdido Key State Park (PKSP) (PKBM-3) and Gulf State Park (PKBM-1). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and provides PCEs 2, 3, and 4.

Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. At the time of listing, it was not known that beach mice occupied this area. While no trapping has been conducted on these private lands to confirm absence for the Act sections 7 and 10 permitting, sign of beach mouse presence was confirmed in 2005 through observations of beach mouse burrows and tracks (Sneckenberger 2005), and this unit is adjacent to contiguous, occupied beach mouse habitat (PKBM-3). Therefore, this unit is considered currently occupied. This unit provides essential connectivity between two core population areas (PKSP and Gulf State Park), provides habitat for expansion, natural movements, and recolonization, and is therefore essential to the conservation of the species. Specifically, this unit may have historically provided for the recolonization of Gulf State Park (PKBM-1) and may facilitate similar recolonization in the future as the habitat recovers from recent hurricane events.

The PKSP Unit (PKBM-3) consists of 238 acres in southern Escambia County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of PKSP from approximately 2.0 miles east of the Alabama–Florida State line to 4.0 miles east of the State line and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary and scrub dune habitat. Trapping efforts in this area were limited in the past. In 2000, a relocation program began to reestablish mice at PKSP. This project is considered a success and the population occupying this unit now considered a core population. This unit provides PCEs 2, 3, 4, and 5, and is essential to the conservation of the species. Improving and/or restoring habitat connections would increase habitat quality and provide more functional connectivity for dispersal, exploratory movements, and population expansion.

The Florida Park Service manages this unit. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as an expansion of the original critical habitat designation (50 FR 23872).

The Gulf Beach Unit (PKBM-4) consists of 162 acres in southern Escambia County, Florida. This unit includes essential features of beach mouse habitat between GINS and PKSP from approximately 4.0 miles east of the Alabama–Florida State line to 6.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. While not known as occupied habitat at the time of listing, presence of beach mice has recently been confirmed within the unit as a result of trapping efforts in conjunction with permitting (Lynn 2004a). This unit provides PCEs 2, 3, and 4 and is essential to the conservation of the species. This unit includes high-elevation scrub habitat and serves as a refuge during storm events and as an important repopulation source if storms extirpate or greatly reduce local populations. This unit currently provides essential connectivity between two populations (PKBM-3 and PKBM-5) and provides essential habitat for expansion, natural movements, and recolonization (PCE 4).

The GINS Unit (PKBM-5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of GINS–Perdido Key Area (also referred to as Johnson Beach) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historical range of the PKBM. PKBM were known to inhabit this unit in 1979, though the population was impacted by Hurricane Frederic (1979) and no beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981, Holler *et al.* 1989) therefore, the unit was unoccupied at the time of listing. In 1986, PKBM were reestablished at this unit as a part of Service recovery efforts. This reestablishment project was identified as the most urgent recovery need for the mouse (Service 1987, Holler *et al.* 1989). The project is considered a success, as the population inhabiting this unit is considered a core population. In 2000 and 2001, PKBM captured from this site served as donors to reestablish beach mice at PKSP (PKBM-3).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and a decrease in habitat quality. The National Park Service GINS manages this unit. This unit was included in the initial critical habitat designation (50 FR 23872).

The Henderson Beach unit (CBM–1) consists of 96 acres in Okaloosa County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Henderson Beach State Park from 0.5 miles east of the intersection of Highway 98 and Scenic Highway 98 to 0.25 miles west of Matthew Boulevard and the area from the MHWL north to the seaward extent of the maritime forest. This westernmost unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3). This unit is within the historical range of the subspecies; however, it was not known to be occupied at the time of listing and current occupancy is unknown because no recent efforts have been made to document beach mouse presence or absence. Because this unit includes protected, high-elevation scrub habitat, it may serve as a refuge during storm events and as an important source population if storms extirpate or greatly reduce local populations or populations to the east.

This unit is managed by the Florida Park Service and is essential to the conservation of the species. Threats specific to this unit that may require special management considerations include habitat fragmentation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Topsail Hill Unit (CBM–2) consists of 308 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Topsail Hill Preserve State Park, as well as adjacent private lands from 0.1 miles east of the Gulf Pines subdivision to 0.6 miles west of the Oyster Lake outlet and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Its large, contiguous, high-quality habitat allows for natural movements and population expansion. Choctawhatchee beach mice were confirmed present in the unit in 1979 (Humphrey *et al*. 1987), were present at the time of listing, and are still present.

Beach mice have been captured on Stallworth County Park and Stallworth Preserve subdivision, a private development within the unit, and east of the Park (Service 2003a). The population of Choctawhatchee beach mice inhabiting this unit appears to harbor unique genetic variation and displays a relatively high degree of genetic divergence considering the close proximity of this population to other populations (Wooten and Holler 1999).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include Park and residential development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the Habitat Conservation Plan (HCP) for the Stallworth County Preserve (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Grayton Beach Unit (CBM–3) consists of 179 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Grayton Beach State Park, as well as adjacent private lands and inholdings, from 0.3 mi west of the Alligator Lake outlet east to 0.8 miles west of Seagrove Beach and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity (PCE 4) and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Beach mice were not detected in the unit in 1979 (Holler 1992a); however, they were found to be present in 1995 after Hurricane Opal (Moyers *et al.* 1999). While it seems likely that beach mice were present at the time of listing (and may have been present, but not detected, in 1979), the Service does not have data to confirm this assumption. Therefore, the Service considered this unit to be unoccupied at the time of listing. A program to strengthen and reestablish the population began in 1989 and yielded a persistent population at the State Park. Recent evidence of beach mice on State Park land was documented in 2004 (Service 2004). Beach mice are also known to currently occupy the private lands immediately east of the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include hurricane impacts that may require dune restoration and revegetation, excessive open, unvegetated habitat due to recreational use or storm impacts that may require revegetation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the Choctawhatchee beach mouse within the area covered under the HCP for the Watercolor development (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Deer Lake Unit (CBM–4) consists of 49 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands from approximately one mile east of the Camp Creek Lake inlet west to approximately 0.5 miles west of the inlet of Deer Lake and the area from the MHWL north to the seaward extent of maritime forest or human development. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity to adjacent lands (PCE 4), and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Because live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers *et al*. 1999), the Service considered this unit to be unoccupied at the time of listing. CBM were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b, 2005a, 2005b, 2005c, 2005d). Tracking within the adjacent State park lands have indicated expansion of the population into the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the HCP/Incidental Take Permit (ITP) for Watersound (71 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act (see Application of Section 4(a)(3) and Exclusions Under Section 4(b)(2) of the Act section below). This excluded area is 0.5 miles west of the Camp Creek Lake inlet to 0.5 miles east of the Camp Creek Lake inlet.

The West Crooked Island/ Shell Island Unit (CBM–5) consists of 1,771 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat within the boundaries of St. Andrew State Park mainland from 0.1 miles east of Venture Boulevard east to the entrance channel of St. Andrew Sound, Shell Island east of the entrance of St. Andrew Sound east to East Pass, and West Crooked Island southwest of East Bay and east of the entrance channel of St. Andrew Sound, and areas from the MHWL north to the seaward extent of the maritime forest. Shell Island consists of State lands, Tyndall Air Force Base (AFB) lands, and small private inholdings. Choctawhatchee beach mice were known to inhabit the majority of Shell Island in 1987 (Holler 1992b) and were again confirmed present in 1998 (Moyers *et al*. 1999), 2002, and 2003 (Lynn 2003a). Because beach mice inhabited nearly the entire suitable habitat on the island less than two years prior to listing and were reconfirmed after listing, the Service considered this area to be occupied at the time of listing. The West Crooked Island population is the result of a natural expansion of the Shell Island population after the two islands became connected in 1998 and 1999, a result of Hurricanes Opal and Georges (Service 2003b). Shell Island was connected to the mainland prior to the 1930s when a navigation inlet severed the connection on the western end. Beach mice were documented at St. Andrew State Park mainland as late as the 1960s (Bowen 1968), though no records of survey efforts exist again until Humphrey and Barbour (1981) and Meyers (1983) at which time beach mice were not detected. Therefore, it seems likely that this area was not occupied at the time of listing. Current beach mouse population levels at this site are unknown, and live-trapping to document the absence of mice has not been conducted. Similar to the original designation, this Park was designated as critical habitat because it has features essential to the CBM. It is also within the historical range of the mouse. This unit supports the easternmost population of CBM, with the next known population 22 miles to the west.

This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Portions of this unit are managed by the Florida Park Service, while the remaining areas are federally (Tyndall AFB) and privately owned.

Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high residential or recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The East Crooked Island Unit (SABM–1) consists of 826 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat on East Crooked Island from the entrance of St. Andrew Sound to one mile west of Mexico Beach, and the area from the MHWL to the seaward extent of the maritime forest (not including Raffield Peninsula). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and possesses all five PCEs. SABM were known to inhabit the unit in 1986 and 1989 (James 1992), though the population was presumably extirpated after 1989 due to impacts from hurricanes. The East Crooked Island population was reestablished with donors from St. Joseph State Park in 1997. This unit was occupied at the time of listing. Recent live-trapping confirms present occupation of mice (Moyers and Shea 2002, Lynn 2002a, Slaby 2005). This unit maintains connectivity along the island and this unit is essential to provide a donor population following storm events.

The majority of this unit is federally owned (Tyndall AFB), while the remaining habitat is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational and military use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Palm Point Unit (SABM–2) consists of 162 acres of private lands in Gulf County, Florida. This unit encompasses habitat from Palm Point 1.25 miles northwest of the inlet of the Gulf County Canal to the southeastern boundary of St. Joseph Beach and the area from the MHWL to the seaward extent of the maritime forest. SABM were documented in the area by Bowen (1968) and were considered to have been present in this unit at the time of listing. Since SABM beach mouse habitat is limited to only two other areas, protecting this mainland site located within the species' historical range is needed for the subspecies' long-term persistence. As other viable opportunities are limited or nonexistent, this unit is essential to reduce the threats of stochastic events to this subspecies. Furthermore, as this unit is on the mainland, it is somewhat buffered from the effects of storm events. This area provides frontal and scrub dune habitat (PCEs 2 and 3), but may provide limited connectivity between habitats. Threats specific to this unit that may require special management considerations include habitat fragmentation, habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high residential use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The St. Joseph Peninsula Unit (SABM–3) consists of 1,502 acres in Gulf County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of St. Joseph Peninsula State Park (Park) as well as south of the Park to the peninsula's constriction north of Cape San Blas (also known as the "stumphole" region) and area from the MHWL to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat, and provides a relatively contiguous expanse of habitat within the historical range of the SABM. This unit possesses all five PCEs and was occupied at the time of listing. SABM were known to inhabit this unit in 1986 and 1987 (James 1987, 1992, 1995, Gore 1994, Moyers *et al.* 1999, Slaby 2005). In addition, recent tracking efforts suggest that mice continue to occupy private lands south of the Park (Slaby 2005). The Park alone does not provide sufficient habitat to allow for population expansion along the peninsula, which may be necessary for a population anchored by the tip of a historically dynamic peninsula. A continuous presence of beach mice along the peninsula is the species' best defense against local and complete extinctions due to storm events. The population of SABM inhabiting this unit appears to possess unique genetic variation, and displays greater than expected genetic divergence from other populations (Wooten and Holler 1999).

The Florida Park Service manages portions of this unit, while the remaining area is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, habitat fragmentation and habitat loss, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality. The population inhabiting this unit may also be particularly susceptible to hurricanes due to its location within St. Joseph Bay (the peninsula is a thin barrier peninsula with a north–south orientation).

Life history (All subspecies of beach mice)

Beach mice are differentiated from the inland subspecies by the variety of fur (pelage) patterns on the head, shoulders, and rump. The overall dorsal coloration in coastal subspecies is lighter in color and less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). Similarly, beach mouse subspecies can be differentiated from each other by pelage pattern and coloration.

The SEBM averages 5.47 inches in total length (average of 10 individuals = 5.07 inches, with a 2.04-inch tail length (Osgood 1909, Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). SEBM have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 0.07 to 0.12 inches of their eyes (Stout 1992). There are no white spots above the eyes as with AIBM (Osgood 1909). Their tail is also buffy above and white below. Juvenile SEBM are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

The AIBM averages 5.45 inches in total length (average of 10 individuals); with 2.05 inches mean tail length (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The SABM has head and body lengths averaging 2.95 inches, and tail mean lengths averaging 2.05 inches (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath and along the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The PKBM is slightly smaller than the other Gulf coast beach mouse subspecies (Bowen 1968). Head and body length ranges from 2.7 to 3.3 inches (Holler 1992b). The pigmentation of PKBM is gray to gray-brown with the underparts white and coloration on the head is less pronounced. The line between pigmented and unpigmented pelage runs dorsally posterior above the eyes and behind the ears. Pigmentation patterns on the rump are either squared or squared superimposed on a tapered pattern (Bowen 1968). There is no tail stripe.

CBM have head and body lengths ranging from 2.7 to 3.5 inches (Holler 1992a). This beach mouse is distinctly more orange-brown to yellow-brown than the other Gulf coast beach mouse subspecies (Bowen 1968). Pigmentation on the head either extends along the dorsal surface of the nose to the tip, or ends posterior to the eyes leaving the cheeks white. A dorsal tail stripe is either present or absent.

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 23.6 to 35.4 inches, and the escape tunnel rises from the nest chamber to within 9.8 inches of the surface (Blair 1951). Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 1.5 to 2.5 inches in diameter. The nest comprises about one-fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice have been found to select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000a, Sneckenberger 2001). A shortage of potential burrow sites is considered to be a possible limiting resource.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however, their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for SEBM on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). Peak breeding season for Gulf Coast beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Rave and Holler 1992, Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers *et al.* 1999).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980, Rave and Holler 1992). Beach mice are believed to be generally monogamous (Smith 1966, Foltz 1981, Lynn 2000a). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63 percent of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37 percent lived 5 months or greater and two percent lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler *et al*. 1997). Greater than 10 percent of mice were recaptured three seasons after first capture; and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951, Holler 1995).

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes (characterized by sea and other grasses), secondary dunes (similar to primary dunes, but also frequently include such plants as woody goldenrod (*Chrysoma pauciflosculosa*), false rosemary (*Conradina canescens*), and interior or scrub dunes (often dominated by scrub oaks and yaupon (*Ilex vomitoria*). Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921, Ivey 1949), or preferred the frontal dunes (Blair 1951, Pournelle and Barrington 1953, Bowen 1968), recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling *et al.* 1998, Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

The sea oat zone of primary dunes is considered essential habitat of beach mice on the Atlantic Coast (Humphrey and Barbour 1981, Humphrey *et al.* 1987, Stout 1992). The SEBM has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980, Extine and Stout 1987), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of several feet.

Primary dune vegetation described from SEBM habitat includes sea oats, bitter panicgrass, railroad vine, beach morning-glory, saltmeadow cordgrass (*Spartina patens*), lamb'squarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphorweed (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include pricklypear, saw palmetto, wax myrtle, Florida rosemary (*Ceratiola ericoides*), sea grape, and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 0.62 miles inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub more than a mile from the beach habitat at Kennedy Space Center/Merritt Island National Wildlife Refuge (NWR) and Cape Canaveral Air Force Station (CCAFS) (Stout *et al*. 2006). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Essential habitat of the AIBM is characterized by patches of bare, loose, sandy soil (Humphrey and Frank 1992a). Although they are mainly found in the sea oat zone of the primary zone, they will occur in sandy areas with broomsedge (*Andropogon* sp.) (Service 1993). Ivy (1949) reported AIBM to occur in woody vegetation as far as 500 feet inland. Pournelle and Barrington (1953) found this subspecies in scrub as far as 1,800 feet from the dunes. Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few feet. Much of the habitat within the range of the AIBM has been converted to condominiums and housing developments. The majority of the high quality habitat, densely occupied by beach mice, remains along the length of both ASP and FMNM, at either end of Anastasia Island.

Two main types of movement have been identified for small mammals: within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*i.e.*, research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Novak's (1997) study of the home range of CBM on Shell Island indicated males had a mean home range of 1.0 ± 4.1 acres and females had a mean home range of 0.81 ± 2.18 acres. Lynn (2000a) found male and female radio-tagged ABM had a mean home range of 1.68 ± 0.27 acres and 1.73 ± 0.40 acres, respectively. Swilling *et al.* (1998) observed one radio-collared ABM to travel over 328 feet during nightly forays after Hurricane Opal to obtain acorns from the scrub dunes. Using radio telemetry, Lynn (2000a) documented an ABM that traveled one mile within a 30-minute period. Moyers and Shea (2002) trapped a male and female CBM that moved about 637 feet and 2,720 feet in one night, respectively. Gore and Schaefer (1993) documented a marked Santa Rosa beach mouse crossing State Road (SR) 399, a two-lane highway. Lynn and Kovatch (2004) through mark and recapture trapping documented PKBM that crossed SR 292, a two-lane highway and right-of-way (100-feet wide).

Sneckenberger (2001) found significant seasonal differences in the movement of ABM, and suggested that this was a result of seasonal fluctuations in food availability, food quality, and nutritional needs. Smith (2003) found that Santa Rosa beach mice demonstrated an increase in movement as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources. Smith also found that Santa Rosa beach mice had a preference for vegetation cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able and do travel great distances the travel pathways should have vegetated cover and no large gaps or open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As fragmentation increases and connectivity is lost, species' ability to move through and between habitats is reduced in a nonlinear fashion.

Foraging

Beach mice are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds and fruits, and appear to forage based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhart 1978, Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat, specifically that the frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period of time. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001).

Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve live trapping mark-recapture studies, which is a common method with small mammals. A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. As the referenced trapping events were not designed similarly or using a standardized sampling techniques, data should not be compared between subspecies or trapping events, nor should densities (mice per 100 trap nights) be inferred beyond the trapping area during that trapping session.

Population densities of beach mice typically reach peak numbers in the late autumn into spring (Rave and Holler 1992, Holler *et al*. 1997). Peak breeding period occurs in autumn and winter, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992, Holler *et al.* 1997). Food supplementation studies showed that old field mouse populations increased when foods were abundant; thus, populations of old field mice appear to be food-limited (Smith 1971, Galindo-Leal and Krebs 1998). Similar studies have not been conducted with beach mouse populations.

Gulf Coast Beach Mice

In 1979, Humphrey and Barbour (1981) estimated about 515 CBM existed on Topsail Hill and Shell Island. That estimate was used during the Federal listing of the CBM in 1985. Population estimates on Shell Island from February 1993 to March 1994, ranged from 105 to 338 CBM on a 23-acre study area (Novak 1997). Just prior to Hurricane Opal in 1995, it was estimated that Shell Island supported 800 to 1,200 CBM (Gore 1999). Three years following Hurricane Opal in June 1998, one trapping effort at six different sites on Shell Island resulted in a cumulative population estimate of 195 CBM (164 CBM captured) (Moyers *et al*. 1999). The east portion of the island has been trapped from 2000 to 2003. Population estimates have ranged between 24 and 67 CBM (Lynn 2004b). At Topsail Hill Preserve State Park, trapping conducted in March 2003 and March 2005 yielded a population estimate of 190 to 250 CBM (Service 2003a, Sneckenberger 2005). From late 2006 through 2007 results of tracking tubes surveys at Topsail Hill Preserve State Park suggested that the CBM population was not densely distributed (FWC 2008b). Trapping of four 100-trap transects yielded population estimates of 190, 250, less than 10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2007a). The track and trapping data together indicate that Topsail Hill Reserve State Park currently does not support a high population of beach mice. In 2003 and again in 2005, a total of 26 mice were translocated from Topsail Hill Preserve State Park to the WaterSound private development adjacent to Deer Lake State Park. Trapping has been sporadic on WaterSound but has yielded population estimates of 5 to 46 individuals in 2003 to 2007 (Moyers 2007). Deer Lake State Park has not been trapped; however, tracks have been observed as recently as 2006 (FWC 2008b). Population estimates from trapping at Grayton Beach State Park (main unit) from 1995 to 2000, ranged from 25 to 116 CBM (Moyers *et al.* 1999, Van Zant 2000). The central unit was trapped for three nights in August 2002; however, no mice were captured (Lynn 2002b). Limited tracking surveys were accomplished in 2003, 2004 and 2005 and beach mouse tracks were observed (Kovatch 2003, Toothacker 2004, FWC 2008b). The western area, although it provides CBM habitat, has not been documented as occupied by CBM (Moyers *et al.* 1999, Van Zant 2000). The population estimates for the WaterColor development for the two years prior to and one year following development ranged from 3 to 7 CBM (St. Joe Company 1999). CBM were last captured in February of 2001 at WaterSound; quarterly trapping has continued on the site through mid-2008 without CBM being captured (St. Joe/Arvida 2003). Auburn University trapped West Crooked Island in October 2000, and the Service trapped the area in 2001 to 2003. The population estimate ranged from a low of 174 to a high of 244 CBM (Lynn 2000b, 2002d, 2002e, 2002f, 2002g, 2003b). The Service estimated the total population of CBM in 2003, to be about 600 to 1,000 beach mice.

Since its listing in 1985, PKBM population estimates never reached more than 400 to 500 individuals until 2003. Before Hurricane Ivan (2004) a population estimate of 500 to 800 was divided between two populations - the Johnson Beach Unit of GINS and PKSP (Service 2004). The status of PKBM at Gulf State Park (GSP) is uncertain, likely extirpated in 1999. In October 2005, following the active hurricane seasons of 2004 and 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25 and 32 percent of the available habitat was occupied at PKSP and GINS, respectively (Loggins 2007). Trapping at PKSP and GINS in March 2007, was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (Loggins 2007). With no tracks observed in the tube surveys the PKBM may now be absent from PKSP (FWC 2008b). At GINS, the number of PKBM has not increased since the initial high levels in winter of 2005-2006 (FWC 2008b). However, population estimates indicate there may be a few hundred PKBM at GINS (Gore 2008).

The SABM even at its lowest population probably numbered several hundred individuals (Gore as cited in 63 FR 70055). James (1992) estimated that the East Crooked Island subpopulation to be about 150. However, by 1996, SABM were no longer found on East Crooked Island. Following Hurricane Opal in 1995, Mitchell *et al.* (1997) estimated the St. Joe Peninsula State Park population to be between 300 and 500 mice. In November 1997 and January 1998, 19 pairs of St. Andrew beach mice were relocated from St. Joseph Peninsula State Park to East Crooked Island, Tyndall Air Force Base (Moyers *et al.* 1999). Trapping surveys conducted on East Crooked Island in 2000 and 2002 through 2007 indicated that beach mice occupied the entire island (Lynn 2002c, FWC 2008b). Population estimates ranged from 71 to 133 mice (Lynn 2002c). The FWC (2008b) estimates 22 miles of habitat as occupied by SABM throughout the mouse's historical range with population estimates of about 3,000 mice at East Crooked Island and about 1,775 mice in the front dunes at St. Joseph State Park.

Atlantic Coast Beach Mice

Populations of the SEBM have been estimated to be around 5,000 to 6,000 mice. Recent surveys have confirmed that SEBM are found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Prior to 2006, populations of the SEBM were thought extirpated from both sides of the Sebastian Inlet (Bard 2004). However, during surveys in June 2006, a single mouse was located at the very southern end of the Sebastian Inlet State Park. Mice were also found at Jungle Trail on the Pelican Island National Wildlife Refuge, another area where they where thought extirpated. Additional surveys of other areas south of Brevard County have not located any mice and indicate the distribution of this subspecies in the counties south of Brevard, severely fragmented. SEBM are no longer believed to occur at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

Although the distribution of the AIBM has declined significantly, particularly in the northern part of its range, the populations at ASP and FMNM have continued to fluctuate seasonally between two and 90 mice per acre. It is thought that populations should be characterized by a range rather than a static value (Frank and Humphrey 1996). Quarterly surveys of these two sites have shown that the populations have remained stable. Due to the limited dune habitat at the ASP, this population has not been able to maintain a stable population and it is unknown how many mice remain.

Population variability

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Depressed beach mouse populations may be associated with tropical storms and drought, perhaps resulting from reduced habitat and food resources. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000).

Population stability

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the Service funded Auburn University to develop a PVA for beach mice (Holler *et al*. 1999, Oli *et al.* 2001). Four subpopulations of Gulf Coast beach mice subspecies were modeled. They consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Florida Point, and two subpopulations of ABM, one at Bon Secour NWR and one at Fort Morgan State Park. They used a stochastic (random) differential equation (Wiener-drift) model, applied to long term demographic data. The model is stochastic because it incorporates the variable effects of the environment upon population change. However, it did not model the effects of hurricanes on the habitat or population of beach mice.

The Oli *et al.* (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area had the highest risk for extinction; the PKBM had a 100 percent chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3 percent) within 13 to 20 years. However, following Hurricane Opal in 1995, and subsequent predation pressure, the PKBM population at Florida Point was believed extirpated in 1999. This localized extirpation clearly demonstrates that while PVA's are useful in determining significant factors in species survival, they have limited use in predicting the time to extinction for a given species.

More recently, the Conservation Breeding Specialist Group (Traylor-Holzer 2004, 2005, 2006) was contracted by the Service to conduct a population and habitat viability analysis (PHVA) on ABM using the Vortex population simulation model (Lacy 1993). The goal was to develop an ABM population model and use the model to assess the status of the ABM habitat, and populations and projections for continued existence. The PHVA results projects the ABM to have a 26.8 percent ± 1.0 percent likelihood of extinction over the next 100 years. Much of this risk is due to hurricane impacts on ABM populations and habitat, which can result in population declines. The model suggests that hurricanes are a driving force for ABM populations, both directly and also indirectly as their impacts interact with other factors, including development of higher elevation (scrub) habitat and predation by cats. Due to the similarities in the subspecies and proximal location, it can be inferred that these factors also have a strong influence on the persistence of PKBM populations. When reviewing PHVA results, it is crucial that the actual values for the risk of extinction are not the focus of the interpretation. The true value of a PHVA is the ability to compare management strategies and development scenarios, run sensitivity analyses, and determine the main influence(s) on population persistence.

Similar to the land use arrangement on Perdido Key, the Fort Morgan peninsula (occupied by ABM) consists of three areas of public lands separated by two areas of private lands, which allow for limited (varied) dispersal between the public lands. The current level of dispersal between public lands through private lands is unknown, but is affected by development and habitat degradation. Without dispersal between public lands through private lands, the PHVA results project the ABM to have a 41.2 percent ± 1.1 percent likelihood of extinction. If all privately-owned habitat between the public lands is lost, the likelihood of extinction increases to 46.8 percent ± 1.1 percent. Again, it can be inferred that a similar increase in risk of extinction would occur with the PKBM if dispersal could not occur through private lands.

Despite the similarities in the subspecies, it is important to note that carrying capacity (K), which was found to be a strong influence on the model, would be different in PKBM. For ABM, K was estimated using maximum ABM density estimates (4.5 to 11.6 ABM per acre) and acres of habitat (2,989 acres). As density estimates for PKBM would likely be lower, and remaining PKBM habitat is less than 1,300 acres, the Vortex model for PKBM would likely project a greater likelihood of extinction.

The Service contracted with the Georgia Cooperative Fish and Wildlife Research Unit to critique the PVAs for the ABM accomplished by Oli *et al.* (2001) and Conservation Breeding Specialist Group (Traylor-Holzer 2006). Conroy and Runge (2006) indicated that neither PVA provided reliable estimates of extinction probability for ABM. They recommended that future PVA work should incorporate sampling, temporal, and possibly spatial variance for input variables and should clearly and explicitly express uncertainty in extinction output. Until this can be done, reliable estimates of extinction probability for the ABM (and other beach mouse subspecies) cannot be estimated.

Species that are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations persist naturally through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurred from adjacent populated areas. In addition, from a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000). The history of the PKBM alone illustrates the need for multiple populations (a now potentially extirpated population was the source of the two remaining populations of the subspecies) (Holler *et al.* 1989, 71 FR 60238). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli *et al.* 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988). Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of alleles (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and Distribution

The distribution of all the beach mouse subspecies is significantly reduced from their historical ranges due to modification and destruction of the coastal dune ecosystem inhabit. Habitat loss and alteration was likely a primary cause of the extinction of one subspecies, the Pallid beach mouse, which was endemic to barrier beach between Matanzas and Ponce de Leon inlets in Volusia and Flagler Counties (Humphrey and Barbour 1981).

<u>Atlantic Coast Beach Mice</u>

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 174 miles of Florida's central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet State Park, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet State Park) (Humphrey *et al*. 1987, Robson 1989, Land Planning Group, Inc. 1991, Humphrey and Frank 1992b, Service 1993). The SEBM is geographically isolated from all other subspecies of beach mice.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Populations from the north side of Sebastian Inlet appear to be extirpated

(Bard 2004). SEBM were documented on the south side of Sebastian Inlet in 2006, although none have been found since then.

The status of the species south of Brevard County is currently unknown. The surveys conducted during the mid-1990s indicated the distribution of this subspecies in the counties south of Brevard County was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (Jennings 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. In 2006, a population off Jungle Trail at Pelican Island NWR was discovered (Van Zant 2006). No beach mice were found during surveys in St. Lucie County and it is possible that this species is extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation and harassment by free-roaming cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet State Park in Brevard County was completely extirpated by 1972, presumably by free-roaming cats (Bard 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice (*Mus musculus*) and introduced rats.

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats due mostly to developmental pressures. One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Barbour 1981).

The distribution of the AIBM has declined significantly, particularly in the northern part of its range. Historically, it was reported to occur from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992a). It currently occurs only on Anastasia Island, primarily at the north (ASP) and south (FMNM) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island (Service 1993). The original distribution consisted of about 50 miles of beach; current populations occupy about 14 miles of beach with possibly only 3 miles supporting viable populations (Service 1993).

In 1992 to 1993, 55 mice (27 females and 28 males) were reintroduced to GMTNERR-Guana River in St. Johns County. In 1993, the population was estimated at 220 mice. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms and commercial and residential development.

The primary reason for the significant reduction in the range of the AIBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated AIBM habitat in the northern two-thirds of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a severe effect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by free-roaming cats and dogs. ASP has successfully reduced feral cat populations at the recreation area and has seen a benefit to the beach mice. Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

Gulf Coast Beach Mice

PKBM populations have existed since the late 1970s as isolated populations along its historical range (16.9 miles). The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM. The less than 30 individuals at Gulf State Park (at the westernmost end of Perdido Key) were once the only known existing population of PKBM (Holler *et al*. 1989). Beach mice from this site were used to reestablish PKBM at Gulf Islands National Seashore (GINS) between 1986 and 1988 (Holler *et al.* 1989). Then in 1999 the population at Gulf State Park was considered extirpated (Moyers *et al.* 1999). In 2000, 10 PKBM (five pairs) was relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both north and south sides of SR 292 in suitable habitat. Two years of quarterly survey trapping indicated that the relocations of PKBM to PKSP were successful and this was considered an established population (Lynn and Kovatch 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of current occurrences of the mouse (Lynn 2004a). Based on the similarity of habitat between these areas and the rest of Perdido Key, as well as the continuity of the habitat, the mouse is believed to inhabit other private properties where suitable habitat exists north and south of SR 292. The PKBM is considered to occur on 42 percent of Perdido Key (1,227 acres of 2,949 acres) (**Table 13**).

Table 13. Perdido Key beach mouse habitat on Perdido Key in Florida and Alabama – 2007 estimate[1].

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	Percent	Acres	Percent	Acres	Percent
Perdido Key PKBM habitat	2,949 **1,292**	100 100	2,615 **1,146**	89 **88**	334 148	11 12
Private lands PKBM habitat	1,440 **302**	49 **23**	1,278 **270**	43 **24**	162 33	5 3
Public lands	1,509	51	1,337 GINS 1,052 PKSP 285	45	172 GSP 172	6
PKBM habitat	990	76	876 GINS 638 PKSP 238	67	114 GSP 114	9

[1]Data calculated by Service's Panama City, Florida using 2004 Digital Orthophoto Quarter-Quadrangle (DOQQ) aerial photography, 2005 parcel data from Baldwin County, Florida and 2005 parcel data from Escambia County, Florida and revised June 2006.

The listing of PKBM was based on data collected in 1983-84, and at that time the mouse was recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederic estimated population numbers based on trapping were 13 PKBM found at one location (Gulf State Park). Just prior to listing, only one PKBM was captured in trapping surveys, this again being at Gulf State Park. Since that time, numbers have fluctuated dramatically based on hurricanes and/or translocation efforts, but were at their highest estimate ever documented just prior to Hurricane Ivan in 2004 at between 500-800 individuals. This was a result of significant partnership efforts and included translocation and habitat restoration on public lands. Even with the destructive hurricanes in 2004 and 2005, current numbers of PKBM, while low (no population estimates are available), are greater than one mouse and mice have been confirmed from two areas (PKSP and GINS). Survey efforts (tracking and trapping) have also been sporadic and inconsistent; therefore, it is difficult to establish long term trend information at this time.

CBM subpopulations currently persist along approximately 15 miles of Gulf of Mexico shoreline consisting of four isolated areas along 11 miles of beachfront within its former range. Another five miles outside of the CBM's known historical range has been recently colonized (Lynn, 2000a, 2003a). In the 1950s, the CBM was widespread and abundant at that time according to Bowen (1968). By 1979, Humphrey and Barbour (1981) reported only 40 percent of the original habitat remained undeveloped in noncontiguous areas. They also documented that the CBM had been extirpated from seven of its nine historical localities being restricted to the Topsail Hill area in Walton County and Shell Island in Bay County. In 1985 when the CBM became federally protected, CBM were still only known from the Topsail Hill area and Shell Island, an area consisting of about 10 miles of coastline (50 FR 23872). In 1989, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler *et al*. 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000b). CBM are now known to occupy approximately 15 miles of Gulf of Mexico beachfront; 12 of the 15 miles are publicly owned lands.

There are four subpopulations of CBM that exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), 2) Shell Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall AFB), 3) Grayton Beach (and adjacent eastern private lands), and 4) West Crooked Island. Approximately 96 percent of the lands known to be occupied by CBM are public lands. Translocations to establish a fifth subpopulation of CBM occurred in March of 2003 and 2005. CBM from Topsail Hill Preserve State Park were moved to private lands at Camp Creek/Water Sound in Walton County, Florida (Lynn 2003a, Service 2005a, 2005b, 2005c, 2005d).

Topsail Hill Preserve State Park consists of 1,637 acres of which 262 acres provide CBM habitat; the majority being occupied by CBM. The Florida Park Service prepared a Unit Management Plan for the Preserve that explicitly plans for conservation and protection of CBM habitats (FDEP 2007). Private lands on the east side consist of approximately 9.63 acres. Of that, 7 acres consist of the development known as the Stallworth Preserve. The Service issued an ITP for CBM associated with the Stallworth Preserve HCP in 1995; an amendment to the permit was issued in 1999. The remaining 2.63 acres has been purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall AFB, and private lands. The Unit Management Plan for the State Park was completed in 1999. The plan identifies the need for protection and management of the CBM. Tyndall AFB manages their portion of Shell Island under the installation's Integrated Natural Resources Management Plan. The Service has joined with the State Park and Tyndall AFB since 1995 by providing funding to protect and restore CBM habitats on Shell Island.

The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers 1996, Moyers *et al.* 1999). However, live-trapping to document the absence of the mouse has not been conducted. Reintroduction of this area is considered an action to support recovery of CBM.

The Grayton Beach subpopulation consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is currently connected by a narrow band of primary dunes. Total acreage of the Park is 2,236 acres with 153 acres providing suitable CBM habitat. The Unit Management Plan for the Park identified the protection of the CBM as an important component. The Park has requested and received funds from the Service to implement CBM habitat restoration and protection. Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Lynn 2004b). The West Crooked Island subpopulation resulted from its connection to Shell Island in 1998 -1999. The construction of the St. Andrew Pass navigation inlet in the early 1930s severed Shell Island from the mainland on its western end. Since then, the original pass, East Pass (or Old Pass) began to close. After passage of Hurricane Opal in 1995, East Pass temporarily closed and reopened; however, after passage of hurricanes Earl and Georges in 1998, the pass closed (Coastal Tech 1999, Middlemas 1999). CBM dispersed onto West Crooked Island from Shell Island colonizing most of the island within two years (Lynn 2004b). East Pass was reopened as a joint venture between Tyndall AFB and Bay County in December of 2001 but has since closed again.

SABM is now known to consist of two subpopulations, East Crooked Island and St. Joseph Peninsula State Park. The majority of the East Crooked Island subpopulation is located on Tyndall AFB and the other on the St. Joseph Peninsula State Park. Other important public lands for the conservation of the mouse would include Eglin Air Force Base lands at Cape San Blas and Billy Joe Rish Park. Private lands adjacent to Tyndall AFB and the State Park are either known to be occupied by SABM or contain habitat. Trapping by St Joe/Arvida on about 111 acres of SABM habitat at East Crooked Island was conducted in 2000, 2001, and 2003. The trapping confirmed existence of SABM on the property (Moyers and Shea 2002). However, trapping their property in St. Joseph Beach did not result in capture of any beach mice (Moyers and Shea 2002). Although SABM is thought to continue to occupy habitat south of St. Joseph Peninsula State Park, only tracking has been conducted to confirm its presence on private lands since the late 1990s. Private lands adjacent to public lands are available for population dispersal and food source during periods of high population and after severe weather events. However, subpopulations on large tracts of private land within the historical range of the subspecies are needed for conservation of the SABM.

Land development has been primarily responsible for the permanent loss of SABM habitat along its approximately 40-mile long historical range. In addition, construction of U.S. highway 98 accelerated the habitat loss from associated development. By the mid 1990's about 12 linear miles were known to be occupied (Gore 1994, 1995), indicating a 68 percent reduction in it historical distribution (63 FR 70053). An effort to re-establish the SABM back into its historical range was initiated around the time of listing (Moyers *et al.* 1999); however, the range reduction described above did not take this into account since the success of the reintroduction was not known at the time (63 FR 70053). Similar analyses have not been conducted since.

Our best documentation of the species' decline can be seen from trapping or tracking surveys conducted at various times throughout its range. By the mid to late 1980's concerns were raised when trapping efforts failed to result in captures at West Crooked Island (Gore 1987). By 1990 the SABM appeared to only inhabit a small portion (approximately 11 linear miles) of its original range: west end of East Crooked Island and within St. Joseph Peninsula State Park (Gore 1990). SABM's apparent decline continued into the mid-1990's when in 1994, the population on East Crooked Island was "presumed to be extinct" (Wooten and Holler 1999), leaving only one known population on St. Joseph Peninsula (Moyers *et al.* 1999). Subsequent reintroduction efforts in 1997-1998 appeared to have re-established the population on East Crooked Island (Moyers *et al.* 1999).

Recovery Criteria

The Recovery Plan for the SEBM identifies the primary recovery objectives for the subspecies (Service 1993). The SEBM can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historical range. More specifically, delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals;

2. Five additional viable populations are established throughout the historical range of the subspecies; and

3. These populations should be monitored for at least five years.

The Recovery Plan for the AIBM identifies the primary recovery objectives for the subspecies (Service 1993). The AIBM can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted. For the AIBM to be considered for downlisting to threatened, it is required that those populations at the northern and southern end of Anastasia Island continue to be viable. Each population should support a breeding population of 500 individuals. Two additional viable populations shall be established within the mainland portion of the historical range. All of these populations should be monitored for five years.

The Recovery Plan for the PKBM, CBM, and ABM identifies the primary recovery objectives to be the stabilization of present populations by preventing further habitat deterioration, and the reestablishment of populations in areas where they were extirpated (Service 1987). For each of the subspecies to be considered for downlisting to threatened, it is required that there be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50 percent of the critical habitat being protected and occupied by beach mice (Service 1987).

While this is the currently approved Recovery Plan for the three beach mouse subspecies, studies and research since the Recovery Plan publication provided additional information concerning recovery needs for the subspecies. Protection and enhancement of existing populations and their habitat, plus reestablishment of populations in suitable areas within their historical ranges, are necessary for the subspecies survival and recovery. Core beach mouse populations remain isolated and are vulnerable to natural and anthropogenic factors that may further reduce or degrade habitat and/or directly reduce beach mouse population sizes. Maximizing the number of independent populations is critical to species survival. Protection of a single, isolated, minimally viable population risks the extirpation or extinction of a species as a result of harsh environmental conditions, catastrophic events, or genetic deterioration over several generations (Kautz and Cox 2001). To reduce the risk of extinction through these processes, it is important to establish multiple protected populations across the landscape (Soulé and Simberloff 1986, Wiens 1996). Through the critical habitat designation process we are addressing this by designating five independent units for the subspecies spaced throughout its historical range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs.

The Service completed a five-year status review of the CBM and PKBM in August 2007 (Service 2007a, 2007b). For both subspecies the following was recommended: designate a beach mouse recovery coordinator; revise the recovery plan; accomplish viable populations, monitor habitat improvement, corridor persistence and hurricane response; conduct genetic studies and translocations as necessary; participate in education and outreach and complete an emergency response plan. A draft Recovery Plan for the SABM has been completed and distributed for public review..

In accordance with the Act, Federal agencies (including the Service) consult with the Service for actions that may adversely affect beach mice and their designated habitat. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development (**Table 14**).

Table 14. Previous biological opinions within Florida that have been issued for projects that had adverse impact to the nesting beach mice.

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
GINS Dune Protection (PKBM)	2000	0.01 acre (CH)
Translocation to PKSP (PKBM)	2000	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
Supplemental translocation to PKSP (PKBM)	2003	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
FEMA Berm Orange Beach, AL (PKBM)	2003	0.14 acre non-CH
Service scientific collecting permit program (PKBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
Florencia Development (within Action Area) (PKBM)	2005	3.5 acres (non-CH)
PKSP Re-build (PKBM)	2005	1.99 acres (CH)
FEMA Berm Emergency consultation (within Action Area) (PKBM)	2005	Consultation not complete (non-CH)
GINS road rebuild (PKBM)	2005	1.7 acres (CH)
Magnolia West Development (within Action Area) (PKBM)	2006	5.2 acres (not CH at time of construction, presently CH)
Palazzo Development (PKBM)	2006	0.58 acre (not CH at time of construction, presently CH)
Searinity Development (PKBM)	2006	0.32 acre (not CH at time of construction, presently CH)

Retreat Development (PKBM)	2006	0.21 acre (not CH at time of construction, presently CH)
Bond Residence (PKBM)	2006	0.17 acre (CH)
Three-batch condo (Island Club, Marquesas, Lorelei) (PKBM)	2007	0.95 acres (CH)
Naval Air Station Pensacola Pensacola Pass navigation channel dredging (PKBM)	2007	6.3 miles (CH)
Paradise Island development (PKBM)	2007	0.91 acres (CH)
Calabria condo development (PKBM)	2008	0.33 acres (non-CH)
Escambia County beach nourishment (PKBM)	2008	0.16 acres (partial CH)
Seabreeze Condominiums (PKBM)	2009	0.39 acres
Spanish Key Parking Lot (PKBM)	2009	0.28 acres
Perdido Key Fire Station (PKBM)	2010	0.43 acres (CH)
Stallworth Preserve Development (CBM)	1995	7 acres (CH)
Navy Panama City Beach site 4 construction (CBM)	2000	0.01 acre (CH)
East Pass Re-opening (CBM)	2001	Temporary, indirect take (CH)
WaterColor and WaterSound Developments (CBM)	2000	7.6 acres (non-CH)
Service scientific collecting permit (CBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
FEMA beach berms post hurricane Ivan emergency consultation (CBM)	2005	Consultation not complete (partial CH)
Western Lake Reopening consultation (CBM)	2006	2.7 acres annually for 5 years (CH)
FEMA Statewide post-disaster berm programmatic BO (PKBM, CBM, SABM, AIBM, and SEBM)	2007	75 miles for eroded shoreline(partial CH)
Angelos Development (CBM)	2009	0.42 acres
Bonfire Beach (SABM)	2008	38 acres
Ovation (SABM)	2010	5.41 acres (CH)

Sea Colony Development (AIBM)	1998	0.7 acres (non-CH)
Anastasia State Park beach nourishment (AIBM)	2005	50 linear feet (non-CH)
Service scientific collecting permit program (AIBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
Rodent Control Program on CCAFS (SEBM)	2002	50 beach mice
Cape Canaveral Air Force borrow source (SEBM)	2007	300 linear feet (non-CH)
Service scientific collecting permit program (SEBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
CCAFS Routine Maintenance Programmatic (SEBM)	2008	Temporary loss of habitat during trenching/digging for pipeline installation and repair, roadside mowing, soil remediation, pole placement, wells, soil boring, lines of sight, scrub restoration

Common Threats to Beach Mice in Florida

Habitat Loss or Degradation

Coastal dune ecosystems are continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Habitat manipulation is an old and widely used tool in wildlife management. It is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long term trapping data has shown that beach mouse densities are cyclic and fluctuate by order of magnitude on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992a, 1992b, Humphrey and Frank 1992a). Coastal commercial and residential development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by cats), diseases, and competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

The conservation of multiple large, contiguous tracts of habitat is essential to the persistence of beach mice. At present, large parcels of land exist mainly on public lands. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public lands and their staff are now under pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the chance that at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the foredune once vegetation and some dune structure have recovered (Swilling *et al*. 1998, Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

A lack of suitable burrow sites may be a consequence of habitat degradation. Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000a, Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox, gray fox, skunk (*Mephitis mephitis*), weasel (*Shallela frenata*), and raccoon (Blair 1951, Bowen 1968, Holler 1992a, Novak 1997, Moyers *et al.* 1999, Van Zant and Wooten 2003). Predation of beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

Free-roaming cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). The PHVA for the ABM indicated that if each population had as few as one cat, which ate one mouse a day, rapid extinction would occur in over 99 percent of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, hogs, and raccoon, multi-agency cooperative effort have been initiated and are ongoing throughout Florida, in particular on public lands. These programs also benefit beach mice.

Hurricanes

Hurricanes can severely affect beach mice and their habitat, as tidal surge and wave action overwash habitat, leaving a flat sand surface denuded of vegetation; sand is deposited inland, completely or partially covering vegetation; blowouts between the ocean and bays and lagoons leave patchy landscapes of bare sand; primary dunes are sheared or eroded; and habitat is completely breached, creating channels from the ocean to bays and lagoons. Other effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations (that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread, encompassing the range of the subspecies.

Until frontal dune topography and vegetation redevelop, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000a, Sneckenberger 2001). While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*i.e.*, severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30 percent (Swilling *et al.* 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling *et al.* 1998). Sneckenberger (2001) also found atypical numbers of ABM in scrub following a hurricane. Five months post-storm, "densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids." Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Moyers *et al.* (1999) found similar results for CBM at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat. By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, Swilling *et al.* (1998) found the mean percent of newly marked individuals increased from 14 percent for the three trapping periods before the storm to an average of 26.7 percent for the same interval post hurricane. The average for the three trapping periods immediately following was even higher, at 42.7 percent of the individuals captured. Swilling *et al.* (1998) concluded that this increased presence of new individuals reflected increased reproduction. A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was significantly higher than normal (18.9 percent higher). Moyers *et al.* (1999) also found similar results at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating. Trapping six months after the hurricane, Moyers *et al.* (1999) noted that 51.5 percent of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter beach mouse habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are probably responsible for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Holler *et al.* (1999) suggested that hurricanes could function to break up population subgroups and force population mixing. The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

<u>Beachfront Lighting</u>

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird *et al.* 2004).

The presence of vegetative cover reduces predation risk and perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003).

<u>Genetic variability</u>

Selander *et al.* (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith *et al.* 1975, Garten 1976, Teska *et al.* 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy *et al.* 1995).

In 1995, the Service contracted with Auburn to conduct genetic analysis of: 1) post-reestablishment gene structure in PKBM and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for ABM on the Bon Secour NWR; and 3) if feasible, the historical relationship of SABM from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and reestablished population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Wooten and Holler (1999) recommended strategies for management of CBM based on genetics. Management of the Grayton Beach State Park population for genetic characteristics appears to be needed; however, additional genetic analyses will be needed. Relocation of CBM to Grayton Beach State Park from Shell Island should be continued.

Results of the work for PKBM found that: 1) founder effect (from Florida Point to GINS) did impact the GINS-Perdido Key Area subpopulation. Loss of rare alleles and allele frequency shifts were noted; 2) a low to moderate level of overall genetic divergence was observed; 3) data suggests that some effects of genetic drift were mediated by continued transfer of individuals; 4) levels of heterozygosity were unexpected given recent history; 5) average levels of relatedness among individuals is high which may portend future inbreeding related problems (however, no evidence of existing inbreeding was observed in the data); and 6) the overall level of microsatellite variation retained in the GINS-Perdido Key Area subpopulation was higher than anticipated. Wooten and Holler (1999) recommended management of PKBM based on genetics by: 1) preserving the natural population to the maximum extent possible since the loss of the Florida Point subpopulation resulted in the permanent loss of alleles; 2) using the GINS-Perdido Key Area subpopulation as a donor for reestablishment of other populations because of the retention of a substantial amount of genetic variation; and 3) reestablishment plans should include transfers between donor and reestablished subpopulations. In addition, translocations should be accomplished in pairs.

Analysis of genetic work focused on SABM indicated that there are two possible genetic histories for Crooked Island beach mice: 1) the last known beach mice from Crooked Island were derived from CBM or 2) the last known beach mouse from Crooked Island were unique from both CBM found on Shell Island or SABM found on St. Joseph peninsula (Van Zant 2003).

Climate Change (refer to page 43)

Analysis of the Species/Critical Habitat Likely to be Affected

Beach mice are currently federally protected because of their low numbers caused by habitat loss with continuing threats to their habitat (including critical habitat for CBM, PKBM, and SABM) and resulting affects from storm and post-storm events. The primary reason for the significant reduction in their range is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated beach mouse habitat. Coastal urbanization has also increased the recreational use of beachfront areas. Dune habitat maintenance is an important component of beach mouse conservation. Providing a healthy and continuous dune system assures mouse population stability. Integral to this is keeping visitors to the beach off the dunes and replanting as necessary when impacts occur or are observed. The extremely active 2004 and 2005 hurricane seasons also had a severe affect on Florida’s beaches and beach mouse habitat.

Critical habitat for three (PKBM, CBM, and SABM) of the five subspecies of beach mice has been designated and will be discussed. No critical habitat has been designated for the other two subspecies (SEBM and AIBM). Therefore, the proposed action would have no effect on designated critical habitat for these two subspecies because none is designated.

Generally, sand placement activities or dredged navigation channel material is not placed on existing beach mouse habitat consisting of vegetated dunes. Typical effects from these activities to beach mice and their habitats consist of the staging and storage of equipment, work vehicles, or materials and beach access for sand placement activities or dredged material placement. These effects may result in the permanent and temporary loss, degradation, or fragmentation of beach mouse habitat and changes in essential life history behaviors (dispersal and movement, foraging, seeking mates, breeding, and care of young). Beach mice spend their entire lives within the dune ecosystem and are nocturnal. Sand placement projects may occur at anytime of the year depending on their location and are usually conducted on a 24/7 schedule. The quality of the placed sand could affect the suitability of the beach and dunes to support beach mouse burrow construction and food sources. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on beach mice overall survival and recovery are considered in this SPBO.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area (all subspecies of beach mice)

The action area encompasses the entire range of five subspecies of beach mice, and designated critical habitats of three beach mouse subspecies. Therefore, the previous discussion in "Status of the Species" applies here. The known distribution of the five subspecies of beach mice is a result of cursory surveys and intermittent trapping involving different projects. There has not been a systematic trapping study done in order to determine the status of each subspecies throughout their ranges.

Factors affecting the species environment within the action area

<u>Coastal development</u>

Beach mice were listed as endangered and threatened species primarily because of the fragmentation, adverse alteration, and loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

<u>Hurricanes</u>

Hurricanes were probably responsible for maintaining coastal beach habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (e.g., loss of habitat). Depending on their frequency, storms can affect beach mice on either a short-term basis (e.g., temporary loss of habitat) or long term (e.g., loss of food, which in turn may lead to increased juvenile mortality, resulting in a depressed breeding season). How hurricanes affect beach mice also depends on the characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining habitat, frequent or successive severe weather events could compromise the ability of certain populations of beach mice to survive and recover. Beach mice evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed beach mice to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to beach mice survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a major loss of habitat for beach mice.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Beachfront Lighting

Artificial lighting along developed areas of both coastlines continues to cause increase susceptibility to predators, altered foraging and breeding habits which impact beach mouse recovery. While a majority of coastal local governments and counties have adopted beachfront lighting ordinances compliance and enforcement is lacking in some areas. Further, the lighting in areas outside the beachfront ordinance coverage areas continues to be unregulated resulting in urban glow. Even the darker areas of conservation managed lands are subject to surrounding sky glow.

Predation

A major continuing threat to beach mice is predation by free-roaming cats and other nonnative species. The domestic cat is not native to North America and is considered a separate species from its wild ancestral species, *Felis silvestris*. Cats are hunters, retaining this behavior from their ancestors. However, wildlife in the western Hemisphere did not evolve in the presence of a small, abundant predator like the domestic cat, and thus did not develop defenses against them. Cats were introduced to North America a few hundred years ago.

Free-roaming pets prey on small mammals, birds, and other native wildlife. In the U.S., on a nationwide basis, cats kill over a billion small mammals and hundreds of millions of birds each year. Worldwide, cats are second only to habitat destruction in contributing to the extinction of birds. Cats have been documented to take beach mice, sea turtle hatchlings, shorebirds, and migratory birds. A significant issue in the recovery of beach mice is predation by free-ranging pet and feral cats. Beach mice have a number of natural predators including snakes, owls, herons, and raccoons. Predation is part of the natural world. However, predation pressure from both natural and nonnative predators may result in the extirpation of small, local populations of beach mice in a very short time (Bowen 1968, Linzey 1978).

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of beach mice and its designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting beach mice or its designated critical habitat nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

Factors to be considered

Aspects of the sand placement and dredged material placement activities will occur within habitat that is used by beach mice year round. The activities include the storage of equipment, work vehicles, or materials and creation, expansion, or use of beach access points for sand placement activities or dredged material placement. The work, depending on the location, may be conducted any time of the year. Most effects would be expected to be temporary. These short-term and temporary impacts could include loss of foraging habitat, altered beach mouse movement and dispersal activities. Long-term and permanent impacts from the sand placement activities such as excavation of dune habitat and degradation could impact beach mice by fragmentation of their habitat including critical habitat for the PKBM, CBM, and SABM.

There are typically different "levels" of access sites needed for a project. The primary access is a "lay-down" yard, where pipe is delivered and stored, and storage trailers, and other equipment and materials are stored. These are typically big paved parking lots, so that the Corps's trucks can access the area to drop off and pick up equipment. There's typically a beach access at that point to get the pipe and equipment onto the beach and that access is usually at least 50-ft wide (pipe sections are typically 40 to 50 feet long). In NW Florida and Alabama, these yards have been approximately eight miles apart.

“Intermediate areas" are used at about the quarter points of the project length. These are used for the fuel tank, welding equipment, and other items or systems that get used a couple of times a day. These locations can vary from two to three miles apart. In addition, there are access points to allow project vehicles and trucks on and off the beach. Based on previous projects it would be expected to have single-vehicle entry points at one-half to one-mile intervals.

Protective, avoidance, and minimization measures have been incorporated into the project plan to avoid or minimize the potential impacts from the sand placement and dredged material placement activities. However, even with these measures, impacts to beach mice are expected to occur from some aspects of the project activities. The activities are expected to directly or indirectly adversely affect beach mice and/or their habitat including designated critical habitat for the PKBM, CBM, and SABM. The work may occur on public and/or private lands.

Proximity of Action: Some aspects of the sand placement and dredged material placement activities would occur directly in beach mouse habitat. The storage or staging of pipe and other equipment, and vehicles, use or creation of beach access points, and placement of pipe, nourishment or dredged material could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM. Beach mice spend their entire life cycle within the coastal dune system.

Distribution: The storage or staging of pipe and other equipment and vehicles and use of beach access points that could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM may vary depending on the individual project length and existing beach accesses and non-beach mouse habitat that can be used for storage and staging.

Timing: The timing of the activities would directly and indirectly impact beach mice and their habitat depending on the season. Beach mice reproduce year-round with more mice being produced in the late winter and early spring. Impacts could include but would not be limited to disrupting mice seeking mates, constructing nest burrows, foraging for food, caring for their young, and young mice leaving the nest burrow dispersing into new habitat.

Nature of the Effect: The effects of the activities may include the temporary loss of habitat including the loss of a few beach mice from excavation of habitat for beach access and reduction of beach mouse activity including feeding, reproduction, and movement from loss or alteration of habitat. Activities that decrease the amount or quality of dune habitat or movement could affect beach mice by reducing the amount of available habitat and fragmenting the habitat.

Duration: Time to complete the project construction may vary depending on the project length, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). Project work could take as little as a month and as long as a one or two years. Beach mouse habitats would remain disturbed until the project is completed and the habitats are restored. Dune restoration could be complete from 6 to 12 months after the project has been completed. The short generation time of beach mice combined with the time frames provided in this document (projects from 1 month to 2 years, dune restoration 6 to 12 months following project completion) will impact multiple generations of beach mice. The time to complete a project and restore the habitat can be a complete loss of habitat availability and use for multiple generations of beach mice.

Disturbance frequency: Depending on the sand placement activity and dredging project frequency, this could result in impacts to beach mice and their habitats at any time during the year on a minimum cycle of every 2 years. Following initial sand placement, activities could occur every year depending on the project location and erosion events. The actual number of times the sand placement would occur is unknown. Following initial sand placement or dredge material placement, maintenance activities could occur every two to 10 years depending on the project location and situation (erosion, long shore sand transportation, upstream activities, and weather events). Thus, impacts related to the subject activities would be expected to occur no more often than every two to three years. However, while not anticipated, work could occur annually in response to emergency events. The actual number of times the nourishment and dredging material disposal activities is unknown but can be based on previous work.

Disturbance intensity and severity: Depending on the frequency needed to conduct the nourishment and dredged material work and the existence of staging areas and beach access points, effects to the recovery of beach mouse may vary. However, the action area encompasses entire range of each subspecies and the overall intensity of the disturbance is expected to be minimal. The severity is also likely to be slight as few if any mice would be lost and dune habitats can be restored quickly if protected from other impacts (pedestrians and vehicles).

The staging and storage of equipment and materials and beach access points could occur within habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM and could be adjacent to designated critical habitat for the PKBM, CBM, and SABM. Beach mice are permanent inhabitants of the coastal ecosystem conducting all their life cycles in this environment. While the current status of individual beach mouse subspecies is unknown, their general distribution is known.

Analysis for effects of the action

The action area consists of the Atlantic or Gulf beachfront including the wet and dry unvegetated beach, developing foredunes and interdunal swales, and areas that were formerly primary or secondary dunes. Sand placement or dredged material placement work would not occur on existing vegetated primary or secondary dunes. However, construction of or expansion of an existing beach access could be located through scrub, secondary, or primary dunes. Beach mice would generally be found inhabiting stable primary, secondary, and scrub dunes on a permanent basis with other habitats being used periodically on a daily or seasonal basis for feeding and movement. Some of these areas also include critical habitat.

Direct and Indirect Impacts

Direct impacts are effects of the action on the species occurring during project implementation and construction (sand placement or dredged material placement). Direct loss of individual beach mice may occur during the creation or expansion of beach access points when heavy equipment clears the habitat and packs the sand. In general the length of time between project maintenance work is expected to be sufficient for beach mouse habitat to be restored. Thus, it is not anticipated that the nourishment and dredged material placement activities would result in permanent beach mouse habitat destruction (including critical habitat). However, habitat for all the beach mouse subspecies and critical habitat for the PKBM, CBM, and SABM that provides food or cover may be temporarily destroyed or altered from the activities.

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. The indirect effect of the sand placement and dredged material placement activities would be newly created or expanded existing beach access points that act as barriers to beach mouse movement for foraging, or population expansion or dispersal. Maintaining the connectivity among habitats is vital to persistence of beach mice recovery. Recovery actions needed to assure the connectivity include restoration and maintenance of the dune system following project completion.

For the Service to determine if the project impacts on designated critical habitat would be an adverse modification, the Service shall determine if the impact on the habitat appreciably diminishes the capability of the critical habitat to satisfy essential requirements of beach mice. The long-term maintenance of the beach mouse populations in the project areas could be compromised if the sand placement and dredged material placement activities occur too frequently resulting in a long-term barrier to mice movement. However, our evaluation indicates the impacts to critical habitat should be temporary in nature based on past history of nourishment projects. In addition, the area to be directly affected within the individual subspecies would be a small percentage of the overall critical habitat and would not be expected to reduce the carrying capacity of the recovery unit or appreciably diminish the ability of the PCE's to provide for the essential functions of the critical habitat units.

Species' response to a proposed action

This SPBO is based on effects that are anticipated to beach mice (all life stages) as a result of the temporary physical disturbance of beach mice habitat from beach nourishment or dredged material placement and associated activities. Some individual beach mice (all life stages) may be lost during the initial construction or expansion of beach accesses where heavy equipment destroys dune habitat and compacts the sand within the access corridor. Any mice that survive the initial construction may move outside of the disturbed area and construct burrows elsewhere in the vicinity. This will result in increased exposure to predation due to the removal of their burrows. Following access construction, a bare gap of sand could form a barrier to limit beach mouse movement within the area altering regular movement patterns. The bare areas could not be used for foraging, breeding or sheltering. These impacts are expected to be limited to the construction phase of the project (one month to two years). As the life span of a beach mouse is estimated to be approximately nine months, the loss of individual mice or the temporary loss of habitat could affect several generations of beach mice, but because beach mice can reproduce rapidly with adequate resources, colonization or recolonization of the restored habitat would be expected.

Beach mice have evolved to adapt to catastrophic weather events. Additional factors such as surrounding development pressure and nonnative predators may affect the species' ability to recover from the loss of individuals. However, the temporary loss of the habitat itself is not expected to permanently impact the populations as all beach mouse habitat within the project areas not permanently destroyed would be restored or maintained as part of the conservation measures committed to by the Corps or the Applicant. The temporary nature of the impacts to dune habitats is not expected to alter the function and conservation role of the remaining beach mouse habitat including designated critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this SPBO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion and require separate consultation pursuant to section 7 of the Act.

It is reasonably certain to expect that coastal development, human occupancy and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. Redevelopment along with new developments following the hurricane seasons of 2004 and 2005 are occurring as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline. Any projects that are within endangered or threatened species habitat will require section 7 consultation or section 10(a) (1)(B) permitting from the Service.

In recognizing the importance of coastal barrier islands along the Atlantic and Gulf coasts, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 and Coastal Barrier Improvement Act in 1991. The purpose of CBRA is "…to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers." Congress established the Coastal Barrier Resources System units that apply to the CBRA.

Escambia County is currently in the final permitting stages of a beach nourishment project for Perdido Key. The project would cover approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. The Service completed an endangered species consultation for the project in 2008. The project construction is expected to begin in late 2009-2010. The beach nourishment project is likely to enhance beach mouse habitat by providing an additional buffer to the dune habitats from storm events.

The Pensacola Naval Air Station has proposed to dredge their navigation channel resulting in the need to place eight million cubic yards of dredged material that is beach compatible. Because of cost, Perdido Key is the closest area to receive the material. Receiving areas include the Perdido Key Gulf beachfront (in lieu of the County implementing their project described above), PKSP, and GINS, Escambia County. The project could result in the placement of dredged material on 16 miles of beachfront including private, county, state, and Federal lands. The Navy has received their permits to complete the project. The Service completed an endangered species consultation for the project in 2007. The full project is on hold due to funding. However, the Federal navigation channel in the lower portion of the project area is expected to be maintenance dredged in 2009-2010.

Gulf County is currently completing a beach restoration project on St. Joseph peninsula and St. Joseph Peninsula State Park. The project will cover approximately 7.5 miles of Gulf of Mexico beachfront. The Service completed an endangered species consultation for the project. The project was completed in 2008.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that work conducted under the Statewide Programmatic action , as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. No critical habitat has been designated for any of the sea turtle species in the continental U.S.; therefore, none will be affected.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. Three of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the PFRU, the DTRU, and the NGMRU. Sand placement is not expected to occur within the DTRU. The NGMRU averages about 1,000 nests per year. Northwest Florida accounts for 92 percent of this recovery unit in nest numbers (920 nests) and consists of approximately 234 miles of nesting shoreline. Of the available nesting habitat within the NGMRU, with most sand placement projects have a project life of five to seven years and channel maintenance activities occurring every two to three years, on average, sand placement impacts will occur on 8.8 miles of sea turtle nesting shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

The PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 1,166 miles of shoreline. Of the available nesting habitat within the PFRU, sand placement activities will occur on 18.9 miles of nesting shoreline per year during nonemergency years. This is based on the average linear feet of beach on which sand placement occurred during non-emergency years from 2001 to 2008.

Generally, green, leatherback, hawksbill, and Kemp's ridley nesting overlaps with or occurs within the beaches where loggerhead sea turtles nest on both the Atlantic and Gulf of Mexico beaches. Thus, for green, leatherback, hawksbill, and Kemp's ridley sea turtles, sand placement activities will affect an average of 27.7 miles of shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

For all species of sea turtles, post-hurricane sand placement activities occurred on approximately 205 miles of shoreline for the 2004-2005 period following the emergency events (declared disasters and Congressional Orders). These activities are within the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Beach Mice

The PKBM, CBM, and SABM occur on both public and private lands throughout their historical ranges. Both the SEBM and the AIBM are located completely on county, state, or federally protected lands, except for a small area in St. Johns County in which the AIBM are found on private lands along the Florida coast.

After reviewing the current status of the species of the SEBM, AIBM, PKBM, CBM, and SABM, the environmental baseline for the action area, the effects of beach nourishment and dredged material placement and associated activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that the Statewide Programmatic action for these projects, as proposed, is not likely to jeopardize the continued existence of any of the above subspecies of beach mice and is not likely to destroy or adversely modify designated critical habitat for the PKBM, CBM, or SABM.

As discussed in the Effects of the Action section of this SPBO, we would not expect the carrying capacity of beach mouse habitat within the action area to be reduced. Beach mouse habitat will continue to provide for the biological needs of the subspecies as demonstrated below:

1. No permanent loss of beach mouse habitat will occur within the action area from the project construction or maintenance;

2. Temporary impacts to beach mouse habitat will be restored within the action area after project completion; and

3. A full complement of beach mouse habitat will remain within the action area after project completion.

Temporary impacts are expected to be limited to the construction/maintenance phase of the project and habitat restoration period following the project, which could be completed between one month and two years.

While a few beach mice may be lost, beach mice recover well from population size reductions (Wooten 1994) given sufficient habitat is available for population expansion after the bottleneck occurs. Therefore, we do not consider the potential loss of individuals to be significant.

Also, 50 feet of beach mouse critical habitat for each subspecies (PKBM, CBM, and SABM) could be temporarily affected each time a project is completed as a result of the sand placement activities. We would not anticipate that the loss of the critical habitat would alter or affect the remaining critical habitat in the action area for each subspecies (PKBM, CBM, and SABM) to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role for the subspecies in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and shall be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

Sea Turtles

The Service anticipates that no more than 27.7 miles of highly eroded shoreline along the Florida coastline (no more than 8.8 miles within the NGMRU and no more than 18.9 miles within the PFRU) would receive sand placement per year during nonemergency years with a maximum of 102 miles of shoreline (38 miles within the NGMRU and 64 miles of shoreline within the PFRU) receiving sand during or following an emergency event (declared disaster or Congressional Order) as a result of the Statewide Programmatic action. This represents two percent of the entire shoreline per year during a nonemergency year and seven percent of the entire shoreline during an emergency year. Over the last 10 years, one Congressional Order occurred due to emergency events in the 2004-2005 period. The increased sand placement on 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events. Incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
   a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
   b. Human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;

2. The total number of hatchlings per undiscovered nest is unknown;

3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown;

4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;

5. Lights may misdirect an unknown number of hatchlings and cause death; and

6. Escarpments may form and prevent an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species can be anticipated by the disturbance and sand placement on suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) sand placement activities will likely occur during a portion of the nesting season; (3) sand placement activities will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter or misdirect nesting females and hatchlings during and following sand placement.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests within the Action Area may be misidentified as false crawls and missed. However, due to implementation of the sea turtle protection measures, we anticipate that the take will not exceed seven percent of the nesting average in the action area. This number is not the level of take anticipated because the exact number cannot be predicted nor can the level of incidental take be monitored.

Beach Mouse

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated from the sand placement activities may occur any time of the year within a ten-year period. The Service anticipates incidental take of beach mice would be difficult to detect for the following reasons: (1) an unknown number of beach mice may be injured, crushed or buried during beach access construction work and remain entombed in the sand; (2) beach mice are nocturnal, are small, and finding a dead or injured body is unlikely because of predation, and (3) changes in beach mouse essential life behaviors may not be detectable in standardized monitoring surveys.

For projects that occur within beach mouse habitat it is anticipated that no more than 50 linear feet of beach mouse habitat could be affected per sand placement activity for beach access within a subspecies range statewide as a result of the sand placement activities.

The incidental take is expected to be in the form of: (1) harm or harassment to all beach mice occupying the created or expanded beach access points; (2) harassment of beach mice from disturbance of foraging opportunities within the access areas during the construction period; (3) harassment of beach mice from temporary loss of foraging and burrow habitat; and (4) harassment of beach mice from temporary restriction of movement across access areas.

EFFECT OF THE TAKE

Sea Turtles

In the SPBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat for any of the sea turtle species.

Incidental take of loggerhead nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 18.9 miles of shoreline per year within the PFRU during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year. The increased sand placement of 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events.

Incidental take of green, leatherback, hawksbill and Kemp's ridley nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 27.7 miles (8.8 miles within the northwest portion of Florida and 18.9 miles within the northeast, south and west portion of Florida) of shoreline per year during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year.

Beach Mouse

In the SPBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to AIBM, SEBM, PKBM, CBM, and SABM or in adverse modification or destruction of designated critical habitat for the PKBM, CBM, or SABM. Critical habitat for the SEBM and AIBM has not been designated; therefore, the project will not result in destruction or adverse modification of critical habitat for these subspecies.

Incidental take of SEBM, AIBM, PKBM, CBM, and SABM is anticipated to occur at beach access locations for the sand placement activities. Take will occur during project construction where beach access points are expanded or created and where equipment is staged or stored within beach mouse habitat along approximately 50 feet of vegetated dunes for beach access.

REASONABLE AND PRUDENT MEASURES

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles; SEBM, AIBM, CBM, PKBM, and SABM in the action area for the following activities:

A. Sand placement from beach nourishment, sand bypass, and sand back pass activities;

B. Sand placement from navigation channel maintenance; and

C. Groin and jetty repair or replacement.

If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the term and condition is not reasonable and prudent for the specific project or activity and request exception under the SPBO or
2. Initiate consultation with the Service for the specific project or activity. The Service may respond by either of the following:
    a. Allowing an exception to the terms and conditions under the SPBO or
    b. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

Post construction requirements are listed in Reasonable and Prudent measures A10, A11, A12, and A13. These post construction requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

REASONABLE AND PRUDENT MEASURES for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following measures:

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, sand placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties, sand placement shall not occur from June 1 through September 30. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties, Florida, sand placement may occur during the sea turtle nesting season.

A4. All derelict material or other debris shall be removed from the beach prior to any sand placement.

A5. The Corps shall continue to work with FDEP, FWC and the Service to create a sea turtle friendly beach profile for placement of material during construction.

A6. If a dune system is already part of the project design, the placement and design of the dune shall emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

A7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

A8. A meeting between representatives of the Applicant's or Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

A9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

A10. A post construction survey(s) of all artificial lighting visible from the project beach shall be completed by the Applicant or Corps.

A11. Daily nesting surveys shall be conducted by the Applicant or Corps for two nesting seasons following construction if the new sand still remains on the beach.

A12. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities.

A13. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles.

A14. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

A15. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

A16. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) between dusk and the time of completion the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice.

A18. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

A19. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

A20. Existing vegetated habitat at beach access points and travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access corridor.

A21. Expanded or newly created beach access points shall be restored following construction.

A22. A report describing the actions taken shall be submitted to the Service following completion of the proposed work for each year when the activity has occurred.

A23. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

All conservation measures described in the Corps' PBA are hereby incorporated by reference as Terms and Conditions within this document pursuant to 50 CFR §402.14(I) with the addition of the following Terms and Conditions. In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures, described above and outline required reporting/monitoring requirements.

These Terms and Conditions are nondiscretionary.

Post construction requirements are listed in Terms and Conditions A10, A11, A12, and A13. These post construction requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

TERMS AND CONDITIONS for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following conditions:

All beaches

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

b. Sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in A3.c below).

c. For higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key located in Sarasota and Charlotte counties, sand placement shall not occur during the main part of the nesting season (June 1 through September 30). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

A4. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any sand placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season (**Tables 17 and 18**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

Table 15. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends	Beach Placement Window	Early Season Relocation *	Late Season Relocation**	Nesting Season Monitoring
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	15 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In St. Lucie County, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 1 Nov (28 Aug) (or prior to start of construction **)	1 Mar - 15 Oct
Martin and Palm Beach Counties	12 Feb - 16 Oct	20 Dec	1 Nov - 30 Apr	1 Mar - 30 Apr In Martin and Palm Beach Counties, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 1 Nov (28 Aug) (or prior to start of construction **)	1 Mar - 15 Oct

Table 16. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Outside of Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends	Beach Placement Window	Nesting Season Monitoring and Relocation
Nassau, Duval, St. Johns, Flagler, and Volusia Counties	27 Apr - 3 Oct	30 Nov	All Year	15 Apr – 30 Sep
Miami-Dade County	30 Mar - 25 Sep	30 Nov	All Year	1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island)	1 May - 4 Sep	15 Nov	1 Oct - 31 May	1 May – 15 Sep
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	11 May - 5 Sep	15 Nov	All Year	1 May - 31 Aug
Sarasota and Charlotte Counties (Manasota Key)	27 Apr - 7 Sep	15 Nov	1 Nov - 30 Apr	15 Apr – 15 Sep
All other beaches in Sarasota and Charlotte Counties	27 Apr - 7 Sep	15 Nov	All Year	15 Apr – 15 Sep
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr - 11 Sep	15 Nov	All Year	15 Apr – 15 Sep

A5. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-Federal projects and how the existing sand placement template may be modified.

A6. Dune restoration or creation included in the profile design (or project) shall have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (**Figure 13)** or a 4:1 slope (**Figure 14**) on a low erosion beach. If another slope is proposed for use, the Corps shall consult the Service.

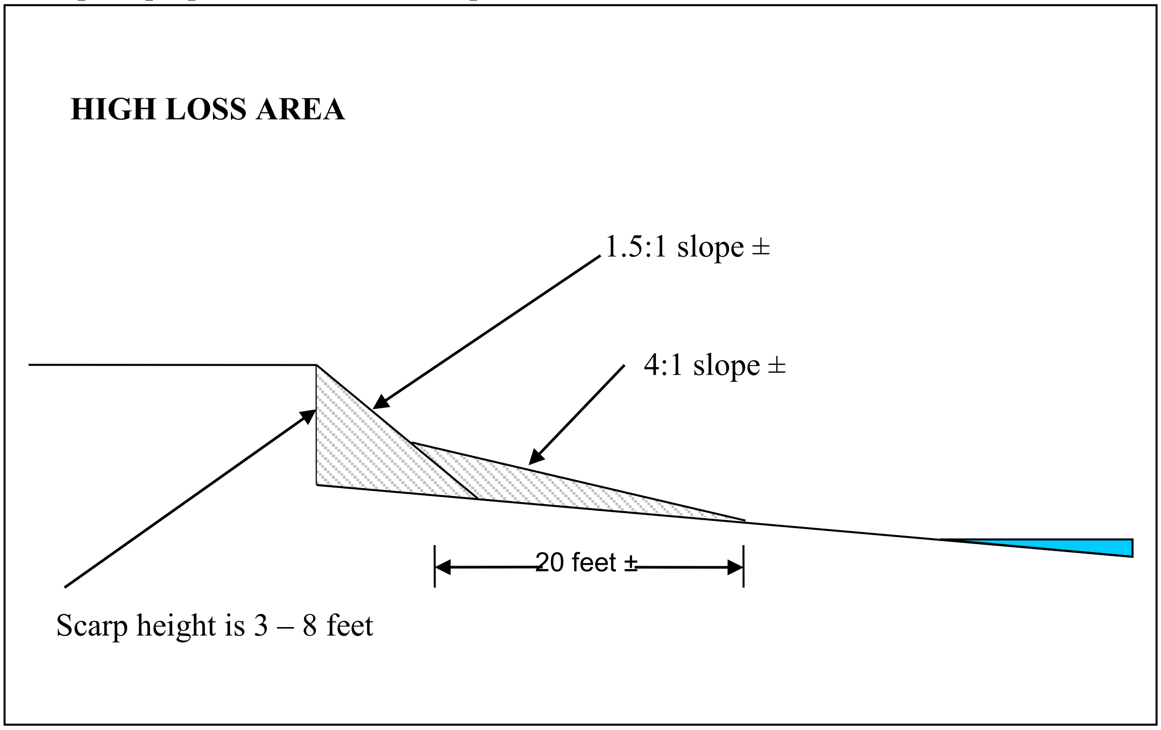

Figure 13. Recommended slope on a high erosion beach for sand placement projects that include the creation of a dune.

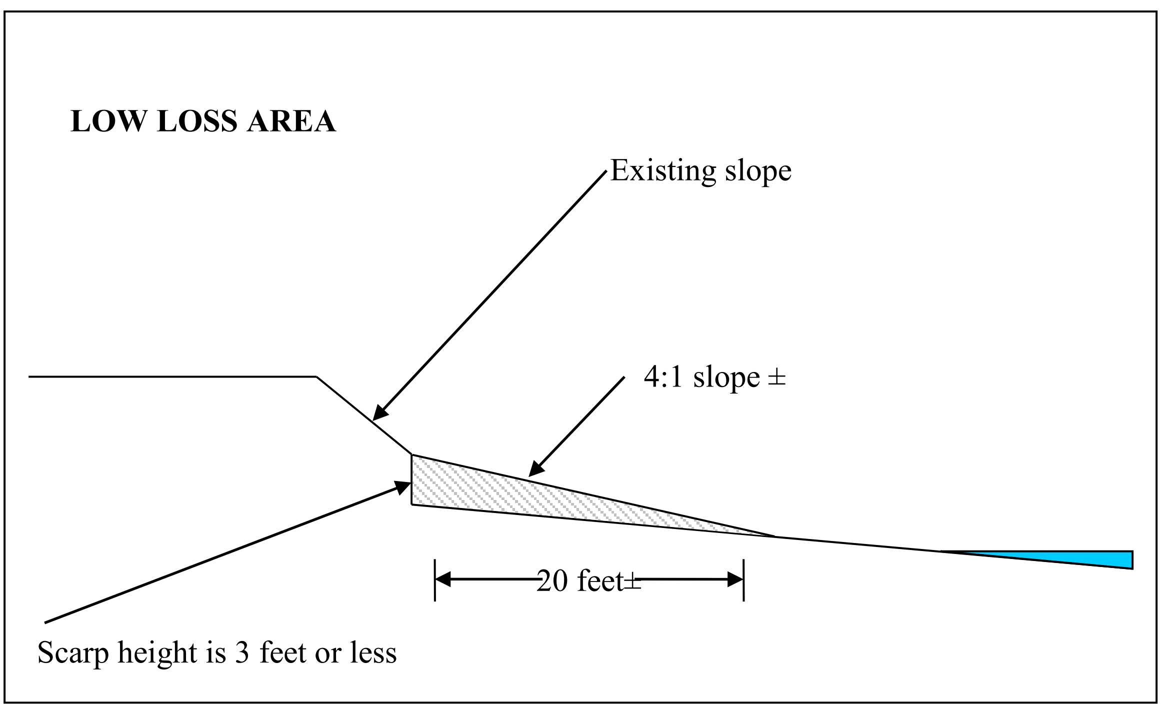

Figure 14. Recommended slope on a low erosion beach for sand placement projects that include the creation of a dune.

A7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix C**). The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

A8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

Sea Turtle Protection

A9. Daily early morning surveys for sea turtle nests shall be required as outlined in **Tables 15 and 16 (Nesting Season Monitoring)**. If nests are constructed in the area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation as outlined in a through f.

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during March 1 through April 30, daily early morning surveys and egg relocation shall be conducted for sea turtle nests until completion of the project (whichever is earliest). Eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through November 30, daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 30, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period from May 1 through October 31, daily early morning (before 9 a.m.) surveys and egg relocation shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in A9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by May 1 whichever is later. Nesting surveys and relocation shall continue through the end of the project or through August 31 whichever is earlier. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in A9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall not occur from June 1 through September 30, the period of peak sea turtle egg laying and egg hatching for this area. If nests are laid between May 1 and May 31 in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15 whichever is later. Nesting surveys and egg relocation shall continue through the end of the project or through September 30 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in A9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 1 whichever is later. Nesting surveys and egg relocation shall continue through the end of the project or through September 30 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to sand placement activities or by April 15 whichever is later. Nesting surveys and egg relocation shall continue through the end of the project or through September 30 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

A10. Daily nesting surveys shall be conducted for two nesting seasons in accordance with the FWC's Statewide Nesting Beach Survey Protocol (**Appendix B**) by the Corps or the Applicant following construction if placed material still remains on the beach (**Table 17**). Post construction year-one surveys shall record the number of nests, nesting success, reproductive success, and lost nests due to erosion and/or inundation. Post construction year-two surveys shall only need to record nest numbers and nesting success. This information will be used to periodically assess the cumulative effects of these projects on sea turtle nesting and hatchling production and monitor suitability of post construction beaches for nesting.

Table 17. Post-Construction Sea Turtle Monitoring.

Region	Nest Laying Season	Years 1 and 2 Post-Construction Monitoring
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	Bi-weekly surveys: 1 Mar - 30 Apr and from 15 Oct – 15 Nov Daily surveys: 1 May - 15 Oct
Martin and Palm Beach Counties	12 Feb - 16 Oct	Daily surveys: 1 Mar - 15 Oct
Nassau, Duval, St. Johns, Flagler, and Volusia Counties	27 Apr - 3 Oct	Daily surveys: 1 May – 30 Sep
Miami-Dade County	30 Mar - 25 Sep	Daily surveys: 1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island)	1 May - 4 Sep	Daily surveys: 1 May – 31 Aug
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	11 May - 5 Sep	Daily surveys: 1 May - 31 Aug
Sarasota and Charlotte Counties (Manasota Key)	27 Apr - 7 Sep	Daily surveys: 1 May –15 Sep
All other beaches in Sarasota and Charlotte Counties	27 Apr - 7 Sep	Daily surveys: 1 May – 15 Sep
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr - 11 Sep	Daily surveys: 1 May – 15 Sep

A11. Two surveys shall be conducted of all lighting visible from the beach placement area by the Applicant or Corps, using standard techniques for such a survey (**Appendix C**), in the year following construction. The first survey shall be conducted between May 1 and May 15 and a brief summary provided to the Service. The second survey shall be conducted between July 15 and August 1. A summary report of the surveys, including any actions taken, shall be submitted to the Service by December 1 of the year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area. If the project is completed during the nesting season and prior to May 1, the Corps may conduct the lighting surveys during the year of construction.

A12. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to the dates in **Table 18** for 3 subsequent years.

Table 18. Dates for Compaction Monitoring and Escarpment Surveys by County.

County where project occurs	Date
Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward	March 1
Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin, Volusia, Flagler, St. Johns, Duval, Nassau, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier	April 15
Miami-Dade, Monroe	April 1

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted to the appropriate Service Field Office (**Table 3**) prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.
(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 18**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

A13. Visual surveys for escarpments along the project area shall be made immediately after completion of the sand placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Tables 15 and 16** for 3 subsequent years if sand in the project area still remains on the dry beach.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or FWC will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted to the appropriate Service Field Office (**Table 3**).

A14. If available, staging areas for construction equipment shall be located off the beach during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems.

A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

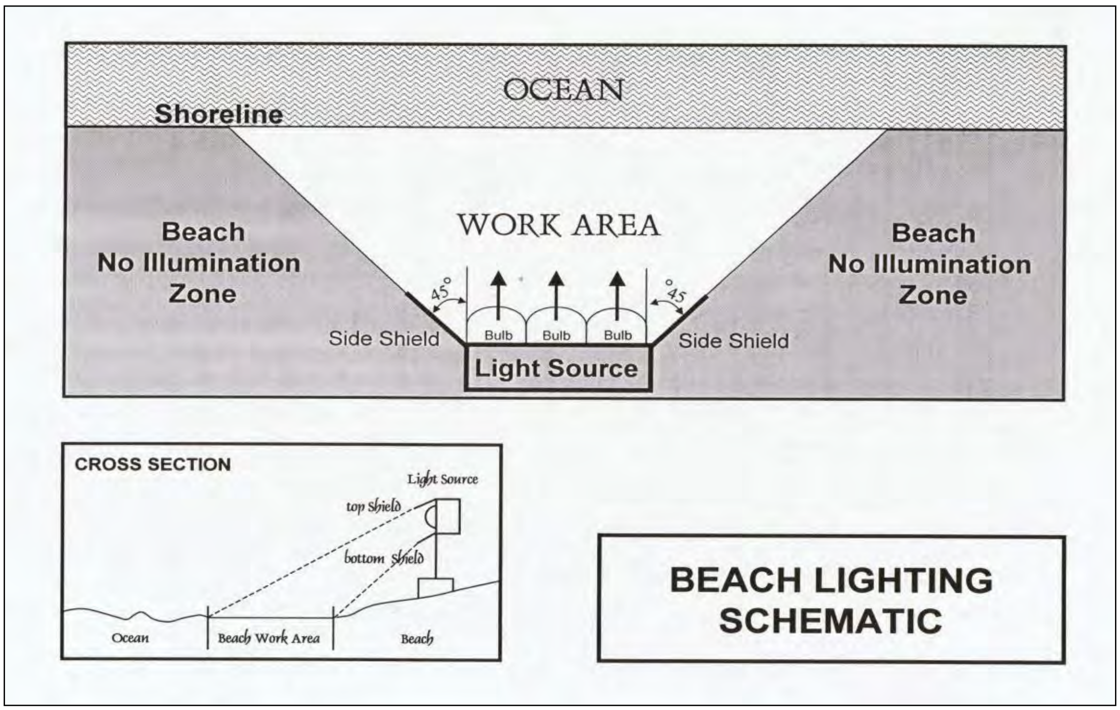

Figure 15. Beach lighting schematic.

A16. During the period during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Dune Planting

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice. Dune vegetation planting may occur during the sea turtle nesting season under the following conditions.

a. Daily early morning sea turtle nesting surveys (before 9 a.m.) shall be conducted during the period from May 1 through October 31 for all counties in Florida where sea turtle nesting occurs. If the planting is conducted in Brevard, Indian River, St. Lucie, Martin, Palm Beach, or Broward Counties, daily early morning surveys shall be extended to include March 1 through April 30 and November 1 through November 30. Nesting surveys shall only be conducted by personnel with prior experience and training in nesting surveys. Surveyors shall have a valid FWC permit. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (all times). No dune planting activity shall occur until after the daily turtle survey and nest conservation and protection efforts have been completed. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys;

b. Any nests deposited in the dune planting area not requiring relocation for conservation purposes shall be left in place. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 3-foot radius around the nest. No planting or other activity shall occur within this area nor will any activities be allowed that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the planting activity;

c. If a nest is disturbed or uncovered during planting activity, the Corps, or the Applicant shall cease all work and immediately contact the project turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within 10 feet of a nest shall be delayed until hatching and emerging success monitoring of the nest is completed;

d. All dune planting activities shall be conducted by hand and only during daylight hours;

e. All dune vegetation shall consist of coastal dune species native to the local area; (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material for the plant size;

f. No use of heavy equipment shall occur on the dunes or seaward for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose; and

g. Irrigation equipment, if needed, shall be authorized under a FDEP permit.

Beach Mouse Protection

A18. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

A19. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

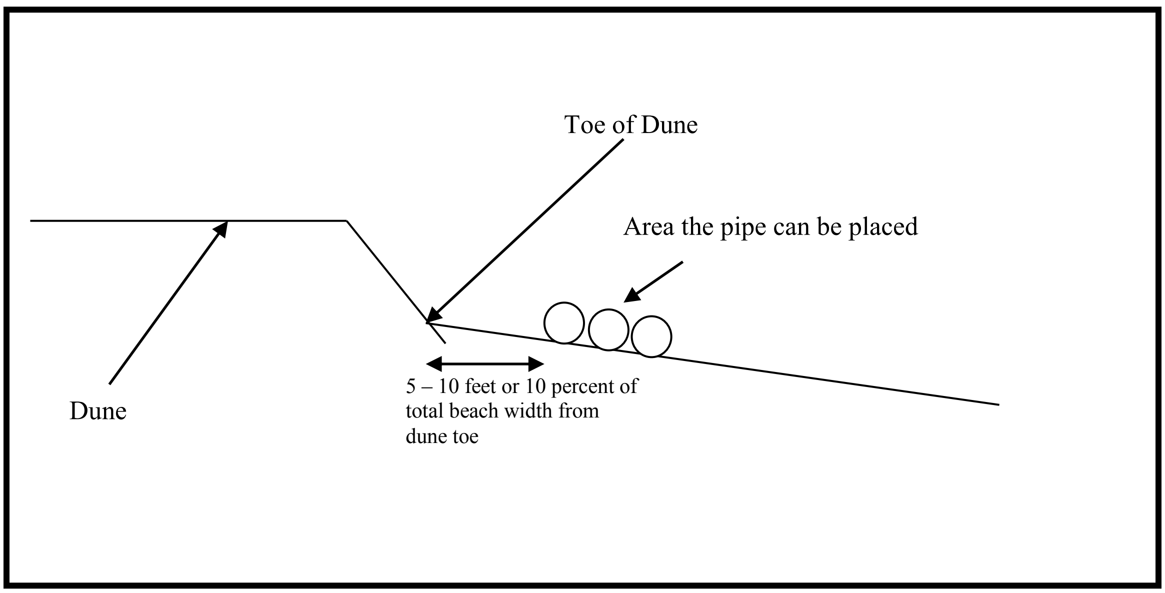

Figure 16. Equipment placement for projects occurring in beach mouse occupied habitat.

A20. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be fully restored to the preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

A21. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be spaced no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least one inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

A22. An excel sheet with the information listed in **Table 19** shall be submitted to the Service (**Table 3**) by July 31 of the following year of construction. The excel sheet shall be available on the Service's website.

A report with the information listed in **Table 20** shall be submitted to the Service by the Corps by December 31 of the year following construction.

Table 19. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description (include linear feet of beach, actual fill template, access points, and borrow areas)
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of self-release beach sites
	Sand compaction, escarpment formation, and lighting survey results by project shall be reported as listed in the Terms and Conditions by December 31 to the FWC and appropriate Service Field Office

	(Table 3)
Beach mice	Acreage of new or widened access areas affected in beach mouse habitat
	Vegetation completed for new or widened access areas
	Success rate of vegetation of restoration

Table 20. Sea turtle monitoring following sand placement activity.

CHARACTERISTIC	PARAMETER	MEASUREMENT	VARIABLE
Nesting Success	False crawls - number	Visual assessment of all false crawls	Number and location of false crawls in nourished areas and non-nourished areas: any interaction of the turtle with obstructions, such as groins, seawalls, or scarps, should be noted.
	False crawl - type	Categorization of the stage at which nesting was abandoned	Number in each of the following categories: emergence-no digging, preliminary body pit, abandoned egg chamber.
	Nests	Number	The number of sea turtle nests in nourished and non-nourished areas should be noted. If possible, the location of all sea turtle nests shall be marked on a project map, and approximate distance to seawalls or scarps measured in meters. Any abnormal cavity morphologies should be reported as well as whether turtle touched groins, seawalls, or scarps during nest excavation.
		Lost Nests	The number of nests lost to inundation or erosion or the number with lost markers.
	Nests	Relocated Nests	The number of nests relocated and relocation area on a map of the areas. The number of successfully hatched eggs per relocated nest.
	Lighting Impacts	Disoriented sea turtles	The number of disoriented hatchlings and adults shall be documented and reported in accordance with existing FWC protocol for disorientation events.

A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Reasonable and Prudent Measures B11 and B12. These post construction requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

B3. For dredged material placement on the beach, sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, dredged material placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur from June 1 through September 30. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape Sand Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, sand placement may occur during the sea turtle nesting season (**Table 15 and Table 16**).

B4. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone, sand placement will be conducted at or below the +3-foot contour. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW. Material will not be stacked too high that the material is above the water during low tide.

B5. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone, sand placement will be conducted at or below the +3-foot contour.

B6. All derelict material or other debris shall be removed from the beach prior to any sand placement.

B7. The Corps shall continue to work with FDEP, FWC, and the Service to create a sea turtle friendly beach profile for placement of material during construction.

B8. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

B9. A meeting between representatives of the Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

B10. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

B11. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities. Not required for dredged material placement in the swash and littoral zone.

B12. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles. Not required for dredged material placement in the swash and littoral zone.

B13. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

B14. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

B15. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) between dusk and the time of completion of the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

B16. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

B17. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

B18. Existing vegetated habitat at beach access points and along shoreline travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access and travel corridors.

B19. Expanded or newly created beach access points shall be restored.

B20. A report describing the actions taken shall be submitted to the Service following completion of the proposed work for each year when the activity has occurred.

B21. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement of Corps civil works project shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Terms and Conditions B10 and B11. These post construction requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

All beaches

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

B3. Dredged material placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Dredged material placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

b. Dredged material placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in B3.c. below).

c. For higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur during the main part of the nesting season (June 1 through September 30). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties.

d. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone during the sea turtle nesting season (**Tables 15 and 16**), the Corps shall contact the Service for coordination.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

B4. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone, sand placement will be conducted at or below the +3-foot contour. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW. Material will not be stacked too high that the material is above the water during low tide and can obstruct the approach of nesting females to the beach.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season

(**Tables 15 and 16**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

B6. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-Federal projects and how the existing sand placement template may be modified.

B7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix C**). The Corps shall provide predator-proof trash receptacles for the construction workers. All workers shall be briefed on the importance of not littering and keeping the project area trash and debris free.

B8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

Sea Turtle Protection

B9. Daily early morning surveys for sea turtle nests shall be required as outlined in a through f. If nests are constructed in the area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation (**Tables 15 and 16**).

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during March 1 through April 30, daily early morning surveys shall be conducted for sea turtle nests until completion of the project (whichever is earliest), and eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through November 30, daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 30, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished area prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period from May 1 through October 31, daily early morning (before 9 a.m.) surveys shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in B9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by May 1 whichever is later. Nesting surveys shall continue through the end of the project or through September 1 whichever is earlier. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in B9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall not occur from June 1 through September 30, the period of peak sea turtle egg laying and egg hatching for this area. If nests laid between May 1 and May 31 in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii below.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15 whichever is later. Nesting surveys shall continue through the end of the project or through September 15 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in B9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by April 1 whichever is later. Nesting surveys shall continue through the end of the project or through September 30 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by April 15 whichever is later. Nesting surveys shall continue through the end of the project or through September 30 whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

B10. Sand compaction shall be monitored in the area of dredged material placement immediately after completion of the project and prior to the dates in **Table 18** for 3 subsequent years. Not required for dredged material placement in the swash and littoral zone.

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted to the appropriate Service Field Office (**Table 3**) prior to any tilling actions being taken. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act (http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 18**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

B11. Visual surveys for escarpments along the project area shall be made immediately after completion of the dredged material placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Tables 15 and 16** for 3 subsequent years if sand in the project area still remains on the dry beach. Not required for dredged material placement in the swash and littoral zone.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or FWC will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted to the appropriate Service Field Office (**Table 3**).

B12. If available, staging areas for construction equipment shall be located off the beach during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems.

B13. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (**Figure 15**).

B14. During the period during early (March 1 through April 30) and late (November 1 through November 30) nesting season for Brevard through Broward counties and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

<u>Beach Mouse Protection</u>

B15. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging, and beach travel corridors to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

B16. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

B17. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The topography at the access points shall be fully restored to preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

B18. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e*., native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least 1 inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

<u>Reporting</u>

B19. An excel sheet with the information listed in **Table 21** shall be submitted to the Service (**Table 3**) by July 31 of the year following construction. The excel sheet shall be available on the Service's website. A report with the information from Terms Conditions B9 and B10 shall be submitted to the Service by December 31 of the year following construction.

B20. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

C. Projects that include groin or jetty repair or replacement shall include the following measures:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall not occur during the period of peak sea turtle egg laying and egg hatching (May 1 through October 31), to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

C2. Maintenance of groin or jetty projects conducted during the early (February 1 through April 30) and late sea turtle nesting season (November 1 through November 30) shall adhere to the following conditions:

a. Install a barrier around the perimeter of the groin or jetty repair or replacement work area sufficient to prevent adult sea turtles from accessing the project site.

b. For projects conducted during the early and late sea turtle nesting season, construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

c. For projects conducted during the early and late sea turtle nesting season, no work may occur at night.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For maintenance of groin or jetty projects, conducted during the sea turtle nesting season.

a. Daily surveys shall be conducted by sea turtle permit holders. Nests laid adjacent to the work area shall be marked by flag and rope for avoidance.

b. A barrier shall be installed around the perimeter of the groin or jetty maintenance work area sufficient to prevent adult sea turtles from accessing the project site.

c. Construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles and beach mice to the maximum extent possible.

d. No work shall occur at night.

In All Counties:

C4. Safety lighting associated with the project shall be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles and nocturnal activities of beach mice.

C5. If entrapment of sea turtle hatchlings occurs in the groin or jetty system, the Corps shall meet with the Service to discuss a possible solution prior to the next nesting season.

C6. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service.

TERMS AND CONDITIONS for:

C. Projects that include groin or jetty repair or replacement shall include the following conditions:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall be started after October 31 and be completed before May 1.

C2. For groin or jetty repair or replacement projects conducted during the early (March 1 through April 30) and/or late (November 1 through November 30) sea turtle nesting season:

a. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at mean high water (MHW), as close to the groin or jetty as feasible, particularly during the period from sunset to sunrise.

b. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL shall be delineated. If the project is conducted during the early (March 1 through April 30) and/or late (November 1 through November 30) sea turtle nesting season, daily morning surveys shall be conducted within the travel corridor. If nests are laid within the travel corridor, the travel corridor must be re-routed to avoid the nest. If re-routing is not possible, these nests shall be relocated per the requirements listed in A9 (a)i through (a)iii.

c. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No construction shall be conducted at night.

e. Daily early morning surveys for sea turtle nests shall be required as outlined in e(i) and e (ii). All nests laid in the vicinity of the project area shall be marked for avoidance per the requirements specified below:

   i. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

   ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For groin or jetty repair or replacement projects conducted during the sea turtle nesting season:

a. Daily early morning surveys shall be conducted within the travel corridor.

b. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at MHW, as close to the groin or jetty as feasible during the period from sunset to sunrise.

c. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL will be delineated. Nests laid within the travel corridor that would impede traffic will be relocated per the requirements listed in A9(a)i through (a)iii.. Nests laid in adjacent areas will be marked and avoided per the requirements listed in C(2)(e) i through iii. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No nighttime construction may occur during the nesting season.

e. Material stockpiled on the beach shall only occur within the 200-foot barrier (100-foot area on either side). Construction activities shall not occur in any location prior to completion of the necessary sea turtle protection measures outlined below. If any nesting turtles are sighted on the beach, construction activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has marked the nest. All activities shall avoid the marked nest areas.

C4. All nests laid adjacent to the project area shall be marked for avoidance per the following requirements:

a. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

i.b. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In All Counties:

C5. To the maximum extent possible within the travel corridor, all ruts shall be filled or leveled to the natural beach profile prior to completion of daily construction.

C6. Exterior lighting shall not be permanently installed in association with the project. Temporary lighting of the construction area during the sea turtle nesting season shall be reduced to the minimum standard required by OSHA for general construction areas. Lighting on all equipment including offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for general construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (**Figure 15**).

C7. If entrapment of sea turtle hatchlings occurs in the groin or jetty system during construction, the Corps shall contact the Service immediately.

C8. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service (**Table 3**) by July 31 of the year following completion of the proposed work for each year when the activity has occurred. This report will include the following information:

Table 21. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and mark and avoid activities
	Nesting survey, mark and avoid activities, and nest relocation results

The Service believes that incidental take will be limited to the 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of sand on the of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. If public driving is allowed on the project beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require the local sponsor or Applicant to have authorization from the Service for incidental take of sea turtles, their nests, and hatchlings and beach mice, as appropriate, due to such driving or provide written documentation from the Service that no incidental take authorization is required. If required, the incidental take authorization for driving on the beach should be obtained prior to any subsequent sand placement events.

2. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties, construction activities for this

project and similar future projects should be planned to take place outside the main part of the sea turtle nesting and hatching season (May 1 through October 31).

3. Beach nourishment should not occur on publicly owned conservation lands during the sea turtle nesting season.

4. All created dunes should be planted with at least three species of appropriate native salt-resistant dune vegetation. Examples along the Atlantic coast include: bitter panicgrass, sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Northwest Florida coast includes: bitter panicgrass, little bluestem (*Schizachyrium scoparium),* sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Southwest Florida coast include: sea oats (grown from local genetic stock), bitter panicgrass, beach morning-glory, and railroad vine.

5. If the project area is within a local municipality that has not adopted a lighting ordinance, and lighting is shown to be an issue on a nourished beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require an ordinance be adopted prior to any subsequent sand placement event.

6. To increase public awareness about sea turtles and beach mice, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and beach mice.

7. If the Corps has the authority, we recommend it exercise its discretionary authority to require predator control programs (including education of pet owners and cat colony supporters) should be implemented that target free-roaming cats.

8. Dune walkovers should be installed at beach access points to protect the restored beach and dunes.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of formal consultation is also required ten years after the issuance of this SPBO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

The above findings and recommendations constitute the report of the Service. If you have any questions about this SPBO, please contact Ann Marie Lauritsen of this office at (904) 525-0661, Richard Zane of the Panama City Field Office at (850) 769-0552, or Jeffrey Howe of the South Florida Field Office at (772) 562-3909.

Service Log Number: 41910-2011-F-0170

Sincerely,

/s/

David L. Hankla
Field Supervisor

cc:
FWC, Tallahassee, Florida, (Robbin Trindell)
FWC, Panama City, Florida (John Himes)
FWC, Lake City, Florida (Terry Doonan)
FWC, Lake City, Florida (Melissa Tucker)
FWC, Lake City, Florida (Nancy Douglass)
Service, Panama City, Florida, (Patricia Kelly, Richard Zane, Ben Frater)Service, Vero Beach, Florida (Jeffrey Howe)
Service, Jacksonville, Florida (Sandy MacPherson)
Service, Atlanta RO digital version in Word (Ken Graham)
NMFS, Protected Species Division, St. Petersburg (Eric Hawk)

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Appendix A

PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR ALL PROJECTS THAT HAD ADVERSE IMPACTS TO THE SEA TURTLES ON THE NESTING BEACH

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
STATEWIDE	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Monroe, Miami-Dade, Collier, Lee, Charlotte, Sarasota, Manatee, Pinellas, Pasco, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia	FEMA Emergency Beach Berm Repair	2007-F-0430		Repair of 5-year beach berms post-disaster	75 miles
JAX FIELD OFFICE						
1991	Brevard	Lighting at Cape Canaveral Air Force and Patrick Air Force Station	4-1-91-028	Lighting at both installations	Sea turtle lighting	75 disoriented loggerhead nests; 2 green turtles nests at CCAFS and 2 loggerhead nests at PAFB
1993	Brevard	Beach nourishment on Cape Canaveral	4-1-93-073C		Beach nourishment	2 miles
1995	Brevard	Inlet Bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14	Inlet bypass	
1996	Brevard	Canaveral Port Authority Dredge and Beach Disposal		R-34 to R-38	Dredge and beach restoration	
1998	Brevard	Inlet bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14		
2000	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	00-0545	Lighting at both installations	Sea turtle lighting	2 percent hatchling and nesting female disorientations at each installation.
2001	Brevard	Brevard County Shore Protection Project (North Reach)		R-5 to R-12 and R-13 to R-54.5	Beach nourishment	9.4 miles
2001	Brevard	Patrick Air Force Base Beach Restoration		R-53 to R-70	Beach nourishment	
2002	Brevard	Brevard County Shore Protection Project		R-123.5 to R-139	Beach nourishment	3.02 miles

		(South Reach)				
2002	Brevard	Brevard County Shore Protection Project (North Reach)		R-4 to R-20	Beach nourishment	
2002	Brevard	Permanent Sand Tightening of North Jetty at Canaveral Harbor	02-1090	North jetty at Canaveral Inlet	Sand tightening and extension of existing jetty	500 feet
2003	Brevard	Brevard County Shore Protection Project (South Reach)		R-118.3 to R-123.5		0.94 mile
2004	Brevard	Canaveral Harbor Federal Sand Bypass and Beach Placement	04-0077	R-14 to R-20	Inlet bypass and beach nourishment	18,600 linear feet
2005	Brevard	Brevard County Shore Protection Project (North and South Reach)	05-0443	R-5 to R-20 and R-21 to R-54.5 and R-118 to R-139	Beach nourishment	13.2 miles
2005	Brevard	Brevard County FEMA Berm and Dune Restoration	05-1054	R-75 to R-118	Dune repair	12 miles
2005	Brevard	Patrick Air Force Base Beach Restoration	05-0258	R-54.5 to R-75.3	Beach nourishment	
2005	Brevard	Sloped Geotexile Revetment Armoring Structures	05-0454	5 tubes along north and south Melbourne beach	Protec tube installation	4,600 linear feet
2006	Brevard	Brevard County FEMA Berm and Dune Restoration	41910-2006-F-0189	R-75 to R-118	Dune repair	12 miles
2006	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	41910-2006-F-0841		Sea turtle lighting	3 percent hatchling and nesting female disorientations at each installation
15 Feb 2008	Brevard	Patrick Air Force Base Dune Restoration	41910-2008-F-0150	R-65 to R-70	Dune restoration	6,000 linear feet
25 Jan 2008	Brevard	Brevard County's Dune Restoration	41910-2008-F-0189	R-75 to R-118 and R-138 to R-202	Dune restoration	140,000 cy along 3,000 linear feet
2009	Brevard	Brevard County's Dune Restoration	41910-2009-F-0125	R 75.4 to R 118.3 and R-139 to R-213	Dune restoration	22 miles
2009	Brevard	Mid Reach		R-75 to R119	Beach berm repair (permanent)	40,748 linear feet
2009	Brevard	South Beach		R-139 to R-215	Beach berm repair (permanent)	70,385 linear feet
2009	Brevard	Patrick Air Force Base Dune Restoration and Beach Nourishment	41910-2009-F-0336	R-36 to R-75, R-53 to R-65	Sand placement	8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment.
2009	Brevard	Brevard Dune	41910-2009-F-0125	R-75.4 to R-118.3, R-139 to R-213	Dune restoration	Periodically on no more than 22 miles.

		Restoration				
2009	Brevard	Mid Reach Shore Protection	41910-2008-F-0547	R-119 to R-75.4	Sand placement	7.7 linear miles
2009	Brevard	Canaveral Harbor Sand Bypass	41910-2008-F-0547	Canaveral Harbor	Sand bypass	18,600 linear no more than every 2 years
2009	Brevard	Kennedy Space Center Lighting	41910-2009-F-0306			3% of all hatchling disorientation events
2009	Brevard	South Beach Renourishment	41910-2009-F-0327			7.8 miles
1991	Duval	Duval County Beach Erosion Control		R-44 to R-52.5	Beach nourishment	9,000 linear feet
1996	Duval	Duval County Beach Erosion Control		R-47 to R-80	Beach nourishment	5 miles
2003	Duval	Duval County Beach Erosion Control		R-72 to R-80	Beach nourishment	
2005	Duval	Duval County Beach Erosion Control	05-1544	R-43 to R-53 and R-57 to R-80	Beach nourishment	5.7 miles
2010	Duval	Duval County Hurricane and Storm Damage Reduction	2010-CPA-0045	V-501 to R-80	Beach nourishment	52,800 linear feet
2005	Flagler	Road Stabilization from SR A1A	41910-2006-IE-0173		Seawall	140 linear feet
2009	Flager	State Road (SR) A1A Shoreline Stabilization	41910-2007-F-0495	200 feet south of South 28th Street to 980 feet south of Osprey Point Drive	Sand placement, revetments, and seawalls	5.2 miles = length of take; 3,000 linear feet of anticipated incidental take
2005	Hillsborough	Egmont Key Nourishment	05-1845	R-2 to R-10	Beach nourishment	8,000 linear feet
1993	Manatee	Anna Maria Island Beach Restoration		R-2 to R-36	Beach nourishment	4.7 miles
1997	Manatee	Dredge Material Disposal and Longboat Key Beach Restoration		R-48 to R-51	Dredge and beach nourishment	
2002	Manatee	Anna Maria Island Beach Restoration		R-7 to R-10 and R-12 to R-36	Beach nourishment	5.2 miles
2005	Manatee	Anna Maria Island Shore Protection Project	41910-2006-F-0079	R-7 to R-10	Beach nourishment	3,000 linear feet
2005	Manatee	Anna Maria Island Emergency Beach Restoration	05-1227	R-2 to R-41	Beach nourishment	4.2 miles
2005	Manatee	Town of Longboat Key Beach Renourishment	4-1-04-TR-4529	R-44.5 to R-46	Beach nourishment	0.34 mile
2007	Manatee	Longboat Key Groin Installation	41910-2007-F-0521		Groin installation	2,210 linear feet
2009	Manatee	Anna Maria Island Beach Nourishment	41910-2008-F-456	R-7 to R-10, R-35 +790 feet and R-41 +365 feet	Sand placement	8,000 linear feet
2010	Manatee	Longboat Key North	41910-2010-F-0301			4,015 linear feet of beach

		End Nourishment				
1994	Nassau	South Amelia Island Beach Restoration		R-60 to R-78	Beach nourishment	
1997	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal		R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
2002	Nassau	South Amelia Island Beach Restoration		R-50 to R-80	Beach nourishment	3.4 miles
2002	Nassau	Fernandina Harbor Dredge and Beach Disposal		R-1 to R-9	Dredge and beach nourishment	8,000 linear feet
2004	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-9 to R-33	Beach nourishment	3.6 miles
2005	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-11 to R-34	Beach nourishment	4.3 miles
2005	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal	41910-2006-F-0254	R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
1988	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1990	Pinellas	Sand Key/Indian Rocks Beach Restoration		R-72 to R-85	Beach nourishment	
1991	Pinellas	Long Key Beach Restoration		R-144 to R-147	Beach nourishment	0.45 mile
1991	Pinellas	Johns Pass Dredge Material Disposal		R-127 to R-130	Dredge disposal and sand placement	
1992	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1992	Pinellas	Sand Key/Indian Shore Beach Restoration		R-85 to R-99	Beach nourishment	
1996	Pinellas	Treasure Island Beach Restoration		R-138 to R-142	Beach nourishment	2,500 linear feet
1996	Pinellas	Long Key Beach Restoration		R-144 to R-146	Beach nourishment	0.45 mile
1998	Pinellas	Sand Key/Belleair Beach Restoration		R-56 to R-66	Beach nourishment	
1999	Pinellas	Sand Key Beach Restoration		R-71 to R-107	Beach nourishment	
2000	Pinellas	Treasure Island Beach Restoration		R-136 to R-141	Beach nourishment	2.0 miles
2000	Pinellas	Terminal Groin at North End of Treasure Island			Groin construction	
2000	Pinellas	Long Key Beach Restoration		R-144 to R-145.6	Beach nourishment	2,800 linear feet
2000	Pinellas	Dredge Material Disposal and Honeymoon Island		R-10 to R-12	Dredge disposal and sand placement	

		Beach Restoration				
2004	Pinellas	Treasure Island Beach Restoration	04-1247	R-136 to R-141	Beach nourishment	5,000 feet
2004	Pinellas	Long Key Beach Restoration	04-1247	R-144 to R-148	Beach nourishment	4,000 linear feet
2005	Pinellas	Sand Key Emergency Renourishment	05-0627	R-56 to R-66 and R-72 to R-106	Beach nourishment	8.6 miles
2006	Pinellas	Treasure Island, Sunset, Long Key, Pass a Grill Emergency Renourishment	41910-2006-F-0480	R-126 to R-146	Beach nourishment	9.5 miles
2006	Pinellas	Dredge Material Disposal and Mullet Key and Fort DeSoto Beach Restoration	41910-2006-F-0692	R-177 to R-179.5 and R-181 to R-183	Dredge disposal and sand placement	4,500 linear feet
2009	Pinellas	Treasure Island Beach Nourishment	41910-2009-F-0250	R-136 to R-141, R-144 to R-148	Sand placement	11,375 linear feet
1997	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209		
2001	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D			
2002	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-137 to R-152	Beach nourishment	2.5 miles
2003	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-132 to R-152	Beach nourishment	3.8 miles
2003	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209	Beach nourishment	
2005	St. Johns	St. Johns County Shore Protection Project at St. Augustine	05-0446	R-137 to R-150	Beach nourishment	2.5 miles
2006	St. Johns		TE091980-0		Beach driving	41.1 linear miles
2007	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	41910-2007-F-0305	R-200 to R-208	Beach nourishment	4,000 linear feet
2009	St. Johns	Beach berm repair		R-201 to R-203, R-207 to R-208	Beach berm repair	7,000 linear feet
2009	St. Johns	Matanzas Inlet Maintenance Dredge and Summer Haven Sand Placement	41910-2009-F-0462	R-200 to R-208	Sand placement	8,000 linear feet

2009	St. Johns	St. Augustine Shore Protection Project	41910-2009-F-0444	600 feet north of R-137 and 600 feet south of R-151	Sand placement	15,280 linear feet
2010	St. Johns	St. Augustine Inlet Dredge and Sand Placement	41910-2010-F-0105			20,000 linear feet
2004	Volusia	Volusia County FEMA Berm	05-1074	R-40 to R-145 and R-161 to R-208	Beach nourishment	
2005	Volusia	Ponce de Leon Dredge and Beach Placement	05-0884	R-143 to R-145	Dredge and sand placement	3,000 linear feet
2005	Volusia		TE811813-11		Beach driving	50 miles
2006	Volusia	New Smyrna/Silver Sands Dune Restoration	05-1007	R-161 to R-175	Beach restoration	5.4 miles
2006	Volusia	Volusia County FEMA Berm	41910-2006-F-0831		Repair of right of way and beach placement	230 linear feet
2007	Volusia	Ponce de Leon Dredge and Beach Placement	41910-2007-F-0109	R-158 to R-175	Dredge and sand placement	3.2 miles
2009	Volusia	Ponce de Leon Inlet Maintenance Dredging and Sand Placement	41910-2009-F-0362	R-143 to R-145	Sand placement	8,000 linear feet
PANAMA CITY FIELD OFFICE						
8 April 1998	Bay	Panama City Beach Beach Nourishment	4-P-97-108	R-4.4 and R-93.2	Beach nourishment new project	16 miles
24 June 1998	Bay	Tyndall AFB Driving on the Beach	4-P-98-020	V-9 (virtual) to R-122	Driving on the beach for military missions	18 miles
31 July 1998	Bay	Lake Powell Emergency Opening	4-P-97-089	R- 0.5	Emergency outlet opening	1,500 feet
16 April 1999	Bay	Panama City Beach Beach Nourishment Amendment 1	4-P-97-108	R-0.5 to R-9	Beach nourishment completion	16 miles (no additional take provided from original)
9 March 2000	Bay	Panama City Beach Beach Nourishment Amendment 2	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
10 April 2000	Bay	Panama City Beach Beach Nourishment Amendment 3	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
18 December 2000	Bay	Panama City Beach Beach Nourishment Amendment 4	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement and compaction testing sample numbers beach nourishment	16 miles (no additional take provided from original)
4 January 2001	Bay	East Pass Re-Opening	4-P-00-211	No R-monuments	Dredging of a closed inlet and dredged material placement on beach	2 miles

29 March 2001	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement beach nourishment	16 miles (no additional take provided from original)
7 Sept 2001	Bay	City of Mexico Beach Sand Bypass System	4-P-01-178	Mexico Beach canal	Dredging and spoil disposal	3,700 feet 2.0 acres
14 January 2005	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-4.4 and R-93.2	Post hurricane restoration	16 miles (no additional take provided from original)
2006	Bay	Tyndall Air Force Base INRMP	4-P-05-240	V-9 (virtual) to R-122	Integrated Natural Resources Management Plan	18 miles
26 March 2006	Bay	Mexico Beach Canal Sand By Pass Amendment 1	4-P-05-281 2007-F-0205	R-127 to R-129	By pass system improvements	5,000 feet
24 May 2007	Bay	Panama City Beach Beach Nourishment Amendment 6	4-P-97-108 2007-TA-0127	R-4.5 to R-30 and R-76 to R-88	New work and post hurricane restoration	31,500 feet of 16 miles total no additional take provided
25 October 2007	Bay	Panama City Beach Nourishment Amendment 8	2008-F-0004	2008 project: R-74 to R-91; Entire project: R-0.5 to R-91	Beach nourishment	17.9 miles
29 Feb 2008	Bay	Panama City Harbor (revised BO)	2008-F-0168	R-97	Navigation channel maintenance dredging and beach placement of dredged material.	500 ft of beachfront at St. Andrew State Park
8 June 2009	Bay	Panama City Harbor Navigation Channel Amendment 1	2009-F-0175	R-92 to R-97	Maintenance navigation channel dredging and dredged material placement	0.85 mile
2009	Bay	City of Mexico Beach		R-128.5 to R-138.2	Beach berm repair (emergency)	9,393 linear feet
06 Jan 2010	Bay	Lake Powell Outlet Emergency Opening	2009-F-0226	R-0-A and R-1	Emergency opening of the outlet to the Gulf of Mexico	2,400 feet
7 August 2000	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin	Destin Dome OCS Offshore Oil and Gas Drilling	4-P-00-003	Gulf of Mexico federal waters	Oil and gas offshore exploration	Formal consultation with no take
3 June 2002	Escambia	Pensacola Beach Beach Nourishment	4-P-02-056	R-108 to R-143	Beach nourishment	8.3 miles Loggerhead 14 nests Green 1 nest Leatherback < 1 nest Kemp's ridley <1 nest
9 June 2009	Escambia	Perdido Key Beach Nourishment	2008-F-0059	R-1 to R-34	New beach nourishment	6.5 miles
9 Sept 2010	Escambia	Pensacola Navigation Channel	2009-F-0205; using statewide programmatic 41910-2010-F-0547	R-32 to R-64	Navigation channel maintenance and dredge material disposal	6.3 miles

11 Jan 2010	Escambia	FEMA Perdido Key Upland Berm	Using statewide programmatic 41910-2010-F-0547	R-21.5 to R-31.5	Post Tropical Storm Gustav berm	2.0 miles
8 April 2005	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf	FEMA Beach Berms Post Hurricane Ivan Emergency Coordination (consultation incomplete)		UK	Emergency beach berms	Walton 20 miles Okaloosa 4.2 miles Mexico Bch 1 mile Panama City Bch UK St Joseph peninsula UK Perdido Key UK Navarre UK
10 May 2004	Franklin	Alligator Point Beach Nourishment	4-P-02-163	R-207 to R-210	Beach nourishment	2,500 feet Loggerhead,: 2 nests, green 1 nest; leatherback 1 nest
17 May 2007	Gulf	St. Joseph Peninsula Beach Nourishment	4-P-07-056 2007-F-0220	R-67 to R-105.5	Beach nourishment	7.5 miles
31 Jan 2008	Gulf	St. Joseph Peninsula Beach Nourishment; Amendment 2	2008-F-0161	R-67 to R-105.5	Beach nourishment – change from work in 2 to 1 season.	7.5 miles; no increase in IT.
2009	Gulf	St. Joseph Peninsula Beach		R-95.3 to R-105.5	Beach berm repair (emergency)	10,300 linear feet
25 April 2001	Okaloosa	Eglin AFB Porous Groin within Season	4-P-00-207	Eglin AFB Test Sites 1 and 3	Experimental porous groin system	
18 June 2002	Okaloosa	Eglin 737 Sensor Test Site 13-A SRI	4-P-02-088	V-507	Military testing	0.01 acre 0.12 mile
2009	Okaloosa	City of Destin		R-17.37 to R-19	Beach berm repair (emergency)	1,260 linear feet
23 Dec 2009	Okaloosa	East Pass at Destin Navigation Channel	2009-F-0096	R-17 to R-25.5	Navigational channel maintenance	1.7 miles
21 March 2003	Okaloosa Santa Rosa	Eglin Marine Expeditionary Unit Training	4-P-03-052	V-621 to V-501	Military marine training	
9 October 2003	Okaloosa Santa Rosa	Eglin AFB U.S. Army Ranger Los Banos	4-P-03-289	V-502 to V-533	Military army training	7 miles
25 February 2004	Okaloosa, Santa Rosa	Eglin AFB Advance Skills Training	4-P-03-264	R-502 to R-534	Military training	7 miles 70 acres
4 June 2004	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	4-P-04-225	V-501 to V-514	Military naval testing	0.5 mile 15.2 acres
1 December 2005	Okaloosa Santa Rosa	Eglin Air Force Base Military Mission & Training Santa Rosa Island Programmatic	4-P-05-242	V-621 to V-501	Military missions	17 miles
6 December 2007	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	2008-F-0056	V-501 to V-514 Test Site A-15	Military naval testing	0.7 acre
3 June 2008	Okaloosa Santa Rosa	Eglin AFB Beach and Dune Restoration	2008-F-0139	V-551 to V-609 excluding non-AF lands and V-512 to	Beach nourishment including dune	5.0 miles

				V-518	restoration (new)	
28 August 2008	Okaloosa, Santa Rosa	Eglin Air Force Base Armoring Santa Rosa Island Test Sites A-3, A-6, A-13B	2008-F-061	Test Sites A-3, A-6, A-13B	Storm protection at air force facilities, Santa Rosa island	0.57 miles
21 April 2009	Okaloosa, Santa Rosa	East Pass Destin Navigation Channel	2009-F-0295	V-619.5 to V-621 and R-17	Maintenance navigation channel dredging and dredged material placement	1.6 miles
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base protection of Test Sites A-3, A-13, and A-13b	2008-F-061 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base	2008-F-039 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
26 March 2002	Santa Rosa, Okaloosa, Gulf	Eglin AFB INRMP		V-621 to V-501	Integrated natural resources management program	17 miles
19 July 2005	Santa Rosa	Navarre Beach Nourishment Emergency Coordination (consultation incomplete)	4-P-04-244	R-192.5 to R-213.5	Emergency beach nourishment	4.1 miles
24 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
30 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
29 Nov 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
28 August 2008	Santa Rosa	Eglin AFB SRI Armoring at Test Sites	2008-F-0061	V-608, V-551, and V-512	Bulkheads around test sites A-3, A-6, and A-13B	0.57 mile
7 Dec 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with	4.1 miles (no additional take provided from original)

					beach nourishment	
9 October 2009	Santa Rosa	Navarre Beach Restoration Amendment 7	2010-F-0036	R-192 to R-194	Emergency beach restoration	1,800 feet
30 April 2004	Walton, Okaloosa	Walton County-Destin Beach Nourishment	4-P-01-149	R-39 (Okaloosa Co.) to R-21.93 (Walton Co.)	New beach nourishment	6.7 miles Loggerhead: 11 nests; green 1 nests; leatherback & Kemp's ridley: < 1 nests
8 May 2006	Walton	Western Lake Emergency Opening	4-P-01-105	R-72 to R-73	Emergency outlet opening	0.5 miles 3.0 acres
26 October 2007	Walton	Eastern Lake Emergency Opening	2007-F-0627	R-94 to R-95	Emergency opening of coastal dune lake to GOM	0.5 mile
9 November 2007	Walton	Alligator Lake Emergency Opening	2007-F-0031	R-68 to R-70	Emergency opening of coastal dune lake to GOM	0.5 mile
2 October 2008	Walton	Walton County Beach Nourishment Phase 2	2008-F-060	R-41 to R-67, R-78 to R-98, R-105.5 to R-127	Beach nourishment (new)	13.5 miles
SOUTH FLORIDA FIELD OFFICE						3,390 feet
11 March 2003	Broward	Broward County Shore Protection Project	4-1-99-F-506		Port Everglades dredging and beach nourishment	
4 Dec 2003	Broward	Diplomat Beach Nourishment	4-1-00-F-743		Nourishment and 200 feet of riprap	
25 Aug 2004	Broward	Fishermen's Pier	4-1-04-F-8366		Pier repair	14,910 square feet
18 June 2007	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	315 feet of the Inlet and 500 feet of shoreline at R-25.	Inlet dredging and sand nourishment	500 feet
10 Dec 2007	Broward	Town of Hillsboro Beach Pressure Equalizing Modules (PEMs) Pilot Project	41420-2007-F-0859	300 feet north of R-7 to 100 feet south of R-12 1 mile of shoreline	Pilot project to investigate the effectiveness of the PEMs	1 mile
7 Mar 2008	Broward	Broward County Glass Cullet Pilot Project	41420-2007-FA-0599	Centered at R-103	Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement material for shoreline stabilization.	333 feet
28 April 2008	Broward	Town of Hillsboro Truck Haul Beach Nourishment Project	41420-2008-FA-0187	330 feet north and 100 feet south of R-7	Temporary beach nourishment	0.08 mile (430 feet)

3 Sept 2008	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	500 feet south of R-25	Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 18 June 2007.	500 feet
28 May 2010	Broward	Port Everglades Jetty Repair	41420-2010-CPA-0144	South Jetty	Repair of the south jetty.	0.15 mile
18 June 2010	Broward	Hillsboro Beach Sand Placement	41420-2008-FA-0187	R-5 +300 to R-12 +450 feet	Beach nourishment	1.35 miles
23 March 2005	Charlotte	Manasota Key Groin Construction	4-1-04-F-8338	R-19 to R-20	Stump Pass dredging (material placed on beach); and groin construction	1,000 feet
29 March 2006	Charlotte	Stump Pass Dredging and Beach Nourishment	4-1-04-F-8338	R-16.5 to R-18	Stump Pass dredging and beach nourishment	1,500 feet
26 April 2010	Charlotte	Stump Pass Dredging and Sand Placement	41420-2008-FA-0425	R-14.4 to R-20 R-22 to R-23 R-29 to R-39	Stump Pass dredging and sand placement	3.5 miles
3 April 2003	Collier	Keewaydin Island Limited Partnership T-Groin Project	4-02-F-1099	R-90 to R-91	Gordon Pass – maintenance dredge; nourish the section of beach where groins are to be constructed; construct three t-groins	1,000 feet
14 March 2005	Collier	Hideaway Beach	4-1-04-F-6342	H-1 to H-5 and H-9 to H-12	Beach nourishment and t-groin construction	1.4 miles
20 Sept 2005	Collier	Collier County Beach Re-Nourishment Project	4-1-04-TR-8709	Segments within R-22 and R-79	Beach nourishment	13.4 miles
14 Nov 2005	Collier	South Marco Island Beach Re-Nourishment	4-1-04-TR-11752	R-144 to G-2	Beach nourishment	0.83 mile
28 August 2008	Collier	Doctor's Pass North Jetty Repair	41420-2008-FA-0432	R-57 plus 500 feet south	Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the same footprint.	0.25 mile
27 October 2009	Collier	Hideaway Beach Erosion Control	41420-2008-FA-0935	H-4 to H-9	Sand placement and construction of six T-head groins.	0.47 mile
18 August 2010	Collier	Gordon Pass Erosion Control Project – Phase 2 (T-head groins)	41420-2008-FA-0765	R-91 to R-92	Construction of two T-head groins.	0.19 mile

28 Oct 2010	Collier	Collier County Truck Haul Sand Placement (Park Shore & Naples Beach)	41420-2010-F-0225	R-45 +600 feet to R-46 +400 feet; R-58A -500 feet to R-58	A truck haul sand placement project	0.37 mile
12 Oct 2004	Indian River	Issuance of Permits to Homeowners for Emergency Coastal Armoring	10(a)(1)(B) permit			3,196 feet
28 Feb 2005	Indian River	Indian River County Beach Nourishment - Sectors 3 and 5	4-1-05-F-10922	Gaps between R-21 and R-107	Dune restoration and beach nourishment	5.90 miles dunes 0.8 mile beach
22 Nov 2005	Indian River	Indian River County Beach Nourishment – Sector 7	4-1-05-TR-9179	R-97 to R-108	Beach nourishment	2.2 miles
31 Oct 2006	Indian River	Indian River County Beach Nourishment – Sectors 1 and 2	41420-2006-FA-1491	R-3.5 to R-12	Dune enhancement and beach nourishment	1.62 miles
10 Sept 2007	Indian River	Sebastian Inlet Channel and Sand Trap Dredging, Sectors 1 and 2 Beach Nourishment	41420-2007-F-0864	R-3 to R-12	Sand trap dredging and beach nourishment	1.61 miles
10 October 2008	Indian River	Baytree and Marbrisa Condominium Dune Restoration	41420-2008-FA-0007	200 feet south of R-46 to 200 feet south of R-48	Dune restoration/enhancement	0.38 mile
16 October 2009	Indian River	City of Vero Beach, Outfall Pipe Installation	41420-2009-FA-0255	220 feet north and 930 feet south of R-83	Outfall pipe installation	0.22 mile
2 December 2009	Indian River	Indian River County Beach Nourishment Sector 3	41420-2007-F-0839	Phase 1 = R-32 to R-55 Phase 2 = R-20 to R-32	Beach and dune nourishment	Phase 1 = ~4.4 miles Phase 2 = ~2.3 miles
24 July 2002	Lee	Gasparilla Island Beach Nourishment	4-01-F-765	R-10 to R-26.5 R-25, R-25.5, R-26	Beach nourishment; breakwater construction; and two t-head groins	3.2 miles
19 June 2003	Lee	Bonita Beach Re-nourishment	4-1-02-F-1736		Beach nourishment	3,922 feet
4 March 2005	Lee	Sanibel and Captiva Island Beach Nourishment	4-1-04-F-9180	R-83 to R-109 and R-110 to R-118	Beach nourishment	6.0 miles
14 March 2007	Lee	Gasparilla Island Beach Nourishment (BO amendment)	41420-2007-FA-0509	South of R-26A	Beach nourishment	
27 August 2007	Lee	North Captiva Island Beach Nourishment	41420-2007-FA-1023	R-81 and 208 feet south of R-81A	Beach nourishment	0.23 mile
5 August 2009	Lee	Matanzas Pass Reopening	41420-2009-FA-0132	North end of Estero Island	Channel dredging	0.14 mile
21 March 2008	Lee	Blind Pass Reopening	41420-2006-FA-1549	R-109 to R-114	Reopening Blind Pass and then	0.95 mile

					nourishing the shoreline between R-112 and R-114.	
7 Dec 2009	Lee	Sanibel Island Sand Placement	41420-2009-FA-0066	R-174A to Bay 1A	Beach nourishment	0.25 mile
15 Sept 2010	Lee	Big Hickory Island Sand Placement and Groin Construction	41420-2010-CPA-0100	R-222.3 to R-223.8	Beach nourishment and groin construction	0.47 mile
31 Jan 2002	Martin	Jupiter Island	4-1-05-TR-13281	R-75 to R-117	Beach nourishment	6.5 miles
5 Jan 2005	Martin	Martin County Shore Protection Project	4-1-05-F-10476	R-1 to R-25.6	Beach nourishment	4.1 miles
2 Dec 2005	Martin	Jupiter Island Modification	4-1-05-TR-13281	R-76 to R-84 and R-87 to R-11	Beach nourishment	5 miles
2 Feb 2007	Martin	Sailfish Point Marina Channel Dredging and Beach Nourishment	41420-2007-FA-0196	R-36 to R-39	Channel dredging and beach nourishment	0.66 mile
6 October 2009	Martin	Bathtub Beach Park Sand Placement	41420-2009-FA-0110	R-34.5 to R-36	Beach nourishment	0.24 mile
8 June 2010	Martin	Martin County Beach Erosion Control Project	41420-2009-FA-0190	R-1 to R-25	Beach nourishment	~ 4 miles
23 Sept 2005	Miami-Dade	Bal-Harbour T-Groin Reconstruction	4-1-05-12842	R-27 to R-31.5	Groin removal and reconstruction	0.85 mile
11 Oct 2005	Miami-Dade	Bakers Haulover AIW Maintenance Dredging	4-1-04-TR-8700	R-28 to R-32	Dredging and beach nourishment	0.85 mile
7 June 2006	Miami-Dade	Miami-Dade Beach Nourishment	41420-2006-FA-0028	3 segments within R-48.7 and R-61	Beach nourishment	3,716 feet
25 July 2007	Miami-Dade	Miami Beach Nourishment	41420-2006-F-0028	R-67 to R-70	BO modification to June 7, 2006 BO	3,000 feet
5 Nov 2008	Miami-Dade	Baker's Haulover Dredging and Sand Placement	41420-2008-FA-0729	R-28 to R-32	BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual.	4,000 feet
12 Nov 2008	Miami-Dade	DERM Truck Haul Sand Placement	41420-2008-FA-0776	R-27 to R-29 R-7 to R-12 R-43 to R-44+500 feet	Beach nourishment	1.78 miles
25 Nov 2009	Miami-Dade	DERM 27th Street Sand Placement	41420-2009-FA-0045	R-60 to R-61	Beach nourishment	0.19 mile
17 Dec 2009	Miami-Dade	32nd and 63rd Streets Sand Placement	41420-2009-FA-0415	R-37.75 to R-46.25 R-53.7 to R-55.5 R-60 to R-61	Sand placement	2.14 miles
31 March 2010	Miami-Dade	55th Street Sand Placement	41420-2009-FA-0046	R-48.7 to R-50.7	Sand placement	0.38 mile
30 April 2010	Miami-Dade	44th Street Sand Placement	41420-2009-FA-0047	R-53.7 to R-55.5	Sand placement	0.34 mile
25 June 2010	Miami-Dade	Bal Harbour Sand	41420-2009-FA-	R-29 to R-32	Sand Placement –	0.60 mile

		Placement	0593		truck haul	
28 June 2010	Miami-Dade	Sunny Isles BeachSand Placement	41420-2009-FA-0594	R-12 to R-15)	Sand Placement – truck haul	0.58 mile
30 July 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0595	R-45 to R-48 +700 feet	Sand Placement – truck haul	0.78 mile
13 Sept 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0527	R-43 to R-44 + 500 feet	Sand Placement – truck haul	0.26 mile
8 October 2010	Miami-Dade	Sunny Isles Beach Sand Placement	41420-2009-FA-0526	R-7 to R-12	Sand Placement – truck haul	0.95 mile
8 October 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0525	R-27 to R-29	Sand Placement – truck haul	0.38 mile
2009	Monroe	Reclaimed sand placement and sand cleaning (seaweed removal)	41420-2010-F-0006	No R-monuments	Sand placement and cleaning	1,462 linear feet
2009	Monroe	City of Key West (South Beach)	41420-2010-F-0013	No R-monuments	Beach repair (emergency)	235 linear feet
2009	Monroe	City of Key West (Rest Beach)	41420-2010-F-0014	No R-monuments	Beach repair (emergency)	640 linear feet
2009	Monroe	City of Marathon, Sombrero Beach	41420-2010-F-0001	No R-monuments	Beach repair (emergency)	1,380 linear feet
5 March 2010	Monroe	City of Key West – Simonton Beach	41420-2010-FC-0412	Approximately 350 feet ENE of V-416 (latitude 24.562, longitude -81.8054	Emergency beach repair	95 linear feet
5 March 2010	Monroe	City of Key West – Dog Beach	41420-2010-FC-0413	Between V-414 and V-413 (latitude 24.5473, longitude -81.7929	Emergency beach repair	35 linear feet
13 May 2010	Monroe	City of Key West, Smathers Beach	41420-2008-FA-0185	No R-monuments	Sand placement	0.57 mile
27 March 2003	Palm Beach	Palm Beach Harbor M & O	4-1-03-F-139	200 feet south of the south jetty	Jetty sand tightening	200 feet
16 March 2004	Palm Beach	Boca Raton Inlet Sand Bypassing	4-1-04-F-4688	200 feet south of R-223	Inlet sand bypassing and beach nourishment	500 feet
11 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Delray Segment	4-1-05-F-10767	R-175 to R-188	Beach restoration	2.7 miles
24 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Ocean Ridge Section	4-1-05-F-10787	R-153 to R-159	Beach nourishment	1.12 miles
11 April 2005	Palm Beach	South Lake Worth Inlet Sand Transfer Plant Reconstruction and Bypassing	4-1-04-F-8640	135 feet south of R-151, to 275 feet south of R-152	STP reconstruction and bypassing	900 feet
5 Dec 2005	Palm Beach	Mid-Town Beach Nourishment Project (Reach 3 & 4)	4-1-00-F-742	R-90.4 to R-101.4	Beach nourishment	2.4 miles

23 Dec 2005	Palm Beach	Palm Beach Harbor M & O	4-1-05-TR-13258	R-76 to R-79	Dredging and beach nourishment	3,450 feet
23 Feb 2006	Palm Beach	Boca Raton Central Beach Nourishment Project	4-1-01-F-1795	R-216 to R-222	Dredge shoal fronting Boca Raton Inlet and beach nourishment	1.3 miles
23 Feb 2006	Palm Beach	Boca Raton South Beach Nourishment Project	41420-2008-FA-0777 Old database number 41-01-F-652	R-223.3 to R-227.9	Dredge shoal fronting Boca Raton Inlet and beach nourishment	Approx. 1 mile
28 April 2006	Palm Beach	Palm Beach Nourishment Project – Reach 8	41420-2006-F-0018	R-125 to R-134	Beach nourishment	2.17 miles
31 July 2006	Palm Beach	Sea Dunes Condominium Seawall	41420-2006-FA-1108		Seawall construction	0.03 acre
15 Dec 2006	Palm Beach	North Ocean Boulevard Rock Revetment	41420-2006-FA-1490	290 feet north of R-84; 1,150 feet south of R-85	Rock revetment construction	0.34 mile
5 Feb 2007	Palm Beach	Palm Beach Sand Transfer Plant Reconstruction	41420-2006-FA-1447	R-76 to R-79	Sand transfer plant reconstruction and discharge pipe extension	0.57 mile
28 March 2007	Palm Beach	Lake Worth Inlet Jetty Repair	41420-2007-FA-0221	200 feet north of R-75 and 200 feet south of R-76	Jetty repair	400 feet
25 May 2007	Palm Beach	Singer Island and South Palm Beach Emergency Dune Restoration	41420-2007-FA-1001	385' south of R-137 to 500' north of R-136; 500'south of R-60 to 850' south of R-65	Dune Restoration	6,135 feet
25 May 2007	Palm Beach	Jupiter Island ICWW Maintenance Dredging and Beach Nourishment	41420-2006-FA-1582	16,000 feet (130,000 cy) of the ICWW dredged; material placed between R-13 and R-19.	Channel dredging and beach nourishment	1.04 miles
20 July 2007	Palm Beach	North Boca Raton Beach Nourishment	41420-2007-FA-0477	T-205 to 181 feet south of R-212	Beach nourishment	1.45 miles
9 Nov 2007	Palm Beach	Jupiter Inlet and channel dredging	41420-2006-FA-1582	R-13 to R-17	Dune restoration	~ 4,000 linear feet
14 Nov 2007	Palm Beach	Jupiter Inlet Sand Trap Dredging and Sand Placement	41420-2007-FA-0600	Maintenance dredging of the inlet; beach compatible placed R-13 to R-19	Inlet dredging and beach nourishment	1.02 miles
28 Nov 2007	Palm Beach	Modification to a Sheet Pile and Rubble-Mound T-Head Groin System	41420-2007-FA-0574	500 feet north of R-94 south to R-95	T-groin repair, extension, construction	0.4 mile
5 Feb 2008	Palm Beach	Reach 8 Dune Restoration	41420-2006-F-0018	R-125 to 350 feet south of R-134	Dune restoration	2.17 miles
9 Sept 2008	Palm Beach	Juno Beach Sand Placement	41420-2008-FA-0081	R-26 to R-38	Sand placement	2.45 miles
4 Nov 2008	Palm Beach	Palm Beach Harbor M&O and Sand	41420-2008-FA-0524	R-76 to R-79	Biannual Inlet dredging and sand	3,450 feet

		Placement			placement events.	
2009	Palm Beach	Beach berm repair	41420-2010-F-0008	R-60 to R-68	Beach berm repair (permanent work)	6,880 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0009	R-135 to R-138	Beach berm repair (permanent work)	3,590 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F0010	R-137 to R-138	Beach berm repair (emergency)	125 linear feet
21 June 2010	Palm Beach	Mid-Town Reaches 3 & 4 Sand Placement	41420-2006-F-0011-R001	R-95 to R-100	Beach nourishment	0.95 mile
2 July 2010	Palm Beach	Phipps Ocean Park Reaches 7&8	41420-2010-CPA-0110	R-116 to R-125	Sand Placement	3.4 miles
3 Sept 2010	Palm Beach	Singer Island Breakwater	41420-2008-FA-0019	R-60.5 to R-66	Segmented, submerged breakwater	1.1 miles
19 June 2003	St. Lucie	Fort Pierce Shoreline Protection	4-1-03-F-1867 41420-2006-FA-1575	R-33.8 to R-41	Beach nourishment; berm expansion; and six t-head groins	1.3 miles
9 March 2006	St. Lucie	Blind Creek Restoration and South St. Lucie Emergency Berm Remediation Project	41420-2006-FA-0075	R-98 to R-115 R-88 to R-90	Wetland restoration and beach nourishment	3.6 miles
27 June 2008	St. Lucie	Fort Pierce Shoreline Protection Project	41420-2006-FA-1575	R-34 to R-41	Beach nourishment, berm expansion, and six t-head groins	1.3 miles
25 Aug 2004	Sarasota and Manatee	Longboat Key Beach Nourishment	4-1-04-F-4529	R-46A to R-29.5	Beach nourishment	9.45 miles
4 Oct 2005	Sarasota and Manatee	Longboat Key Beach Nourishment Project – BO Amendment	4-1-04-TR-4529	R-44 to R-44.5 and R-46A to R-44.5	Beach nourishment	0.47 mile
20 Oct 2005	Sarasota	South Siesta Key	4-1-05-TR-12691	R-67 to R-77 plus 200 feet	Beach nourishment	2.1 miles
7 Dec 2007 (original BO) 28 July 08 (BO mod)	Sarasota	Lido Key Beach Fill Placement Project	41420-2007-F-0841	R-35.5 to R-44.2 2.27 miles	Beach nourishment with 425,000 cy of fill material.	2.27 miles
13 August 2008	Sarasota	Longboat Key Permeable Adjustable Groins	41420-2007-FA-0205	R-13 to R-13.5	Construction of two permeable adjustable groins.	0.09 mile project area 0.43 mile action area
2009	Sarasota		41420-2010-F-0003	R-77 to midpoint between R-77 and R-76	Beach restoration	700 linear feet
2009	Sarasota	Longboat Key Beach	41420-2010-F-0007	R-13 to R-14 Sarasota County; R-44 to R-5, and R-48.5 to R-49.5 Manatee County	Beach berm repair	951, 1,197, and 1,142 linear feet, respectively

Appendix B

FWC FISH AND WILDLIFE RESEARCH INSTITUTE STATEWIDE NESTING BEACH SURVEY PROTOCOL

1. **Survey Period:** There is no set period for Statewide nesting beach surveys, but ideally, all nesting activity is encompassed. Beaches with leatherback nesting usually begin by 1 March.

2. **Survey Time:** Surveys must be conducted in the early morning hours, preferably beginning at dawn in order to optimize crawl interpretation.

3. **Survey Frequency:** Most Statewide nesting beach surveys are conducted seven days a week, but some beaches, particularly remote ones, are surveyed on a less frequent basis.
Ideally, survey frequency should remain constant. All crawls should be marked or "erased" daily to avoid duplicate counts on subsequent survey days. If surveys are not conducted seven days/wk, only emergences made during the preceding 24 hours should be counted on a survey day.

4. **Survey Boundaries:** Survey boundaries should remain the same from year to year. If changes are necessary, please contact FWC well before the nesting season begins.
Boundaries should be permanent physical features.

5. **Crawl Identification:** All fresh crawls are identified to species and as either nests or false crawls based on observable crawl characteristics.

6. **Crawl Verification:** When a crawl does not have characteristics clearly indicating whether it is a nest or a false crawl, surveyors may dig with their hands at the probable location of the eggs to find the soft sand directly above the eggs. Digging should be a rare event. Probing for eggs is not permitted nor is the use of shovels.

7. **Data Reporting:** Data are reported on annual report forms supplied by FWC. The deadline for filing this report is 30 November.

8. **Significant Events:** If significant events occur that may affect turtles or their nests, please let FWC know about them. Significant events include habitat alterations such as beach nourishment, the placement of armoring or beach-access ramps, or erosion due to storms. Indicate date(s) and type of event in the comments section of the data form.

9. **Assistance:** Should questions arise or problems occur, contact Beth Brost at 1-727-896-8626, extension 1914, Fax 727-896-9176.

Appendix C

ASSESSMENTS: DISCERNING PROBLEMS CAUSED BY ARTIFICIAL LIGHTING

LIGHTING INSPECTIONS

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This “urban skyglow” is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach. Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaries need what remedy.

NIGHTTIME INSPECTIONS

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; Appendix A), style of fixture (Appendix E), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated

and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Appendix D

EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960
May 22, 2013

Eric P. Summa
Chief, Environmental Branch (PD-E)
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Summa:

This document transmits the U.S. Fish and Wildlife Service's (Service) Programmatic Piping Plover Biological Opinion (P^3BO) for the effects of U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities on the non-breeding piping plover (*Charadrius melodus*) and its designated Critical Habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The current status of the federally listed piping plover is threatened, and the Service designated Critical Habitat for wintering piping plovers on July 10, 2001. This P^3BO is for the North Florida Ecological Services Office (NFESO) and the South Florida Ecological Services Office (SFESO) areas of responsibility (AORs). You requested formal consultation by letter of May 7, 2013.

This P^3BO is based on the information provided in the Corps May 7, 2013, letter, the Statewide Programmatic Biological Assessment of February 17, 2011, subsequent meetings between Corps and Service personnel, and other sources of information. We have assigned Consultation Code 04EF1000-2013-F-0124 to this consultation. A complete administrative record of this consultation is on file at the NFESO. Each project proposing to utilize this P^3BO will undergo an evaluation process by the Corps to determine if it properly fits within this programmatic approach. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the P^3BO are applicable to the project, the Service will concur within 30 days and it will be covered by this programmatic consultation. The Corps will consult separately on individual projects that do not fit within this programmatic approach unless the Service grants an exception in accordance with the Incidental Take Statement in the P^3BO.

This consultation includes the following proposed activities conducted in the AORs of the NFESO and the SFESO:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management (BOEM);
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

For Civil Works activities, the Corps specified during the consultation process that "fish and wildlife enhancement" activities beyond mitigation of project impacts must be authorized as a project purpose, be authorized as a project feature, or be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 June 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority [ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)], the Corps does not expect to receive authorization and funding for it. However, the Corps proposes to implement the following Conservation Measures to reduce impacts on piping plovers for all projects (those in both non-optimal and optimal piping plover habitat) included in this consultation with the potential to affect piping plovers or their critical habitat:

1. Adhere to appropriate seasonal windows to the maximum extent practicable;

2. Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the "surveys" must be limited to the term of the construction unless they are otherwise authorized and funded by Congress;

   [Note: The term of the construction is considered to be the time in which the construction contractor is working on the beach. This usually starts soon after the "notice to proceed" and ends when the contractor finishes placing sand or finishes conducting other shore protection activities on/near the beach.]

3. Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;

4. Avoid impacts to the primary constituent elements (PCEs) of piping plover Critical Habitat to the maximum extent practicable;

5. The Corps or Applicant will evaluate the project area prior to consultation for the presence of piping plover PCEs as a basis for making their initial determination of effect;

6. The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (*i.e.*, washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose;

7. The Corps will attempt to time the construction of Civil Works sand placement and dredging projects to prevent two adjacent beaches or inlets from being constructed in the same year;

8. The Corps Civil Works program will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (*i.e.*, emergent spits, sand bars, etc.) within each inlet's management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex; and

9. The Corps Civil Works program will consider placing dredged materials in the nearshore region as an alternative to beach placement to minimize effects to piping plovers and their habitat.

With the implementation of these Conservation Measures, the Corps has determined the proposed activities may affect, but are not likely to adversely affect the piping plover in areas not identified as Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and they include coastal habitat features that function mostly unimpeded. Optimal Piping Plover Areas include:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

   a. Located within 1 mile of an inlet;
   b. Emergent nearshore sand bars;
   c. Washover fans;
   d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
   e. Bayside mudflats, sand flats, and algal flats; or
   f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely state-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

   a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
   b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
   c. Palmer Point Park, Sarasota County (R-77 to R-83);

d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
e. Crandon Park, Miami-Dade County (R-89 to R-101); and
f. Sanibel Island, Lee County (R-109 to R-174).

The Service concurs with this determination as it applies to projects in non-optimal habitat, and the Corps will reinitiate consultation if they are unable to implement the Conservation Measures as described above. No additional consultation is required for projects located in habitat determined to be non-optimal for piping plovers. The attached P^{3}BO addresses projects located in optimal piping plover habitat, as defined above.

As with the Service's Statewide Programmatic Biological Opinion (SPBO), the Corps and the Service will meet annually during the fourth week of August to review the proposed activities, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this P^{3}BO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions. This programmatic consultation will be reviewed every 5 years. If new information concerning the projects or the piping plover arises, this consultation will be reviewed sooner than 5 years. Reinitiation of formal consultation is required 10 years after the issuance of this P^{3}BO.

We are available to meet with agency representatives to discuss this consultation. If you have any questions, please contact Dawn Jennings at the NFESO (904-731-3103) or Craig Aubrey in the SFESO (772-469-4309).

Sincerely yours,

Larry Williams
State Supervisor

SHORE PROTECTION ACTIVITIES IN THE GEOGRAPHICAL REGION OF THE NORTH AND SOUTH FLORIDA ECOLOGICAL SERVICES FIELD OFFICES

Programmatic Piping Plover Biological Opinion

May 22, 2013

Prepared by:

U.S. Fish and Wildlife Service

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ACRONYMS AND ABBREVIATIONS

Act	Endangered Species Act
AOR	Area of Responsibility
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FR	Federal Register
MBTA	Migratory Bird Treaty Act
NFESO	U.S. Fish and Wildlife Service's North Florida Ecological Services Office
P^3BO	Programmatic Piping Plover Biological Opinion
PCE	Primary Constituent Elements
Service	U.S. Fish and Wildlife Service
SFESO	U.S. Fish and Wildlife Service's South Florida Ecological Services Office
SPBO	Statewide Programmatic Biological Opinion
USGS	U.S. Geological Survey

CONSULTATION HISTORY

1980s and 1990s	Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s.
April 19, 2011	The Service issued the original SPBO concerning planning and regulatory sand placement projects in Florida and their effects on nesting sea turtles.
August 22, 2011	The Service issued their revised SPBO. The SPBO did not include take for the non-breeding piping plover or its designated Critical Habitat. Consultation for plovers was conducted on a case-by-case basis.
October 30, 2012	The Service and the Corps held the first annual meeting on the progress of the SPBO. The agencies discussed outstanding piping plover issues, including the proposed terms and conditions. The agencies agreed to conduct a separate re-initiation of consultation for piping plovers limited to peninsular Florida to programmatically address take of piping plovers.
May 7, 2013	The Corps sent a letter to the Service formally requesting a Programmatic Piping Plover Biological Opinion.
Other Collaboration	Numerous telephone conversations and e-mails were conducted between the Corps and the Service concerning the content of the P^3BO and initiation of consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes activities associated with the placement of compatible sediment on beaches or in the nearshore region of Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and include coastal habitat features that function mostly unimpeded. Below is a list of currently known Optimal Piping Plover Areas:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or

f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely State-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
    b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
    c. Palmer Point Park, Sarasota County (R-77 to R-83);
    d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
    e. Crandon Park, Miami-Dade County (R-89 to R-101); and
    f. Sanibel Island, Lee County (R-109 to R-174).

ACTION AREA

The Action Area includes sandy beaches; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; bayside shorelines of bays and lagoons; and emergent nearshore sand bars of the Atlantic Coast (Nassau County to Miami-Dade County) and the Gulf Coast (Monroe County to Taylor County) of Florida (Figures 1 and 2). The proposed action includes the replacement and rehabilitation of groins utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This P^{3}BO includes both Corps Regulatory and Civil Works activities. Both Corps Regulatory and Civil Works activities may include the involvement of other Federal agencies, such as the Department of Defense, BOEM, and the Federal Emergency Management Agency. The activities covered in the P^{3}BO encompass the following:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the BOEM;
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future sand placement actions addressed in this P^{3}BO may include maintenance of these existing projects or beaches that have not experienced a history of sand placement activities. Maintenance dredging activities include dredging of both deep draft harbors and shallow draft inlets when these activities affect optimal piping plover habitat.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat description

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). Cryptic coloration is a primary defense mechanism for piping plovers where nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (*e.g.*, pedestrian, avian and mammalian) usually by squatting, running, and flushing (flying).

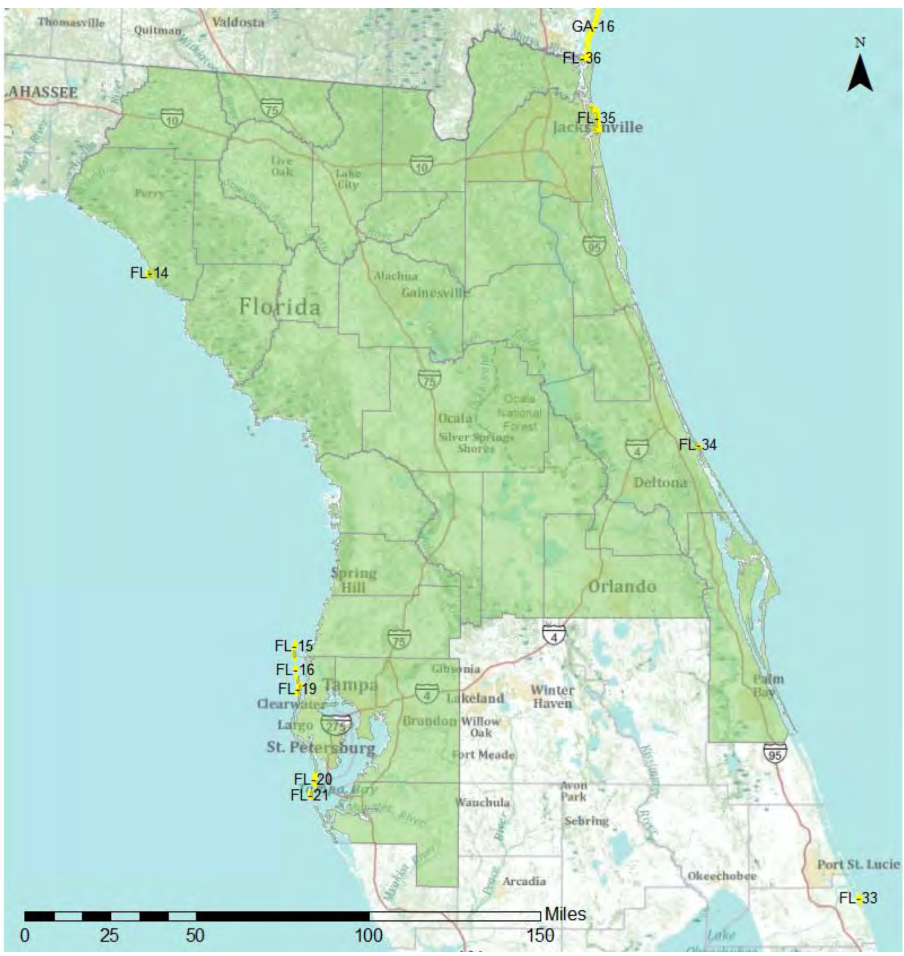

Figure 1 Piping plover designated Critical Habitat in the North Florida Ecological Services Field Office’s area of responsibility**.**

On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide.

Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers in the Action Area include individuals from all three breeding populations. Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist.

Figure 2 Piping plover designated Critical Habitat in the South Florida Ecological Services Field Office's area of responsibility.

The Service has designated Critical Habitat for the piping plover on three occasions. Two of these designations protected different piping plover breeding populations. Critical Habitat for the Great Lakes breeding population was designated May 7, 2001 (66 Federal Register [FR] 22938, Service 2001a), and Critical Habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637, Service 2002). The Service designated Critical Habitat for wintering piping plovers on July 10, 2001 (66 FR 36038, Service 2001b). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic Coast. The three separate designations of piping plover Critical Habitat demonstrate diversity of PCEs between the two breeding populations as well as diversity of PCEs between breeding and wintering populations.

Designated wintering piping plover Critical Habitat originally included 142 areas (the rule states 137 units; this is an error) encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas.

The PCEs for piping plover wintering habitat essential for the conservation of the species are those habitat components that support foraging, roosting, and sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. The PCEs are found in geographically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide (Service 2001a). PCEs of wintering piping plover Critical Habitat include sand or mud flats, or both, with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (Service 2001a). Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as Critical Habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (Service 2001a).

Life history

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Plovers are known to begin breeding as early as 1 year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu et al. 1990; Cross 1990; Goldin et al. 1990; MacIvor 1990; Hake 1993). Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost. The reduction in suitable nesting habitat due to a number of factors is a major threat to the species, likely limiting reproductive success and future recruitment into the population (Service 2009).

Plovers depart their breeding grounds for their wintering grounds between July and late August, but southward migration extends through November. More information about the three breeding populations of piping plovers can be found in the following documents:

a. Piping Plover, Atlantic Coast Population: 1996 Revised Recovery Plan (Service 1996);
b. 2009 Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation (Service 2009);
c. 2003 Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*) (Service 2003);
d. Questions and Answers about the Northern Great Plains Population of Piping Plover (Service 2002).

Piping plovers use habitats in Florida primarily from July 15 through May 15. Below (2010) surveyed plovers north of Marco Island, Florida, and found plovers color-banded during the surveys to have very high wintering site fidelity. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (Service 1996). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to 1 month during their migrations (Noel and Chandler 2005; Stucker and Cuthbert 2006). Some midcontinent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006). Use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). The source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked. Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. While piping plover migration patterns and needs remain poorly understood, and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle.

Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Data based on four rangewide mid-winter (late January to early February) population surveys, conducted at 5-year intervals starting in 1991, show that total numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.,* inlet relocation, dredging of shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Elliott-Smith et al. 2009). Similarly, the increase in the 2006 numbers in the Bahamas is attributed to greatly increased census efforts; the extent of additional habitat not surveyed remains undetermined (Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Opportunities to locate previously unidentified wintering sites are concentrated in the Caribbean and Mexico (Elliott-Smith et al. 2009). Further surveys and assessment of seasonally emergent habitats (*e.g.,* seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Midwinter surveys may underestimate the abundance of nonbreeding piping plovers using a site or region during other months. In late September 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (National Park Service 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith et al. 2009). Noel et al. (2007) observed up to 100 piping plovers during peak migration at Little St. Simons Island, Georgia, where approximately 40 piping plovers wintered in 2003 to 2005. Differences among fall, winter, and spring counts in South Carolina were less pronounced, but inter-year fluctuations (*e.g.,* 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) at 28 sites were striking (Maddock et al. 2009). Even as far south as the Florida Panhandle, monthly counts at Phipps Preserve in Franklin County ranged from a midwinter low of 4 piping plovers in December 2006, to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Pinkston (2004) observed much heavier use of Texas Gulf Coast (ocean-facing) beaches between early September and mid-October (approximately 16 birds per mile) than during December to March (approximately 2 birds per mile).

Local movements of non-breeding piping plovers may also affect abundance estimates. At Deveaux Bank, one of South Carolina's most important piping plover sites, 5 counts at approximately 10-day intervals between August 27 and October 7, 2006, oscillated from 28 to 14 to 29 to 18 to 26 (Maddock et al. 2009). Noel and Chandler (2008) detected banded Great Lakes piping plovers known to be wintering on their Georgia study site in 73.8 ± 8.1 percent of surveys over 3 years.

Abundance estimates for non-breeding piping plovers may also be affected by the number of surveyor visits to the site. Preliminary analysis of detection rates by Maddock et al. (2009) found 87 percent detection during the midwinter period on core sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42 percent detection on sites surveyed three times per year (Cohen 2009).

Gratto-Trevor et al. (2009) found strong patterns (but no exclusive partitioning) in winter distribution of uniquely banded piping plovers from four breeding populations (Figure 3).

All eastern Canada and 94 percent of Great Lakes birds wintered from North Carolina to southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, and a larger proportion of Great Lakes piping plovers were found in South Carolina and Georgia. Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. Although the great majority of Prairie Canada individuals were observed in Texas, particularly southern Texas, individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast from Florida to Texas.

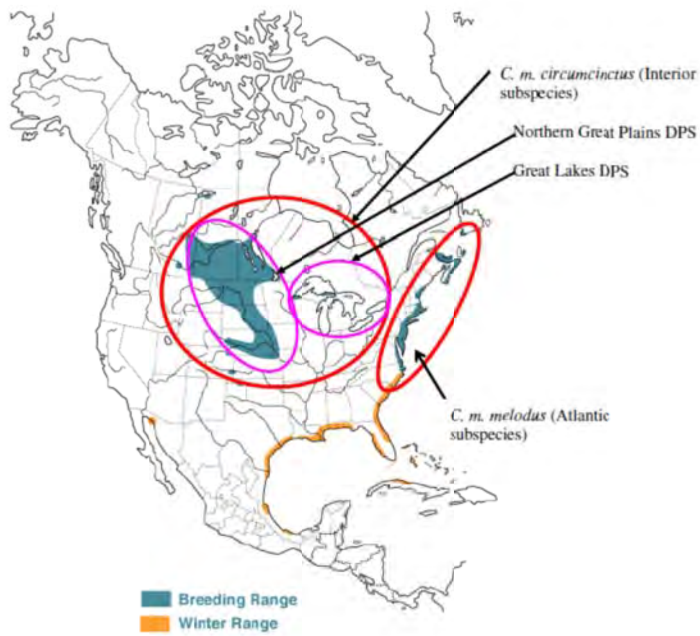

Figure 3 Distribution and range of *C. m. melodus:* Great Lakes DPS of *C. m. circumcinctus*, Northern Great Plains DPS of *C. m. circumcinctus* (base map from Elliott-Smith and Haig 2004 by permission of Birds of North America Online, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology). Note that this map is a conceptual presentation of subspecies and DPS ranges, and is not intended to convey precise boundaries.

The findings of Gratto-Trevor et al. (2009) provide evidence of differences in the wintering distribution of piping plovers from these four breeding areas. However, the distribution of birds by breeding origin during migration remains largely unknown. Other major information gaps include the wintering locations of the U.S. Atlantic Coast breeding population (banding of U.S. Atlantic Coast piping plovers has been extremely limited) and the breeding origin of piping plovers wintering on Caribbean islands and in much of Mexico.

Banded piping plovers from the Great Lakes, Northern Great Plains, and eastern Canada breeding populations showed similar patterns of seasonal abundance at Little St. Simons Island, Georgia (Noel et al. 2007). However, the number of banded plovers originating from the latter two populations was relatively small at this study area.

This species exhibits a high degree of intra- and interannual wintering site fidelity (Nicholls and Baldassarre 1990a; Drake et al. 2001; Noel and Chandler 2005; Stucker and Cuthbert 2006). Gratto-Trevor et al. (2009) reported that 6 of 259 banded piping plovers observed more than once per winter moved across boundaries of the 7 U.S. regions. Of 216 birds observed in different years, only 8 changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor et al. 2009). Total number of individuals observed on the wintering grounds was 46 for Eastern Canada, 150 for the U.S. Great Lakes, 169 for the U.S. Great Plains, and 356 for Prairie Canada.

Local movements are more common. In South Carolina, Maddock et al. (2009) documented many cross-inlet movements by wintering banded piping plovers as well as occasional movements of up to 11.2 miles by approximately 10 percent of the banded population. Larger movements within South Carolina were seen during fall and spring migration. Similarly, eight banded piping plovers that were observed in two locations during 2006 and 2007 surveys in Louisiana and Texas were all in close proximity to their original location (Maddock 2008).

In 2001, 2,389 piping plovers were located during a winter census, accounting for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U.S. do so along the Gulf Coast (Texas to Florida), while 8 percent winter along the Atlantic Coast (North Carolina to Florida).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of Critical Habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat.

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. Conversely, hard shoreline structures are put into place following storms throughout the species range to prevent such shoreline migration (see *Factors Affecting the Species Habitat within the Action Area*). Four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found that the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted that habitat changes in the Chandeleurs stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea-level rise relative to the land.

The Service is aware of the following site specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including Critical Habitat Units. In Texas, one Critical Habitat Unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were removed from a portion of the beach decreasing the likelihood of automobile disturbance to plovers. Exotic plant removal is occurring in another Critical Habitat Unit in South Florida. The Service and other government agencies remain in a contractual agreement with the U.S. Department of Agriculture for predator control within limited coastal areas in the Florida panhandle, including portions of some Critical Habitat Units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one Critical Habitat Unit was afforded greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of a nearby inlet channel.

Biogeography and Habitat Preferences

Wintering piping plovers prefer coastal habitats that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and overwash areas are also considered primary foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2008). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990a).

Recent study results in North Carolina, South Carolina, and Florida, complement information from earlier investigations in Texas and Alabama (summarized in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans) regarding habitat use patterns of piping plovers in their coastal migration and wintering range. As documented in Gulf Coast studies, nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound islands for foraging and ocean beaches for roosting, preening, and being alert (Cohen et al. 2008). The probability of piping plovers being present on the sound islands increased with increasing exposure of the intertidal area (Cohen et al. 2008). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina.

LeDee et al. (2008) conducted a remote analysis of piping plover wintering sites, measuring 11 ecological parameters to determine their correlation to piping plover presence. Piping plover abundance was negatively correlated with urban area and total road length, and positively correlated with inter-tidal area, presence on the mainland (as opposed to the peninsula/island feature), and total inter-tidal and beach area (LeDee et al. 2008).

Recent geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas at the mouths of rivers, washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels), and major bay systems (Arvin 2008). Earlier studies in Texas have drawn attention to washover passes, which are commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997; Zonick 2000). Elliott-Smith et al. (2009) reported piping plover concentrations on exposed seagrass beds and oyster reefs during seasonal low water periods in 2006.

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea-level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or the Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). West-central Florida beaches are considered to be low energy beaches with a gradual offshore slope and fine-grained, quartz sand beaches. The dynamics of the Florida shoreline are shaped by the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. The East coast may also experience erosion from late September through March due to nor'easters. Gulf beaches are largely protected from severe nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of 7 feet at the Florida-Georgia line to less than 2 feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than 3 feet (microtidal) except in the extreme south where it ranges from 3 to 4 feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Foraging/Food Habits

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging (Nicholls and Baldassarre 1990a; Drake 1999a, 1999b). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, and ephemeral pools, and adjacent salt marshes (Gibbs 1986; Zivojnovich and Baldassarre 1987; Nicholls 1989; Coutu et al. 1990; Nicholls and Baldassarre 1990a; Nicholls and Baldassarre 1990b; Hoopes 1993; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Wilkinson and Spinks 1994; Zonick 1997; Service 2001a). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks found on top of the soil or just beneath the surface (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996).

As observed in Texas studies, Lott et al. (2009) identified bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers in southwest Florida. However in northwest Florida, Smith (2007) reported landform use by foraging piping plovers about equally divided between Gulf of Mexico (ocean-facing) and bay beaches. Exposed intertidal areas were the dominant foraging substrate in South Carolina (accounting for 94 percent of observed foraging piping plovers; Maddock et al. 2009) and in northwest Florida (96 percent of foraging observations; Smith 2007). In southwest Florida, Lott et al. (2009) found approximately 75 percent of foraging piping plovers on intertidal substrates.

Home Range

Plovers seem to exhibit strong site fidelity to nonbreeding areas. Plovers vary their habitat use, and it is suggested heterogeneous habitats may be more important than specific habitat features for plovers (Drake et al. 2001; Nicholls and Baldassarre 1990b). Mean home range size (95 percent of locations) for 49 radio-tagged piping plovers in southern Texas in 1997 through 1998 was 3,113 acres, mean core area (50 percent of locations) was 717 acres, and the mean linear distance moved between successive locations (1.97 ± 0.04 days apart) averaged across seasons, was 2.1 miles (Drake 1999a; Drake et al. 2001). Seven radio-tagged piping plovers used a 4,967-acre area (100 percent minimum convex polygon) at Oregon Inlet in 2005 and 2006, and piping plover activity was concentrated in 12 areas totaling 544 acres (Cohen et al. 2008). Noel and Chandler (2008) observed high fidelity of banded piping plovers along a 0.62 and 2.8 mile section of beach on Little St. Simons Island, Georgia.

Life Cycle

Piping plovers spend up to 10 months of their life cycle on their migration and at wintering grounds, generally July 15 through as late as May 15. Piping plover migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault et al. 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008), but the composition (*e.g.,* adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Predators and Competitors

Plovers face predation by avian and mammalian predators that are present year-round on the wintering grounds. There are minimal studies on the impacts of predation on migrating or wintering piping plovers, and investigations into effects of predation on nonbreeding piping plovers falls under the Great Lakes recovery plan. Predator control on their wintering and migration grounds is considered to be a low priority at this time, except for the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash (Service 2009). Plovers must compete with other shorebirds for suitable foraging and roosting habitat.

Disease Factors

Neither the final listing rule nor the recovery plans state that disease is an issue for the species, and no plan assigns recovery actions to this threat factor. The Piping Plover 5-Year Review: Summary and Evaluation provides additional information on the limited concern of avian influenza and West Nile virus on the species (Service 2009).

Roosting

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. Lott et al. (2009) found greater than 90 percent of roosting piping plovers in southwest Florida in old wrack with the remainder roosting on dry sand. In South Carolina, 18 and 45 percent of roosting piping plovers were in fresh and old wrack, respectively. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as the zone of dry sand, shell, cobble and beach debris from the mean high water line up to the toe of the dune; 8 percent), washover (2 percent), and ephemeral pools (1 percent) (Maddock et al. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates with 49 percent on dry sand and 20 percent using intertidal habitat (Smith 2007). In Texas, seagrass debris (bayshore wrack) was an important feature of piping plover roosting sites (Drake 1999a). Mean abundance of two other plover species in California, including the listed western snowy plover, was positively correlated with an abundance of wrack during the nonbreeding season (Dugan et al. 2003).

Seven years of surveys, two to three times per month, along 8 miles of Gulf of Mexico (ocean-facing) beach in Gulf County, Florida, cumulatively documented nearly the entire area used at various times by roosting or foraging piping plovers. Birds were reported using the midbeach to the intertidal zone. Numbers ranged from 0 to 39 birds on any given survey day (Eells unpublished data).

Atlantic Coast and Florida studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90 percent of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Test Scores) at inlet locations versus noninlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008).

Population dynamics

Population Size

The International Piping Plover Breeding Census is conducted throughout the breeding grounds every 5 years by the Great Lakes/Northern Great Plains Recovery Team of the U.S. Geological Survey (USGS). The census is the largest known, complete avian species census, and is coordinated by Elise Elliott Smith and various state and provincial coordinators. It is designed to determine species abundance and distribution throughout its annual cycle. The last survey in 2006 documented 3,497 breeding pairs, with a total of 8,065 birds throughout Canada and the U.S. A more recent 2010 Atlantic Coast breeding piping plover population estimate was 1,782 pairs, which was more than double the 1986 estimate of 790 pairs. This was determined to be a net increase of 86 percent between 1989 and 2010 (Service 2011). An associated winter census documented a total of 454 piping plovers in Florida (Elliott-Smith et al. 2009). For the Gulf Coast of Florida, the surveys documented 321 piping plovers at 117 sites covering approximately 522 miles of suitable habitat (Elliott-Smith et al 2009). A total of 133 plovers were observed along the Atlantic Coast during the 2009 survey, and Northwest Florida numbers for the 2006 International Piping Plover Census were 111, with an increased survey effort from previous years. This represents an increase from the 53 piping plovers sighted in the 2001 effort. More information on the results of past International Piping Plover Censuses and an analysis of the data is found in the 2009 Service's Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) and in the report published by the USGS (Elliott-Smith et al. 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. Although multiple observations of the same bird may have been documented, these reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR.

Population Variability

The pattern of population growth among the recovery units along the Atlantic Coast was uneven, and was accompanied by periodic declines in both overall and regional populations (Service 2011). Although there is some indication of recovery in the Atlantic Coast population, any optimism should be tempered by observed geographic and temporal variability in population growth.

Population Stability

The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan et al. 1993; Melvin and Gibbs 1996; Plissner and Haig 2000; Wemmer et al. 2001; Larson et al. 2002; Amirault et al. 2005; Calvert et al. 2006; Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk. A banding study conducted between 1998 and 2004 in Atlantic Canada concluded lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1996), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase in abundance despite high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U.S. over the last 15 plus years (Amirault et al. 2005). This suggests maximizing productivity does not ensure population increases. However, other studies suggest that survivability is good at wintering sites (Drake et al. 2001). Please see the Piping Plover 5-Year Review: Summary and Evaluation for additional information on survival rates at wintering habitats (Service 2009).

Status and distribution

Reasons for Listing

The 1985 final rule stated the number of piping plovers on the Gulf of Mexico coastal wintering grounds might be declining as indicated by preliminary analysis of the Christmas Bird Count data. Independent counts of piping plovers on the Alabama coast indicated a decline in numbers between the 1950s and early 1980s. At the time of listing, the Texas Parks and Wildlife Department stated 30 percent of wintering habitat in Texas had been lost over the previous 20 years. The final rule also stated, in addition to extensive breeding area problems, the loss and modification of wintering habitat was a significant threat to the piping plover.

Threats to Piping Plovers

The Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) provides an analysis of threats to piping plovers in their migration and wintering range. The threats identified in this document that were of primary concern included the loss and modification of wintering habitat (including shoreline development, beach maintenance and nourishment, inlet dredging, and the construction of jetties and groins).

The Piping Plover 5-Year Review: Summary and Evaluation noted that overutilization for commercial, recreational, scientific, or educational purposes was not a current threat to piping plovers on their wintering and migration grounds. Disease was identified as being only a minor threat. The impacts of predation on nonbreeding populations are largely undocumented, but they remain a potential threat. However, the Service considers predator control on piping plover wintering and migration grounds to be a low priority at this time (Service 2009).

Neither the final listing rule nor the recovery plans state disease is an issue for piping plover, and no plan assigns recovery actions to this threat factor. Based on information available to date, West Nile virus and avian influenza are a minor threat to piping plovers (Service 2009).

Habitat loss and degradation on winter and migration grounds from shoreline and inlet stabilization efforts, both within and outside of designated Critical Habitat, remains a serious threat to all piping plover populations. In some areas, beaches that abut private property are needed by wintering and migrating piping plovers. However, residential and commercial developments that typically occur along private beaches may pose significant challenges for efforts to maintain natural coastal processes. The threat of habitat loss and degradation, combined with the threat of sea-level rise associated with climate change, raise serious concerns regarding the ability of private beaches to support piping plovers over the long term.

Future actions taken on private beaches will determine whether piping plovers continue to use these beaches or whether the recovery of piping plovers will principally depend on public property. As Lott et al. (2009) concludes, "The combination of development and shoreline protection seems to limit distribution of non-breeding piping plovers in Florida. If mitigation or habitat restoration efforts on barrier islands fronting private property are not sufficient to allow plover use of some of these areas, the burden for plover conservation will fall almost entirely on public land managers."

While public lands may not be at risk of habitat loss from private development, significant threats to piping plover habitat remain on many municipal, State, and federally owned properties. These public lands may be managed with competing missions that include conservation of imperiled species, but this goal frequently ranks below providing recreational enjoyment to the public, readiness training for the military, or energy development projects.

Public lands remain the primary places where natural coastal dynamics are allowed. Of recent concern are requests to undertake beach nourishment actions to protect coastal roads or military infrastructure on public lands. If project design does not minimize impediments to shoreline overwash which are necessary to help replenish bayside tidal flat sediments and elevations, significant bayside habitat may become vegetated or inundated, thereby exacerbating the loss of preferred piping plover habitat. Conversely, if beach fill on public lands is applied in a way that allows for "normal" system overwash processes, and sediment is added back to the system, projects may be less injurious to barrier island species that depend on natural coastal dynamics.

Maintaining wrack for food and cover in areas used by piping plovers may help offset effects that result from habitat degradation due to sand placement associated with berm and beach nourishment projects and ensuing human disturbance. Leaving wrack on private beaches may improve use by piping plovers, especially during migration when habitat fragmentation may have a greater effect on the species. In addition, using recreation management techniques, Great Lakes recovery action 2.14 may minimize the effects of habitat loss. Addressing off-road vehicles and pet disturbance may increase the suitability of existing piping plover habitat.

The dredging and mining of sediment from inlet complexes threatens the piping plover on its wintering grounds through habitat loss and degradation. The maintenance of deep draft navigation channels by dredging can alter the natural coastal processes on inlet shorelines of nearby barrier islands (Service 2012). Forty-four percent of the tidal inlets within the U.S. wintering range of the piping plover have been or continue to be dredged, primarily for navigational purposes. The dredging of navigation channels or relocation of inlet channels for erosion-control purposes contributes to the cumulative effects of inlet habitat modification by removing or redistributing the local and regional sediment supply. Dredging can occur on an annual basis or every 2 to 3 years, resulting in continual perturbations and modifications to inlets and their adjacent shoreline habitats (Service 2012).

As sand sources for beach nourishment projects have become more limited, ebb tidal shoals are being utilized as borrow areas more frequently. Exposed ebb and flood tidal shoals and sandbars are prime roosting and foraging habitats for piping plovers. In general, these shoals are only accessible by boat and tend to receive less human recreational use than nearby mainland beaches. This mining of material from inlet shoals for use as beach fill is not equivalent to the natural sediment bypassing due to the virtually instantaneous movement of sand. In a natural system, the sand would gradually and continuously move through the inlet system, providing a greater opportunity for emergent shoals to form (Service 2012).

The Deepwater Horizon oil spill, which started April 20, 2010, discharged into the Gulf of Mexico through July 15, 2010. According to government estimates, the leak released between 100 and 200 million gallons of oil into the Gulf. The U.S. Coast Guard estimates that more than 50 million gallons of oil have been removed from the Gulf, or roughly a quarter of the spill amount. Additional effects to natural resources may be attributed to the 1.84 million gallons of dispersant applied to the spill. As of July 2010, approximately 625 miles of Gulf Coast shoreline was oiled (approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama and 94 miles in Florida) (Joint Information Center 2010). These numbers reflect a daily snapshot of shoreline that experienced effects from oil; however, they do not include cumulative effects to date, or shoreline that has already been cleaned.

Piping plovers have continued to winter within the Gulf of Mexico shorelines. Researchers have and continue to document oiled piping plovers stemming from this spill. Oiling of designated piping plover Critical Habitat has been documented. Affects to the species and its habitat are expected, but their extent remains difficult to predict. The U.S. Coast Guard, the states, and responsible parties from the Unified Command, with advice from Federal and State natural resource agencies, initiated protective and cleanup efforts per prepared contingency plans to deal with petroleum and other hazardous chemical spills for each state's coastline. The contingency plans identify sensitive habitats, including all federally listed species' habitats, which receive a higher priority for response actions. Those plans allow for immediate habitat protective measures for cleanup activities in response to large contaminant spills. While such plans usually ameliorate the threat to piping plovers, it is yet unknown how much improvement will result in this case given the breadth of the effects associated with the Deepwater Horizon incident.

Based on all available data prior to the Deepwater Horizon oil spill, the risk of effects from contamination to piping plovers and their habitat was recognized, but the safety contingency plans were considered adequate to alleviate most of these concerns. The Deepwater Horizon incident has brought heightened awareness of the intensity and extent of impacts to fish and wildlife habitat from large-scale releases. In addition to potential direct habitat degradation from oiling of intertidal habitats and retraction of stranded boom, effects to piping plovers may occur from the increased human presence associated with boom deployment and retraction, cleanup activities, wildlife response, and damage assessment crews working along shorelines. Research studies are documenting the potential expanse of effects to the piping plover.

Analysis of the species/Critical Habitat likely to be affected

The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from all three breeding populations that may use the Action Area. The Atlantic Coast and Great Plains breeding populations of piping plover are listed as threatened, while the Great Lakes breeding population is listed as endangered. Therefore, this P^3BO considers the potential effects of this project on this species and its designated Critical Habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres (corresponding to approximately 47 miles of beach) as Critical Habitat for wintering piping plovers in peninsular Florida. There are no Corps civil works shore protection projects located in designated Critical Habitat. There are five Corps civil works navigation projects that typically place dredged material in Critical Habitat Units: King’s Bay (Unit FL-36), Ponce Inlet (Unit FL-34), St. Lucie Inlet (Unit FL-33), Matanzas Pass (Unit FL-25), and Tampa Harbor (Unit FL-21). Maintenance dredging at these navigational channels typically occurs on 1 to 5 year intervals. These five units account for 1,749 acres (10 miles) of the 23,709 acres of total designated Critical Habitat in the Action Area (or 7.4 percent). These and other Critical Habitat Units may also be affected by non-Civil Works projects under Corps regulatory authority.

This P^3BO does not rely on the regulatory definition of “destruction or adverse modification” of Critical Habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to Critical Habitat.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area

As mentioned in Section II(C)1, the 2006 International Piping Plover Census surveys documented 321 wintering piping plovers at 117 sites covering approximately 522 miles of suitable habitat along the Gulf Coast of Florida, and an additional 133 plovers along the Atlantic Coast (Elliott-Smith et al 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several

Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. These reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR. It is important to note many of these observations may be multiple observations of the same specimen; therefore, these numbers do not represent a population estimate.

The Action Area encompasses 11 Critical Habitat Units in the NFESO's AOR (Figure 1), and an additional 11 Critical Habitat Units in the SFESO's AOR (Figure 2). The descriptions of the Critical Habitat Units associated with the proposed action vary, but generally include land from mean lower low water to where densely vegetated habitat or developed structures, not used by piping plovers, begin and where the PCEs no longer occur. The PCEs consist of intertidal flats including sand or mud flats with no or very sparse emergent vegetation. In addition, adjacent unvegetated or sparely vegetated sand, mud, or algal flats above high tide are important.

Factors affecting the species environment within the Action Area

Coastal development

Shoreline development throughout the wintering range poses a threat to all populations of piping plovers. Beach maintenance and nourishment, inlet dredging, and artificial structures, such as jetties and groins, can eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat. Structural development along the shoreline or manipulation of natural inlets upsets the dynamic processes and results in habitat loss or degradation (Melvin et al. 1991). Increased coastal development brings other recreational disturbances that are known to prevent bird usage of an area, including human disturbance, predation or disturbance by domestic animals, beach raking and cleaning, and habitat degradation by off-road vehicles (Service 2009).

Recreational management techniques, such as vehicle restrictions, pet restrictions, and symbolic fencing (usually sign posts and string) of roosting and feeding habitats, can help to address anthropogenic disturbances to wintering plovers. Educational materials, such as informational signs or brochures, can also provide valuable information to assist the public in understanding the need for conservation measures. Although these measures can be effective, they are not implemented consistently throughout the State.

Accelerated sea-level rise

Potential effects of sea-level rise on coastal beaches vary regionally due to subsidence or uplift as well as the geological character of the coast and nearshore (Service 2009). Low elevations and proximity to the coast make all nonbreeding coastal piping plover foraging and roosting habitats vulnerable to the effects of rising sea-level. Furthermore, areas with small astronomical tidal ranges (*e.g.*, portions of the Gulf Coast where intertidal range is less than 3.3 feet) are the most vulnerable to loss of intertidal wetlands and flats induced by sea-level rise (EPA 2009).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat that lies immediately seaward of numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being re-deposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea-level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

A number of groups have met to discuss climate change and its potential impacts to Florida. In 2007, Governor Charlie Crist hosted “Serve to Preserve: A Florida Summit on Global Climate Change.” To combat climate change, this summit focused on methods for reducing emissions to avoid contributing to climate change. It did not address efforts to limit coastal development or to encourage more natural coastal processes. Based on the present level of available information concerning the effects of global climate change on the status of the piping plover and its designated Critical Habitat, the Service acknowledges the potential for changes to occur in the Action Area.

Sand placement activities

Sand placement projects have the potential to alter piping plover habitat, including the PCEs of Critical Habitat. Beach nourishment can create a beach seaward of existing hard stabilization or heavy development, where the beach has been lost due to erosion and/or sea-level rise, restoring associated ecosystem functions. Although dredge and fill projects that place sand on beaches or dunes may restore lost or degraded habitat, these projects may degrade habitat by altering the natural sediment composition and depressing the invertebrate base in some areas. This hinders habitat migration with sea-level rise, and replaces the natural dune beach nearshore system with artificial geomorphology (Service 2012). Lott et al. (2009) found a strong negative correlation between sand placement projects and the presence of plovers on the Gulf Coast of Florida; however, he noted that additional research was needed to clarify whether the cause was the sand placement project or the tendency for these projects to be located on highly developed shorelines. Harrington (2008) noted the need for a better understanding of the potential effects of inlet-related projects, such as jetties, on bird habitats.

In areas where the shoreline is highly eroded, sand placement activities can improve piping plover foraging and roosting habitat (National Research Council 1995). Sand placement activities add sand to the sediment budget, increasing the beach width and providing a sand source for emergent nearshore features to form. Although there is some research related to the management of beach nourishment projects to better maintain the habitat for piping plovers, much of this research is focused on beaches in the northern U.S. where breeding occurs (Melvin et al. 1991; Houghton 2005; Maslo et al. 2010). In their wintering grounds, increasing beach width is an important aspect of beach nourishment projects in highly developed, eroding areas. The timing of the project is also important in preventing impacts to piping plovers as a result of sand placement activities.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on wintering piping plovers within the Action Area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by wintering piping plovers. Since piping plovers can be present on these beaches for up to 10 months per year, construction is likely to occur while the species is utilizing these beaches and associated habitats. Short-term and temporary impacts to piping plover activities could result from project work occurring on the beach that flushes birds from roosting or foraging habitat. Long-term impacts could include a hindrance in the ability of wintering plovers to recuperate from their migratory flight from their breeding grounds, survive on their wintering areas, or to build fat reserves in preparation for migration back to their breeding grounds. Long-term impacts may also result from changes in the physical characteristics of the beach from the placement of the sand.

Proximity of the action

Maintenance dredging of navigational inlets occurs throughout the state in both Federal and non-Federal channels. Sand placement activities (resulting from both shore protection projects and placement of dredged materials as a result of maintenance dredging activities) would occur within and adjacent to wintering piping plover foraging and roosting habitats. Groin and jetty repair or replacement would occur adjacent to inlets, or along beach habitats where they may be used to stabilize the beach and limit erosion.

Distribution

Sand placement activities that may impact piping plover roosting and foraging would occur along both the Gulf of Mexico and the Atlantic Ocean coasts. The Service expects the proposed construction activities could directly and indirectly affect the availability of habitat for migrating and wintering piping plovers to roost and forage. The proposed construction activities are also expected to cause piping plovers usage of Critical Habitat Units located within the Action Area to temporarily decrease.

Timing

The timing of maintenance dredging, sand placement, and groin/jetty repairs or replacement activities may occur during or outside of the migration and wintering period for piping plovers (July 15 to May 15). For projects occurring outside of the migration and wintering period, the Service expects indirect effects to occur later in time.

Nature of the effect

Although the Service expects direct short-term effects from disturbance during project construction, it is anticipated the action will also result in direct, and indirect, long term effects to piping plovers and Critical Habitat. The Service expects there may be morphological changes to piping plover habitat, including roosting and foraging habitat, and to Critical Habitat within the Action Area. Activities that affect or alter the use of optimal habitat, Critical Habitat, or increase disturbance to the species may decrease the survival and recovery potential of the piping plover. Effects to piping plovers and their habitat as a result of groin and jetty repair or replacement will primarily be due to construction ingress and egress when construction is required to be conducted from land. In addition, construction materials and equipment may need to be stockpiled on the beach. These effects would be more likely to be experienced with repair or replacement of groin structures that are located in shallower water, as the majority of work done to jetties is conducted from the water or from the crest of the structure (Martin 2013).

Duration

Time to complete the project construction varies depending on the project size, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). According to Corps estimations, project work could take as little as 1 month and as long as 2 years. Piping plover habitats would remain disturbed until the project is completed and the habitats are restored. Beach restoration projects would typically be complete in 6 to 12 months. The direct effects would be expected to be short-term in duration, until the benthic community reestablishes within the new beach profile. Indirect effects from the activity, including those related to altered sand transport systems, may continue to occur as long as sand remains on the beach.

The effects of the proposed action are of a temporary quantitative and qualitative nature. The habitat will be temporarily unavailable to wintering plovers during the construction period, and the quality of the habitat will be reduced for several months following project activities. Dredging in inlets where emergent shoals have formed would result in a loss of optimal piping plover habitat, which may or may not reform in the same quality or quantity in the future. Dredging inlets, repairing and replacing groins or jetties, or sand placement during months when piping plovers are present causes disturbance that disrupts the birds' foraging efficiency and hinders their ability to build fat reserves over the winter and in preparation for migration, as well as their recuperation from migratory flights (Service 2009). The mean linear distance moved by wintering plovers from their core area is estimated to be approximately 2.1 miles (Drake et al.

2001), suggesting they could be negatively impacted by temporary disturbances anywhere in their core habitat area. The PCEs associated with designated Critical Habitat would be temporarily adversely affected during and following sand placement, but may also experience some positive benefits from the increase in available beach and its associated new wrack.

Disturbance frequency

The frequency of maintenance dredging activities varies greatly, and can be as often as annually or semiannually at some inlets that experience high rates of shoaling, or as infrequently as once every 7 years at inlets that do not experience high rates of shoaling. Sand placement activities as a result of shore protection activities typically occur once every 5 to 7 years. Dredging and sand placement can occur at any time during the year based on availability of funding, other applicable species' windows, and the availability of dredges to conduct the work.

The disturbance frequency related to groin and jetty repair and replacement varies greatly based on the original construction methodology, the construction materials, and the conditions under which the structure is placed. Most structures in Florida are constructed with Florida limerock or granite (preferred). Granite structures can last 50 years or more without requiring maintenance, while limerock structures may require maintenance on a slightly more frequent basis due to their lower densities. On average, hard structures are designed to require only minor repairs (such as replacing dislocated rock) that would only be expected approximately every 20 years (Martin 2013).

Disturbance severity

The Action Area encompasses a large percentage of the wintering range of the piping plover; however, the overall intensity of the disturbance is expected to be minimal. The intensity of the effect on piping plover habitat may vary depending on the frequency of the sand placement activities, the existence of staging areas, and the location of the beach access points. The severity is also likely to be slight, as plovers located within the Action Area are expected to move outside of the construction zone due to disturbance; therefore, no plovers are expected to be directly taken as a result of this action.

Analyses for effects of the action

The Action Area encompasses peninsular Florida within the AORs of the NFESO and the SFESO on both the Atlantic and Gulf coasts of Florida. It consists mostly of designated piping plover Critical Habitat Units and publicly owned land that exhibits the following features: located within 1 mile of an inlet; emergent nearshore sand bars; washover fans; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; or bayside shorelines of bays and lagoons.

Direct effects

Sand placement projects that utilize beach compatible material from either an appropriate borrow site or from the authorized Federal channel, have the potential to elevate the beach berm and widen the beach, providing storm protection and increasing recreational space. The construction window (*i.e.,* sand placement, dredging, groin and jetty repair/replacement) for each event is likely to extend through a portion of at least one piping plover migration and winter season. If material is placed on the beach, heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on Action Area beaches, the placement of the dredge pipeline, and sand placement) may adversely affect migrating and wintering piping plovers in the Action Area by disturbing and disrupting normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat in adjacent areas along the shoreline. Sand placement may occur in and adjacent to habitat that appears suitable for roosting and foraging piping plovers, or that will become more optimal with time. Short-term and temporary construction effects to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The deposition of sand may temporarily deplete the intertidal food base along the shoreline and temporarily disturb roosting birds during project construction.

For some highly eroded beaches, sand placement will have a beneficial effect on the habitat's ability to support wintering piping plovers. Narrow beaches that do not support a productive wrack line may see an improvement in foraging habitat available to piping plovers following sand placement. The addition of sand to the sediment budget may also increase a sand-starved beach's likelihood of developing habitat features valued by piping plovers, including washover fans and emergent nearshore sand bars.

Maintenance dredging of shallow-draft inlets can occasionally require the removal of emergent shoals that may have formed at the location of the Federally-authorized channel from the migration of the channel over time. In these cases, the dredging activities would result in a complete take of that habitat. However, this take could be either temporary or more permanent in nature depending upon the location of future shoaling within the inlet.

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979; Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983; Pilkey et al. 1984). As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water, where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983). The proposed activities associated with this P^3BO only include the repair and replacement of existing groins and jetties. Since the primary effects associated with groins and jetties are associated with their alteration of sand movement, the effects would not change with the proposed action. Temporary adverse effects to the piping plover from disruption in the immediate vicinity of the project would occur during construction.

Indirect effects

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. During sand placement, suffocation of invertebrate species will occur and degrade the suitability of the habitat for foraging. The effects to the benthic communities and the indirect effects to the piping plover will occur even if sand placement activities occur outside the piping plover migration and wintering seasons. Timeframes projected for benthic recruitment and re-establishment following sand placement are between 6 months and 2 years. Tilling to loosen compacted sand, sometimes required following beach nourishment to minimize effects to nesting sea turtles, may affect wrack that has accumulated on the beach. However, tilling is usually conducted above the wrack line. This may affect feeding and roosting habitat for piping plovers since they often use wrack for cover and foraging.

Natural, undeveloped barrier islands need storms and overwash to maintain the physical and biological environments they support (Young et al. 2006). Sand placement may limit washover fans from developing, which could accelerate the successional state of sand flats such that they will likely become vegetated within a few years (Leatherman 1988). This may reduce an area's value to foraging and roosting piping plovers. The piping plover's rapid response to habitats formed by washovers from the hurricanes in 2004 and 2005 in the Florida panhandle at Gulf Islands National Seashore and Eglin Air Force Base's Santa Rosa Island, and similar observations of their preferences for overwash habitats at Phipps Preserve and Lanark Reef in Franklin County, Florida, and elsewhere in their range, demonstrate the importance of these habitats for wintering and migrating piping plovers.

Restoration of beaches through sand placement may increase recreational pressures within the project area. Recreational activities, including increased pedestrian use, have the potential to adversely affect piping plovers through disturbance and through increased presence of predators, including both domestic animals and feral animals attracted by the presence of people and their trash. Long-term effects could include a decrease in piping plover use of habitat due to increased disturbance levels.

Pilkey and Dixon (1996) stated beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development, which leads to the need for more and larger protective measures. Greater development may also support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas. Optimal habitat for the piping plover often occurs on publicly owned lands where human development may be limited; however, development of roads, bridges, and recreational facilities may be subject to scenarios similar to those described above.

Species' response to the proposed action

The Service bases this P^3BO on anticipated direct and indirect effects to piping plovers (wintering and migrating) and their Critical Habitat as a result of dredging, sand placement on beaches, and groin and jetty repair/replacement, which may prevent the maintenance or formation of habitat that piping plovers consider optimal for foraging and roosting. Heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and forging, and possibly forcing piping plovers to expend valuable energy reserves to seek available habitat elsewhere. In addition, foraging in suboptimal habitat by migrating and wintering piping plovers may reduce the fitness of individuals. Furthermore, increased and continual disturbance within optimal habitat, including Critical Habitat Units, could have effects on all three breeding populations of piping plovers.

Cumulative effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

It is reasonably certain coastal development, human occupancy, and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. However, areas identified as optimal piping plover habitat are not as likely to be affected by coastal development and human occupancy, since they are primarily protected areas that are relatively undeveloped compared to other beaches in Florida. Optimal Piping Plover Areas may still experience heavy recreational use. It is unknown how much influence beach nourishment will contribute to the development and recreational use of the shoreline. Most activities affecting designated piping plover Critical Habitat would require Federal permits or funding. The Service is unable to identify any specific activities that would be considered cumulative effects.

CONCLUSION

There are 2,340 miles of sandy shoreline available (although not necessarily suitable) throughout the piping plover wintering range within the conterminous U.S. The primary effects of the proposed activities are to piping plover foraging and roosting habitat, and these effects are typically limited to the first year following project construction. Beach wrack and the benthic community are often reestablished between 6 months and 1 year following project construction.

In the long-term, sand placement activities will add sediment to the system that could otherwise be removed as part of inlet maintenance, and increase the availability of suitable habitat for the species.

After reviewing the current status of the northern Great Plains, Great Lakes, and Atlantic Coast wintering piping plover populations, the environmental baseline for Action Area, the effects of the proposed activities, the Conservation Measures proposed by the Corps, and the cumulative effects, it is the Service's biological opinion that implementation of these actions, as proposed, is not likely to jeopardize the continued existence of the piping plover.

In addition, after reviewing the current status of the affected species, the environmental baseline for the Action Area, the effects of the proposed activities, and the cumulative effects, it is the Service's biological opinion the action, as proposed, will not adversely modify designated critical habitat for the reason given below.

Although some Critical Habitat Units may be impacted by project activities, these would most frequently be units or portions of units that are highly eroded and where habitat for piping plovers has become degraded. In these instances, the adverse effects of project activities would be offset over time by beneficial effects associated with the restoration of beaches. In all cases, neither the negative nor the positive effects of beach nourishment are likely to be permanent due to the dynamic nature of shoreline processes. Project activities would not affect a Critical Habitat Unit to the extent that, over time, the unit would be unable to serve its intended purposes. Therefore, any loss of habitat would not have a significant effect on the species' persistence or on the function of these Critical Habitat Units as a whole.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and

Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effects of incidental take, the Corps must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

It is difficult for the Service to estimate the exact number of piping plovers that could be migrating through or wintering within the Action Area at any one point in time and place during project construction. Disturbance to suitable habitat resulting from both dredging and sand placement activities within the Action Area would affect the ability of an undetermined number of piping plovers to find suitable foraging and roosting habitat during the migrating and wintering periods of any given year. Because the number of piping plovers that would be affected by projects cannot be determined, the Service will use the annual disturbance in shoreline miles as a surrogate for take.

The FDEP's Critically Eroded Beaches in Florida report identified 204.2 miles of critically eroded beaches on the Atlantic Coast of Florida, and an additional 102.3 miles of critically eroded beaches on the Gulf Coast of Florida in the Action Area (FDEP 2012). FDEP's definition of "critically eroded" requires upland development, recreation, wildlife habitat, or important cultural resources to be threatened. Due to the threat to upland interests, it is anticipated that beaches identified by FDEP to be critically eroding would be the most likely to be affected by the proposed action. Of the 204.2 miles of critically eroded beaches on the Atlantic Coast, approximately 49.4 miles are located on public lands primarily managed for conservation purposes; on the Gulf Coast, approximately 14.7 miles of the 102.3 miles of critically eroded beaches are located on public lands, for a total of 64.1 miles in the Action Area that are most likely to be affected. We acknowledge some additional public lands that are not defined as critically eroded and not included in the estimate above may also be affected. However, not all public lands have habitat elements that support migrating or wintering piping plover on a regular basis; therefore, some public lands included in the estimate above are not optimal piping plover habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres, corresponding to approximately 47 miles of beach, as Critical Habitat for wintering piping plovers in peninsular Florida. Most designated Critical Habitat is publicly owned (see Appendix A) and the Critical Habitat most likely to be disturbed would fall under the critically eroded, publicly owned category, part of the estimated 64.1 miles of beach cited above.

An additional 15.0 miles of beach in six units are defined as optimal piping plover habitat, but not located on publically-owned lands or Critical Habitat Units. Over time, most or all of these areas may be subject to project-related disturbance. Therefore, the total shoreline (optimal piping plover habitat) estimated to be effected by the proposed action is 79.1 miles, rounded for our purposes to 80 miles. It is estimated approximately 10 percent or less of the total 80 miles of potentially affected optimal habitat would be impacted in any given year (or approximately 8 miles). In years following emergency events, the impacted area is expected to increase to approximately 25 percent or less of the total mileage, or 20 miles of shoreline. Over the past 10 years, two Congressional Orders occurred due to emergency events (2004-2005 hurricane season, and the 2012 hurricane season). The increased sand placement activities due to emergency events are anticipated to occur once in a 7-year period. This estimate is considered to be conservative, as many of the lands identified as optimal piping plover habitat are undeveloped. Since upland development is generally not threatened in these areas, the cost of placing sand on these shorelines is not justified.

Sand placement resulting from maintenance dredging projects is the most likely activity to affect these areas due to the preference to keep sand within the littoral system. It is expected the exact mileage of shoreline affected by the proposed action will vary from year to year. Maintenance dredging and sand placement activities may result in an unspecified number of piping plovers occupying these areas to be taken in the form of harm (*e.g.*, death, injury) and harassment as a result of this action.

EFFECT OF THE TAKE

In this P^3BO, the Service determined the proposed project is not likely to result in jeopardy to the piping plover.

REASONABLE AND PRUDENT MEASURES

The Service has determined the following Reasonable and Prudent Measures are necessary and appropriate to minimize take of the piping plover in the Action Area. If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the Term and Condition is not reasonable and prudent for the specific project or activity and request exception under the P^3BO; or

2. Initiate consultation with the Service for the specific project or activity.

The Service may respond by either of the following:

1. Allowing an exception to the Terms and Conditions under the P^3BO; or

2. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

The post construction survey requirements are described in Reasonable and Prudent Measure #5 and Term and Condition #8. These requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps will notify the Service when initiating consultation for the project.

1. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

2. The Corps or the Applicant will notify the Service of the commencement of projects that utilize this P^3BO for the purposes of tracking incidental take of the species.

3. The Corps shall protect habitat features considered preferred by plovers outside of the project footprint in accordance with Terms and Conditions 3, 4, 5, and 6.

4. The Corps will facilitate awareness of piping plover habitat by educating the public on ways to minimize disruption to the species.

5. The Corps, the Applicant, or the local sponsor shall provide the mechanisms necessary to monitor impacts to piping plovers within the Action Area.

6. The Corps shall facilitate an annual meeting with the Service to assess the effectiveness of the protection and minimization measures outlined in this P^3BO.

TERMS AND CONDITIONS

1. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

2. The Corps or the Permittee must provide the following information to the Service Field Supervisor of the appropriate Field Office at least 10 business days prior to the commencement of work:

    a. Project location (include FDEP Range Monuments and latitude and longitude coordinates);
    b. Project description (include linear feet of beach, actual fill template, access points, and borrow areas);
    c. Date of commencement and anticipated duration of construction; and
    d. Names and qualifications of personnel involved in piping plover surveys.

3. Prior to construction, the Corps shall delineate preferred piping plover habitat (intertidal portions of ocean beaches, ephemeral pools, washover areas, wrack lines) adjacent to or outside of the project footprint that might be impacted by construction activities. Obvious identifiers shall be used (for example, pink flagging on metal poles) to clearly mark the beginning and end points to prevent accidental impacts to use areas.

4. Piping plover habitat delineated adjacent to or outside of the project footprint shall be avoided to the maximum extent practicable when staging equipment, establishing travel corridors, and aligning pipeline.

5. Driving on the beach for construction shall be limited to the minimum necessary within the designated travel corridor, which will be established just above or just below the primary "wrack" line.

6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of piping plovers. Workers shall be briefed on the importance of not littering and keeping the project area trash and debris free. See Appendix B for examples of suitable receptacles.

7. Educational signs shall be installed at public access points within the project area with emphasis on the importance of the beach habitat and wrack for piping plovers. When the project area has a pet or dog regulation, the provisions of the regulation shall be included on the educational signs.

8. For one full piping plover migration and winter season (beginning July 15 to May 15) prior to construction, and 2 years following each dredging and sand placement event, bi-monthly (twice-monthly) surveys for piping plovers shall be conducted in the beach fill and in any other intertidal or shoreline areas within or affected by the project. If a full season is not available, at least 5 consecutive months with three surveys per month spaced at least 9 days apart are required. During emergency projects, the surveys will begin as soon as possible prior to, and up to implementing the project. Piping plover identification, especially when in non-breeding plumage, can be difficult. If pre-construction monitoring is not practicable, it will be so indicated in the notification to the Service (see Term and Condition #2 above) and the Service will decide whether to require a separate individual consultation. See introductory paragraph to Reasonable and Prudent Measures earlier in this document.

9. The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the information listed below.
   The following will be collected, mapped, and reported:

a. Date, location, time of day, weather, and tide cycle when survey was conducted;
b. Latitude and longitude of observed piping plover locations (decimal degrees preferred);
c. Any color bands observed on piping plovers;
d. Behavior of piping plovers (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking);
e. Landscape features(s) where piping plovers are located (*e.g.*, inlet spit, tidal creeks, shoals, lagoon shoreline);
f. Habitat features(s) used by piping plovers when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
g. Substrata used by piping plovers (*e.g.*, sand, mud/sand, mud, algal mat);
h. The amount and type of recreational use (*e.g.*, people, dogs on or off leash, vehicles, kite-boarders); and
i. All other shorebirds/waterbirds seen within the survey area.

All information shall be provided in an Excel spreadsheet. Monitoring results shall be submitted (datasheets, maps, database) on standard electronic media (*e.g.*, CD, DVD) to the appropriate Field Office by July 31 of each year in which monitoring is completed. If an appropriate web based reporting system becomes available, it would be used in lieu of hard copy/media.

[NOTE: As a condition to a permit from the FDEP, the bird monitor may also be required to report shorebird data to the Florida Fish and Wildlife Conservation Commission (FWC) https://public.myfwc.com/crossdoi/shorebirds/SigninExploreData.aspx.]

10. The Corps shall meet with the Service and the FWC (and BOEM as appropriate) annually to discuss the effectiveness of the avoidance measures and additional measures to include for future projects. The agencies will also review the projects utilizing this P^{3}BO the previous year to ensure that the reporting requirements for calculating the extent of take are adequate. This meeting will also explore:

    a. The possibility of using dredged materials to enhance potential or existing piping plover habitat within and adjacent to the project area;
    b. Methods for funding beneficial use opportunities for dredged materials that are not least-cost disposal to benefit piping plovers and their habitat;
    c. The development of shore protection design guidelines that can be utilized during future project planning to protect and/or enhance piping plover habitat; and
    d. Incorporating artificial lagoons or ephemeral pools into project designs adjacent to inlets where sand placement is proposed.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or Critical Habitat, to help implement recovery plans, or to develop information.

1. The Corps will facilitate a meeting between the Applicant or the local sponsor, the FWC, and the Service to discuss steps for the long-term protection of wrack within the project area; and

2. The Service encourages continued investigation into opportunities for increasing monitoring for Civil Works operations and maintenance projects.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

The amount or extent of incidental take for piping plovers will be considered exceeded if sand is placed on more than 8 miles of optimal piping plover shoreline during a nonemergency year, and a maximum of 20 miles of optimal piping plover shoreline during or following an emergency event (declared disaster or Congressional Order) as a result of this programmatic action. If the anticipated level of incidental take is exceeded during the course of this action, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or Critical Habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or Critical Habitat not considered in this opinion; or (4) a new species is listed or Critical Habitat designated that may be affected by the action. Reinitiation of formal consultation is also required 10 years after the issuance of this P^3BO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

MIGRATORY BIRD TREATY ACT

Migratory Bird Treaty Act (MBTA) for all Projects:

Comply with the FWC's standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of these projects on the Gulf Coast during the periods from February 15-August 31 or on the Atlantic Coast from April 1- August 31. All sand placement events could impact nesting shorebirds protected under the MBTA.

***The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA it is unlawful by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

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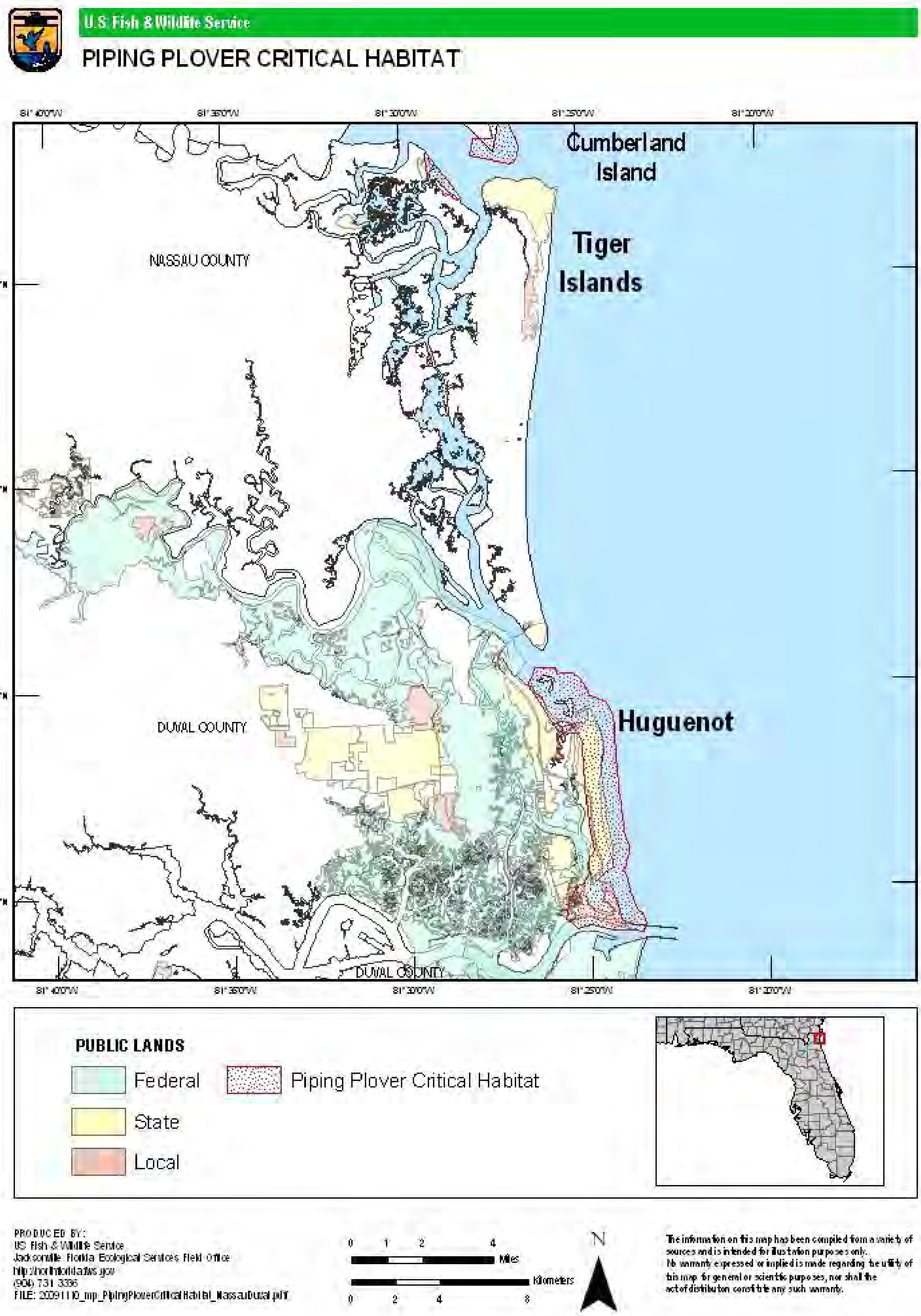
APPENDIX A: PIPING PLOVER CRITICAL HABITAT UNITS IN THE ACTION AREA



U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Cumberland Island
Tiger Islands
NASSAU COUNTY
Huguenot
DUVAL COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
Miles
Kilometers
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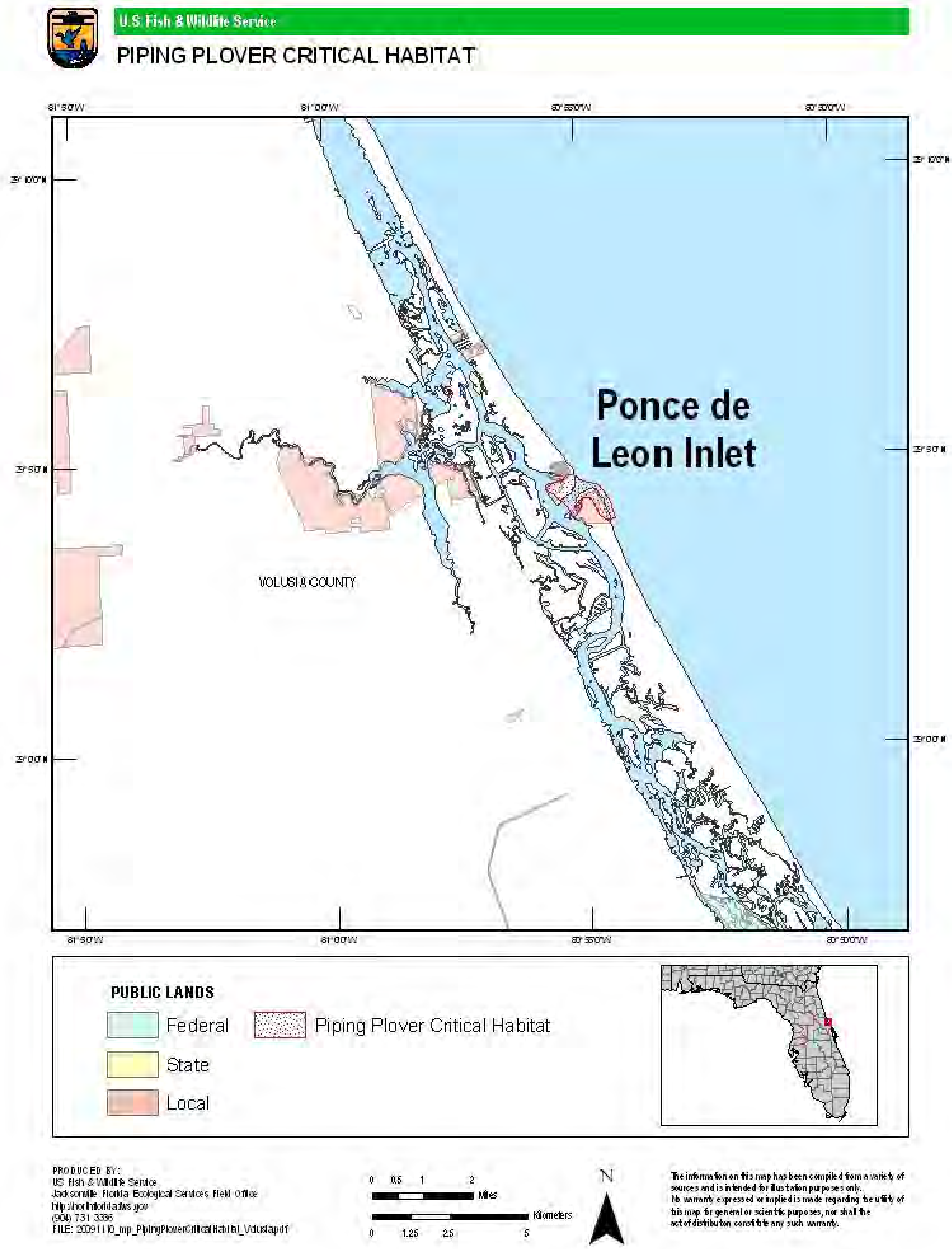
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Ponce de Leon Inlet
VOLUSIA COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
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Miles
Kilometers
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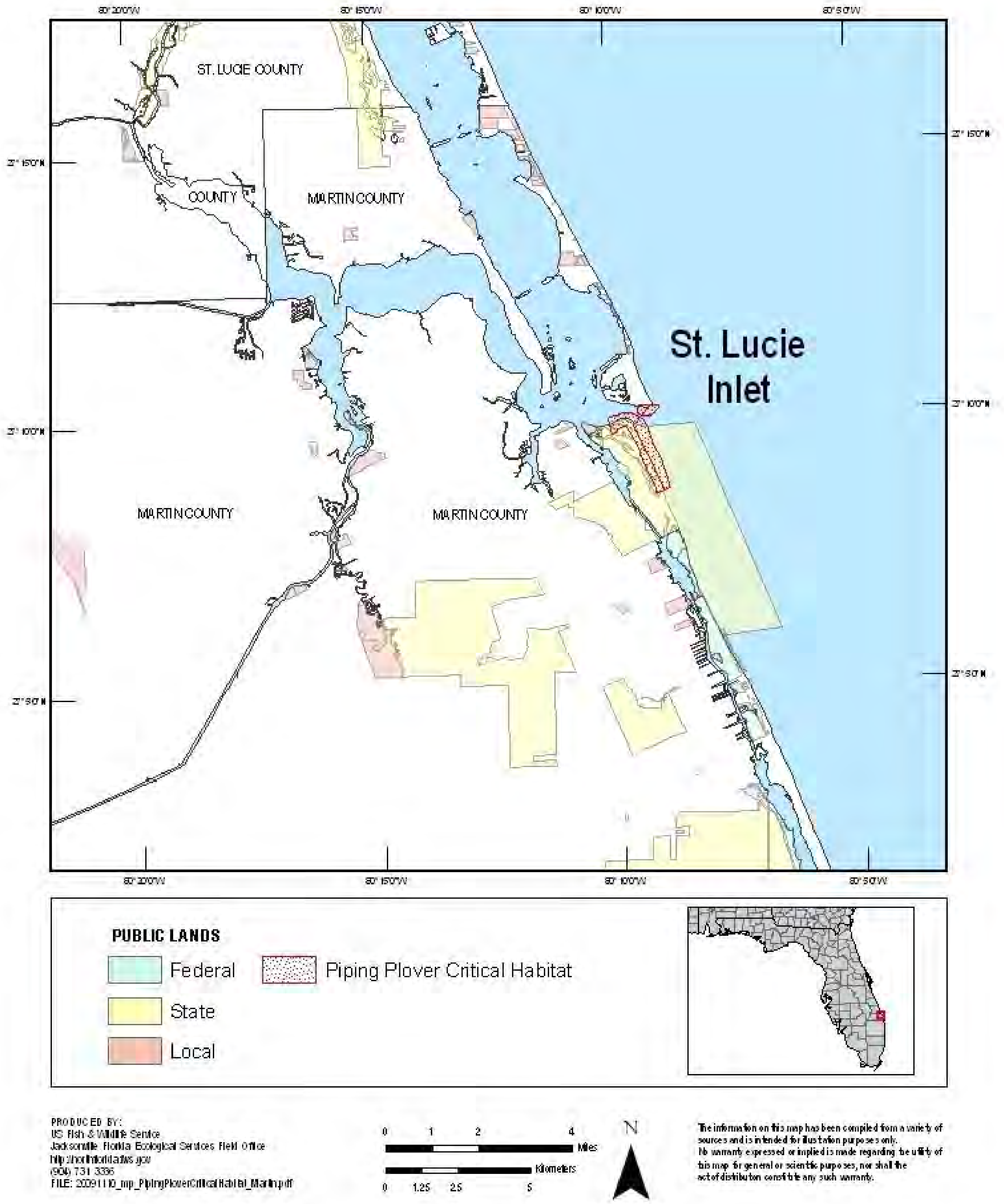
The information on this map has been compiled from a variety of sources and is intended for illustration purposes only.

U.S. Fish & Wildlife Service

PIPING PLOVER CRITICAL HABITAT



PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northflorida.fws.gov
(904) 731 3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Martin.pdf

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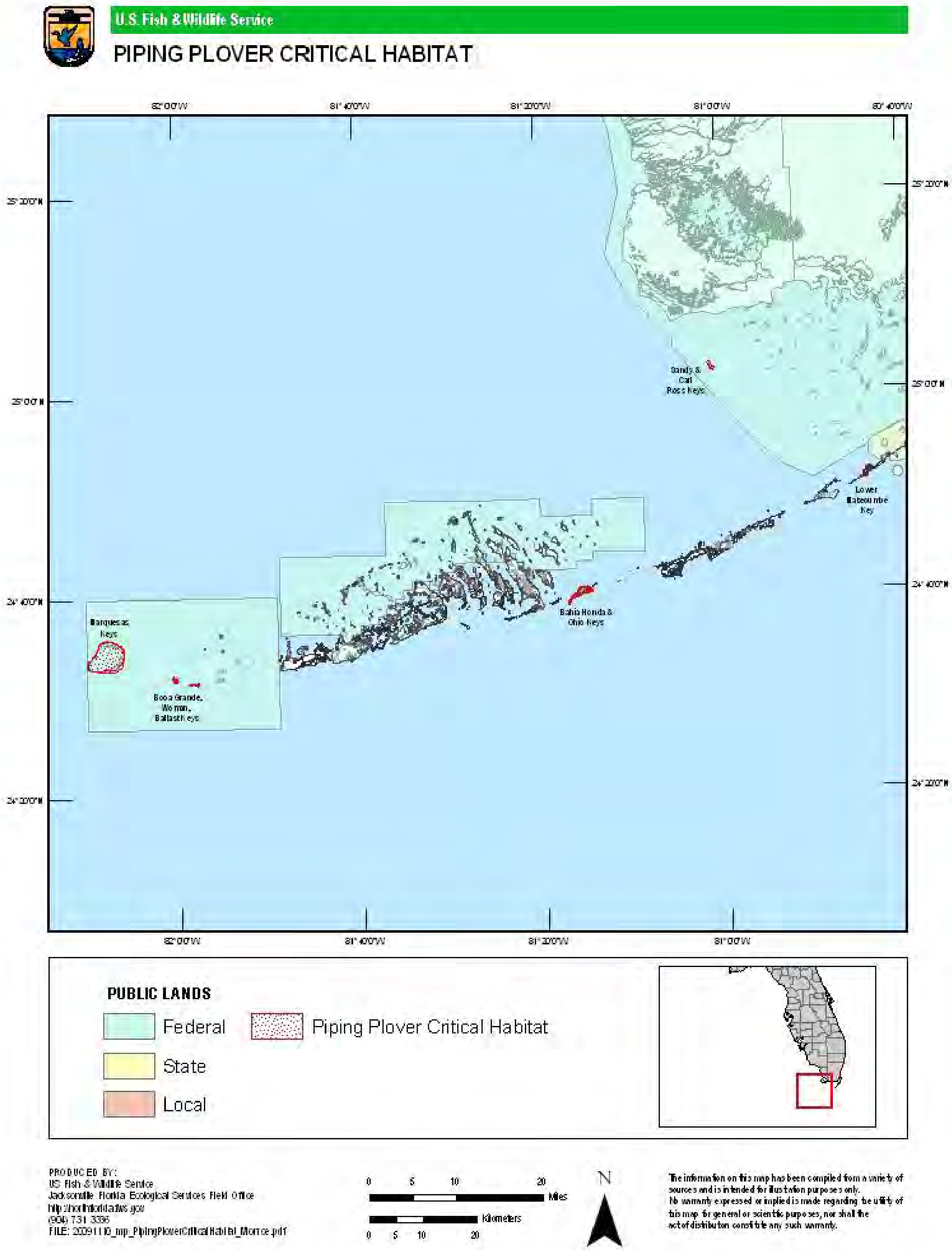
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Sandy & Cari Ross Keys
Lower Matecumbe Key
Bahia Honda & Ohio Keys
Marquesas Keys
Boca Grande, Woman, Ballast Keys
82°0'0"W
81°40'0"W
81°20'0"W
81°0'0"W
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
Miles
Kilometers
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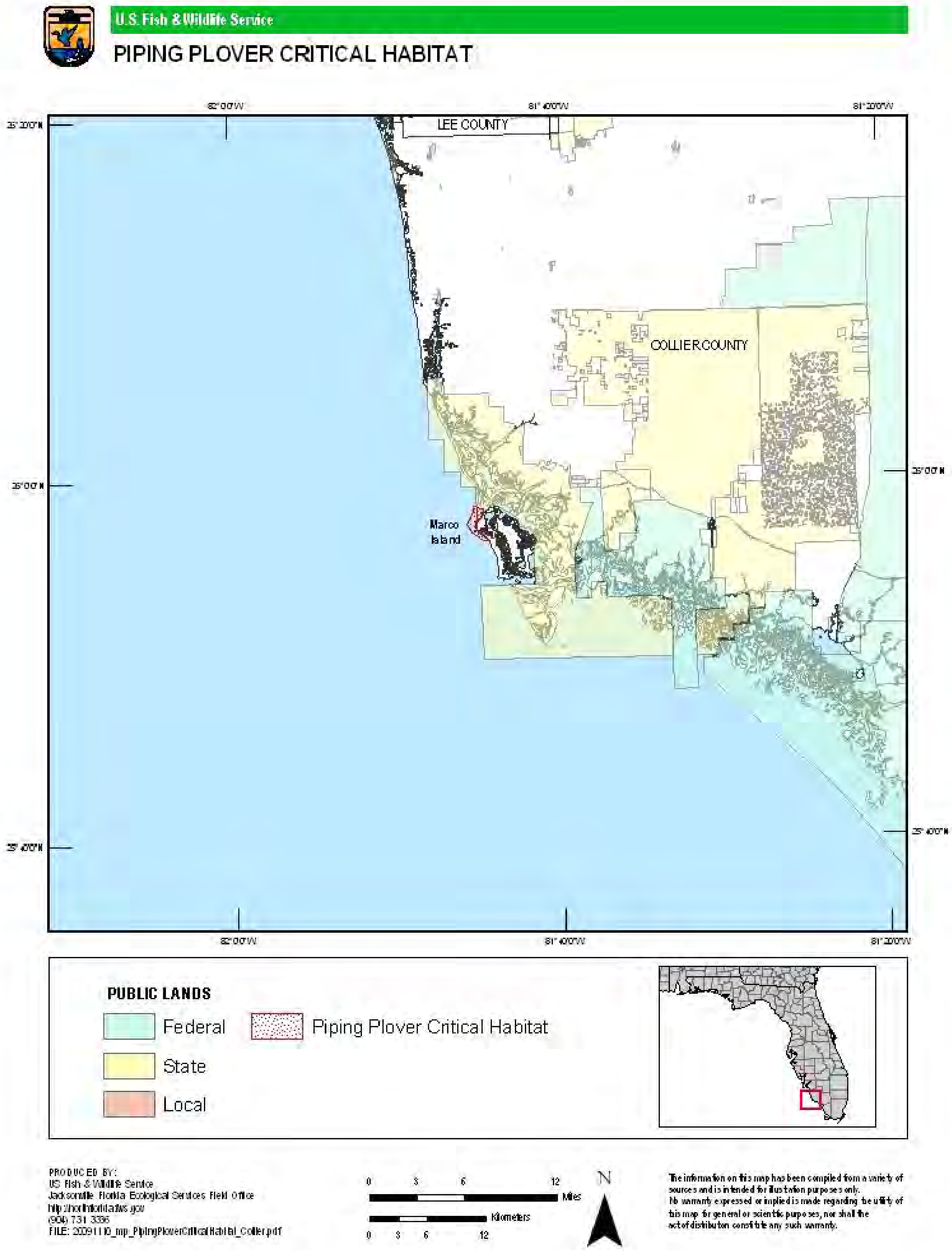
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
LEE COUNTY
COLLIER COUNTY
Marco Island
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
0 3 6 12 Miles
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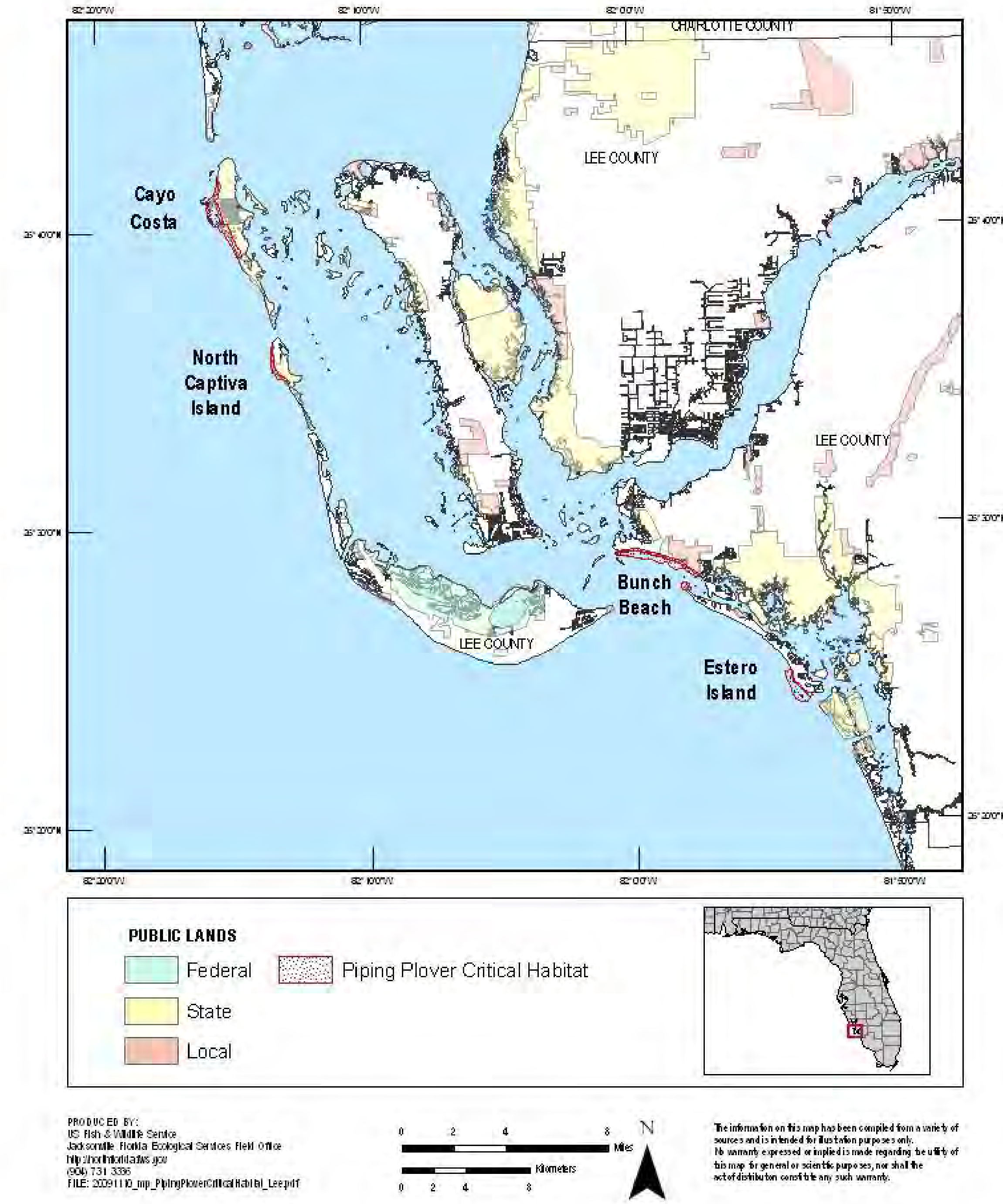
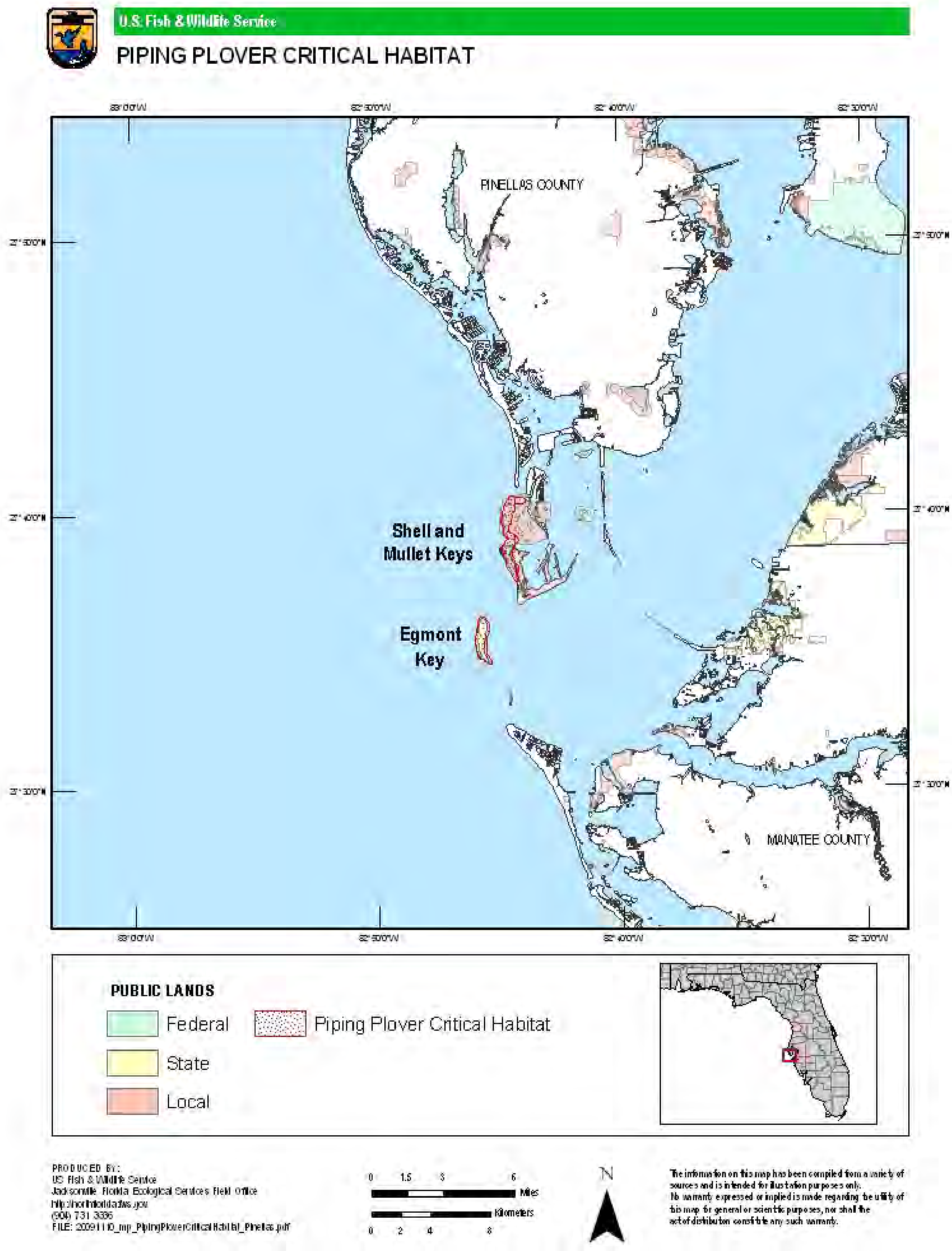
PIPING PLOVER CRITICAL HABITAT




U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
83°0'0"W
82°50'0"W
82°40'0"W
82°30'0"W
PINELLAS COUNTY
Shell and Mullet Keys
Egmont Key
MANATEE COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Pinellas.pdf
0 1.5 3 6
Miles
Kilometers
0 2 4 8
N
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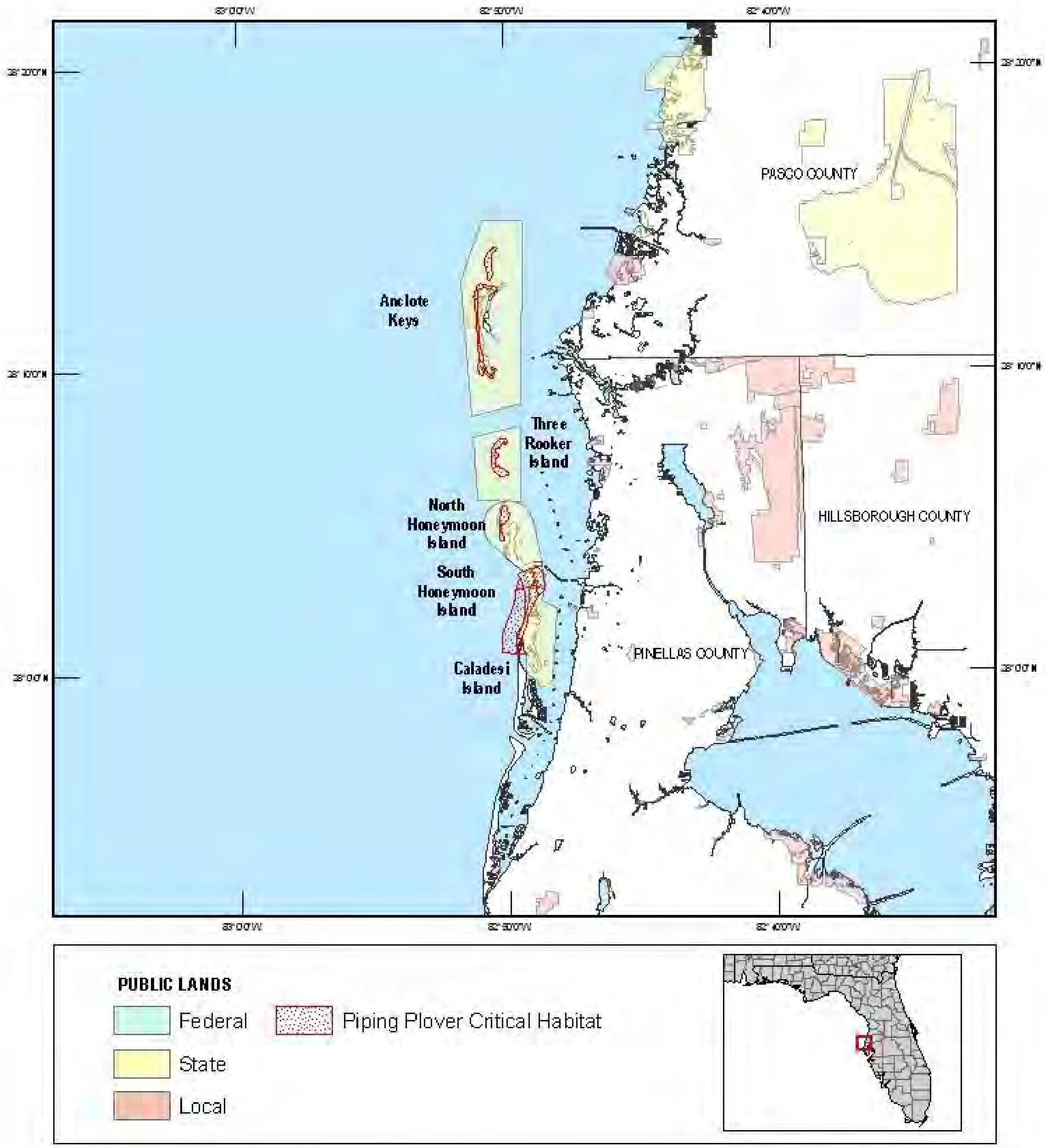
U.S. Fish & Wildlife Service

PIPING PLOVER CRITICAL HABITAT



PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northflorida.fws.gov
(904) 731 3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_PascoPinellas.pdf

0 1.5 3 6 Miles
0 2 4 8 Kilometers

N

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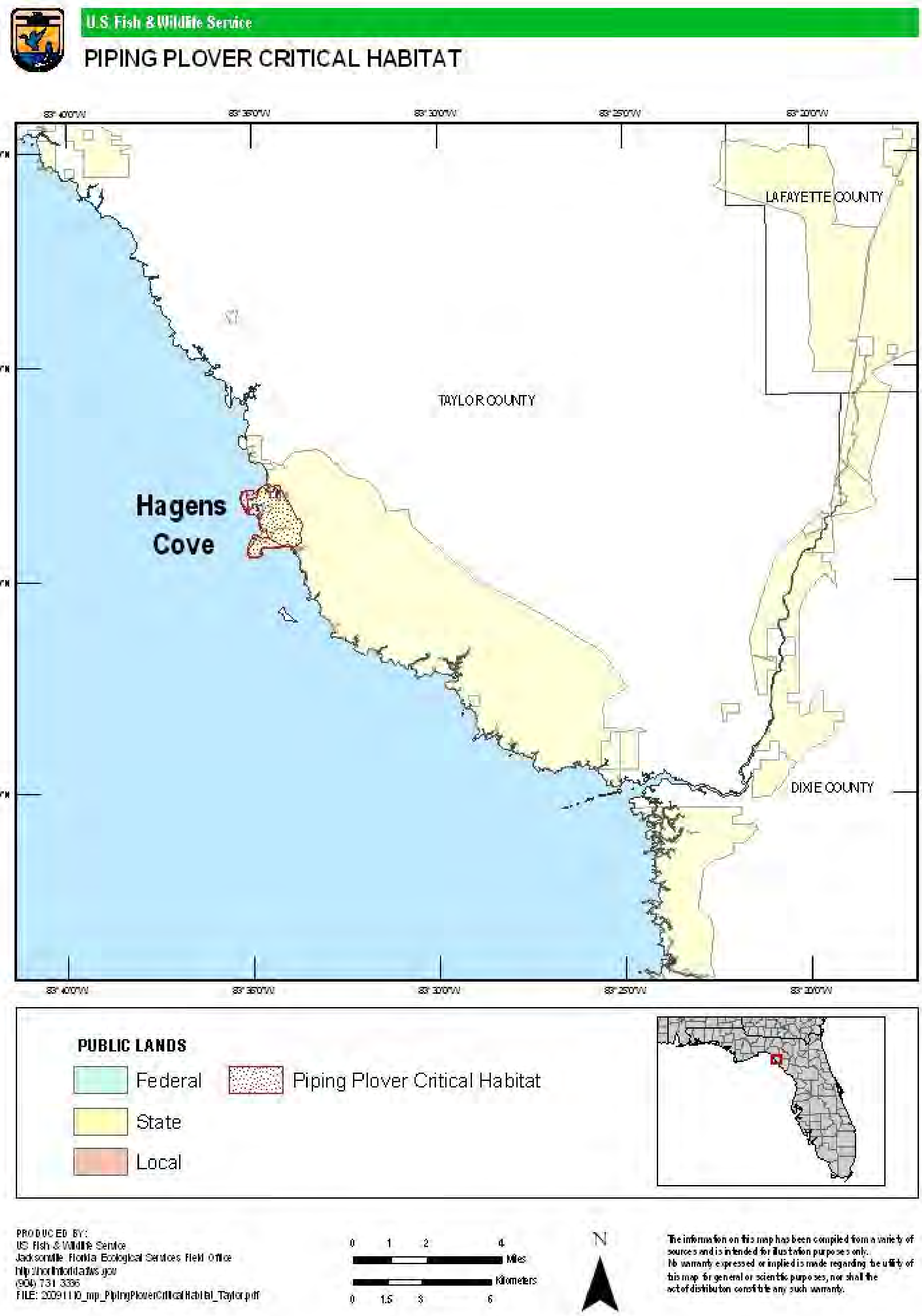
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
LAFAYETTE COUNTY
TAYLOR COUNTY
Hagens Cove
DIXIE COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
(904) 731 3336
0 1 2 4 Miles
Kilometers 0 1.5 3 6
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APPENDIX B: EXAMPLE PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle that is secured and heavy enough not to easily be turned over.

APPENDIX H

United States Army Corps of Engineers
Consultations with
National Marine Fisheries Service
for
Brevard County Florida North and South Reach Areas

Culbertaon, Jennlfer <Jennlfar.cubertson@boem.gov>

RE: Brevard Monitoring Data for nearshore hardbottom

Kevin Bodge <kbodge@olsen-associates.com> Reply-To: kbodge@olsen-associates.com
To: RCUibertson, Jennifer" <jennifer.culbertson@boem.gov> Cc: "Stodola, Paul E SAJ" <Paui.E.Stodola@usace.army.mil>

Mon. May 20, 2013 at 10:53 AM

To my knowledge, the NMFS never responded. Paul Stodola (cc: above) might know.

Kevin R. Bodga, Ph.D., P.E

Olsen Associates, a,c.

2618 Herschel Street

Jacksonvlle, FL 32204 USA.

Office (904) 387-6114/ Fax (904) 384-7368

kbodge@olsen-associates.com

R-om: Culbertson, Jennifer [maiiiD: jennifer.rulbertson@boem.gov]
Sent: Monday, May 20, 2013 9:13 AM
To: kbodge@olsen-associates.com
Subject; Re: Brevard MonitOring Data for nearshore hardbottom

Thanks Kevin! I,l take a look at this report. In the 2009 project consultation with NMFS the USACE stated:

..the Corps and its local sponsor, Brewrd County, propose to continue to monitor nearshore rock in the years when physical monitoring is required (years 1, 2, 3, 5 post construction) and the results submitted to your office.

I don't see the response from NMFS in our files. Was this monitoring not a requirement?

Thanks,

Jen

Jennifer Culbertson, Ph.D

Oceanographer

Jennifer.Culbertson@boem.gov

703-787-1742

Department of the Interior, Bureau of Ocean Energy Management Headquarters, Di\Asion of En\Aronmental Assessment

381 Elden Street
Hemdon, VA 20170-4817

On Fri, May 17, 2013 at 3:51 PM, Ke\An Bodge <kbodge@olsen-associates.com> wrote:

Jen,

No new reports published from the South Reach since before 2009 {i.e.,same as you previously cited). We did only three years of monitoring there {2005-2008).

Monitoring at the south end of Patrick AFB was conducted for seven years. The final summary report for that study is attached.

The degree of natural variability in rock exposure over 7 years (unrelated to project) was pretty interesting.

Kevin

Kevin R Bodge, Ph.D., P.E.

Olsen Associates, Inc.

2618 Herschel Street

Jacksonville, FL 32204 USA

Office (904) 387-6114/ Fax (904) 384-7368

kbodge@olsen-associates.com

From: Culbertson, Jennifer [mailto:jennifer.culbertson@boem.gov]
Sent: Friday, May 17, 2013 1:28PM
To: kbodge@olsen-associates.com
Subject: Brevard Monitoring Data for nearshore hardbottom

Hi Ke\4n,

I am working on the N and S Reach EA and was wondering if you had an nearshore hardbottom monitoring data that may be relevant. I know a monitoring program was in place per NMFS CRs for, at least, South Reach. Do you haw any information from this or any other data that may be new since 2009 that I could reference in the EA?

Thanks!

Jen

Jennifer Culbertson, Ph.D

Oceanographer

Jennifer.Culbertson@boem.gov

703-787-1742

Department of the Interior, Bureau of Ocean Energy Management Headquarters, Di\lision of En\lironmental Assessment
381 Elden Street
Hemdon, VA 20170-4817

BISON CONNECT

Wikel, Geoffrey <geoffrey.wikel@boem.gov>

RE: Brevard North and South Reach FCCE Renourishment Projects (UNCLASSIFIED)

DeMarco, Paul M SAJ <Paul.M.DeMarco@usace.army.mil> Mon, May 6, 2013 at 8:41 AM
To: Geoffrey Wikel <geoffrey.wikel@boem.gov>

Classification: UNCLASSIFIED
Caveats: NONE

No response to the follow-up email below.

-----Original Message-----
From: Geoffrey Wikel [mailto:geoffrey.wikel@boem.gov]
Sent: Saturday, May 04, 2013 8:41 AM
To: DeMarco, Paul M SAJ
Subject: Re: Brevard North and South Reach FCCE Renourishment Projects (UNCLASSIFIED)

Any response to this note?

Geoffrey Wikel
Bureau of Ocean Energy Management
Division of Environmental Assessment
703-787-1283

On Apr 19, 2013, at 10:42 AM, "DeMarco, Paul M SAJ" <Paul.M.DeMarco@usace.army.mil> wrote:

> Classification: UNCLASSIFIED
> Caveats: NONE
>
> Good morning George and Pace,
>
> The USACE has been designated the lead agency for compliance with MSA requirements for the proposed maintenance of Brevard North and South Reach Segments.
>
> Please see the attached correspondence from your office that explains the notification provided and its basis.
> The USACE has complied with BOEM's request to provide courtesy notice to NMFS about the proposed maintenance work.
>
> Please review the section entitled "Finding - Consultation Initiation." Since the proposed action is considered a maintenance of a previously constructed project, we have determined, according to the agreement, that separate consultation is not required.
>
> For this project, the parameters have not appreciably changed and therefore do not trigger specific re-initiation.
> Please note that the 2005 Conservation Recommendations were previously re-considered and re-applied in 2009 following these same procedures.
>
> BOEM is preparing a brief environmental assessment that considers the observed effects of past projects and any new environmental information relevant to potentially different, significant effects that could result from BOEM's decision to authorize use of OCS sand. At this time, BOEM has not identified any information that suggests that there will be significantly different environmental effects to federally managed fish species and fish

habitat from those previously analyzed or considered (see USACE 1996 EIS, USACE 1998 EA, BOEM 2005 EA, BOEM 2009 EA, BOEM in draft).
>
> If there is any specific information that HCD would like to provide for BOEM to consider, BOEM would be more than happy to incorporate that information.
>
> The USACE and BOEM will honor previous commitments reflected in the 2005/2009 response to HCD's Conservation Recommendations. In addition, BOEM will be requiring pre- and post-construction bathymetric surveys at the borrow area. We will provide copy of that data to HCD.
>
> Paul DeMarco
> Biologist
> Corps of Engineers - SAD
> Jacksonville District
> Planning and Policy Division
> 701 San Marco Blvd - P.O. Box 4970
> Jacksonville, FL 32232
> 904-232-1897 (phone)
> 904-232-3442 (fax)
> Paul.M.DeMarco@usace.army.mil<mailto:Paul.M.DeMarco@usace.army.mil>
>
>
> On Thu, Apr 18, 2013 at 5:07 PM, Pace Wilber - NOAA Federal <pace.wilber@noaa.gov<mailto:pace.wilber@noaa.gov>> wrote:
> Hi Paul. Can you or BOEM share with us the evaluation done that shows current conditions are similar to those previously consulted? Pace
>
> On Thu, Apr 18, 2013 at 5:00 PM, DeMarco, Paul M SAJ <Paul.M.DeMarco@usace.army.mil <mailto:Paul.M.DeMarco@usace.army.mil>> wrote:
> Classification: UNCLASSIFIED
> Caveats: NONE
>
> Hello George and Pace, this email is to notify you that the U.S. Army Corps of Engineers (Corps), Jacksonville District, as the lead Federal agency, and the Bureau of Ocean Energy Management (BOEM), which has authority over the use of the borrow area, are proposing to renourish the North and South Reach portions of the Brevard County Shore Protection Project under the authority of the Flood Control and Coastal Emergency (FCCE) program due to impacts to the projects from the passage of Hurricane Sandy. Most likely a hopper dredge would be used to remove up to 2,400,000 cubic yards of sand from either Canaveral Shoals I or II, and the material would be placed on the North and South Reach beach placement areas.
>
> Essential Fish Habitat (EFH) consultation was completed for these projects by National Marine Fisheries Service (NMFS) letter dated 17 January 2005 and Corps response dated 19 January 2005.
>
> Paul DeMarco
> Corps of Engineers - SAD
> Jacksonville District
> Planning and Policy Division
> 701 San Marco Blvd - P.O. Box 4970
> Jacksonville, FL 32232
> 904-232-1897 (phone)
> 904-232-3442 (fax)
> Paul.M.DeMarco@usace.army.mil<mailto:Paul.M.DeMarco@usace.army.mil>
>
>
>
> Classification: UNCLASSIFIED
> Caveats: NONE

>
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>
>
> --
> Pace Wilber, Ph.D.
> HCD Atlantic Branch Supervisor
> NOAA Fisheries Service
> 219 Ft Johnson Road
> Charleston, SC 29412
>
> Voice: 843-762-8601
> FAX: 843-953-7205
> Pace.Wilber@noaa.gov<mailto:Pace.Wilber@noaa.gov>
>
>
> Classification: UNCLASSIFIED
> Caveats: NONE
>
> <5-3-99_NMFS_SERO_EFH_Finding_of_Adequacyltr-signed (3).pdf>

Classification: UNCLASSIFIED
Caveats: NONE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702-2432

January 12, 2005

James C. Duck
Chief, Planning Division
Jacksonville District, Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Duck:

The National Marine Fisheries Service (NOAA Fisheries) has reviewed the essential fish habitat (EFH) consultation you provided concerning beach restoration along the Atlantic Ocean at the "North Reach" and "South Reach" areas of Brevard County, Florida. According to the information provided, the work is needed to protect critically eroded shoreline.

As noted during a several interagency emergency-permitting meetings, a large area of high value Coquina/Sabellariid rock formation is present in the mid-reach reef area off Brevard County. This extends northward to the southern boundary of Patrick Air Force Base (PAFB). The South Atlantic Fishery Management Council (SAFMC) has identified Coquina/Sabellariid rock, nearshore hard bottom, and the ocean water column as EFH. Federally managed fishery resources associated with these habitats include postlarval and juvenile red drum (*Sciaenops ocellata*), white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), and brown shrimp (*Farfantepenaeus aztecus*). The SAFMC has also designated Coquina/Sabellariid rock reefs as a habitat area of particular concern (HAPC) for postlarval/juvenile and subadult pink shrimp and postlarval/juvenile and subadult red drum. HAPC's are subsets of EFH that are rare, particularly susceptible to human-induced degradation, have special ecological importance, or are located in an environmentally stressed area. Detailed information concerning federally managed fisheries and their EFH is provided in the 1998 comprehensive amendments of the Fishery Management Plans for the SAFMC and MAFMC. The 1998 amendment was prepared in accordance with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (P.L. 104-297). The project area may also provide nursery and forage habitat for other species including black drum (*Pogonias cromis*), Atlantic menhaden (*Brevoortia tyrannus*), and blue crab (*Callinectes sapidus*) which serve as prey for other species (e.g., mackerels, snappers, and groupers) that are managed by the SAFMC, and for highly migratory species (e.g., billfishes and sharks) that are managed by NOAA Fisheries.

As discussed with your staff, NOAA Fisheries is concerned that placement of sand fill in the North and South Reach areas is likely to result in burial of portions of Coquina/Sabellariid rock formations. Burial of Coquina/Sabellariid rock formations would result in the subsequent loss or diminishment of highly significant nursery, maturation, cover, and forage base functions which this habitat provides for federally managed fishery resources. This concern is further heightened given that the proposed project would be constructed concurrently with planned beach nourishment at PAFB. The combined effect of these projects would include nourishment of 17.8 miles of the Atlantic Coast shoreline with 2.4 million cubic yards of sand.

Based on discussions with the project sponsors (PAFB, Brevard County, and the U.S. Army Corps of Engineers) and other state and federal resource agencies, it is apparent that several issues require resolution prior to authorization and construction of these projects. Specifically, agreement should be reached on the following needs/issues:

1. An acceptable survey methodology needs to be developed. Presently, a combination of aerial photography, trained multi-spectral image classification, and ground-truthing transects has been proposed;

2. A baseline pre-construction bottom profile which includes mapping and acreage calculation of Coquina/Sabellariid rock coverage should be prepared. This includes determination of which agencies will be responsible for monitoring development of a plan for compensatory mitigation (if needed) in the Mid-Reach sector; and

3. A resource agency approved plan for providing full compensatory mitigation for direct, indirect, and cumulative impacts to Coquina/Sabellariid rock and other EFH. This plan should address compensation for loss of productivity and habitat availability, including that which may be realized during the period between the onset of any impact and reestablishment of a comparable replacement resource.

Due to the magnitude of this historic beach renourishment event, the potential for direct, indirect and cumulative impacts to Coquina/Sabellariid rock formations and other categories of EFH exists. Given that the greatest likelihood for degradation and loss of EFH is through redistribution of sand used for beach nourishment, NOAA Fisheries recommends that the Department of the Army incorporate the following provisions into the project plan:

EFH Conservation Recommendations

1. No fill sand shall be deposited within 50 feet of any Coquina/Sabellariid rock outcrops;

2. A baseline, pre-construction bottom profile which includes mapping and an acreage assessment of Coquina/Sabellariid rock habitat shall be established for the North, South, and the Mid-Reach areas. Post-construction monitoring surveys shall be performed at one year intervals, following project completion. A consistent survey methodology which provides a reliable measure of shoreline accretion and erosion and change in Coquina/Sabellariid rock exposure shall be developed by Brevard County, the U.S. Army Corps of Engineers and PAFB and all monitoring reports shall be made available for review by NOAA Fisheries, and other state and federal resource agencies;

3. A plan for assigning areas of monitoring and mitigation responsibility within the Mid-Reach shall be developed by PAFB, Brevard County and the U.S. Army Corps of Engineers. Details of the plan shall be made available for NOAA Fisheries review and approval prior to project implementation; and

4. A plan for providing full compensation for unavoidable direct, indirect, and cumulative impacts to Coquina/Sabellariid rock outcrops and other categories of EFH shall be developed and made available for NOAA Fisheries' review prior to project implementation. The plan shall address compensation for loss of productivity and habitat availability, including that which may be realized during the period between the onset of any impact and reestablishment of a comparable replacement resource.

The Magnuson-Stevens Act and the regulation to implement the EFH provisions (50 CFR 600.920) require your office to provide a written response to this letter. That response must be provided within 30 days and at least 10 days prior to final agency action. A preliminary response is acceptable if final action cannot be completed within 30 days. Your final response must include a description of measures to be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH conservation recommendations, you must provide an explanation of the reasons for not implementing those recommendations.

We appreciate the opportunity to provide these comments. Please direct related questions or comments to the attention of Mr. George Getsinger, at our Jacksonville Office. He may be reached at 6620 Southpoint Drive South, Suite 310, Jacksonville, Florida 32216-0958, or at (904) 232-2580 ext. 138.

Sincerely,

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:
EPA, ATL
FWS, JAX
DEP, JAX
FFWCC, TAL
F/SER4
F/SER43-Ruebsamen
SAFMC

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702
(727) 570-5317, FAX 570-5300

PD

May 3, 1999

Colonel Joe R. Miller
District Engineer, Jacksonville District
Department of the Army, Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Miller:

Staff of the National Marine Fisheries Service (NMFS) and the Jacksonville District (District) have met to discuss Essential Fish Habitat (EFH) consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This letter concerns the District's planning and operations activities subject to provisions of the National Environmental Policy Act (NEPA). The EFH regulations (50 CFR 600.920) specify that after discussion with a Federal action agency, the NMFS may make a finding that an agency's existing consultation/environmental review processes are adequate, or can be modified, to satisfy EFH consultation requirements.

Three criteria must be achieved to meet the consultation provisions of the regulations. These provisions are: 1) the existing process must provide NMFS with timely notification of actions that may adversely affect EFH; 2) notification must include an assessment of impacts of the proposed action as discussed in Section 600.920 (g); and, 3) NMFS must have made a finding pursuant to Section 600.920(e)(3) that the existing process satisfies the requirements of Section 305(b)(2) of the MSFCMA.

Timely Notification

The District's NEPA process, involving the planning for and preparation of environmental assessments and impact statements and your coordination associated with operational activities, provides the NMFS with timely notification of proposed actions. Your District's public review process generally provides 30 to 90 days before a final decision is rendered on a project.

EFH Assessment

Our staffs have agreed that draft NEPA documents prepared by the District could be modified to contain sufficient information to satisfy the requirements in Section 600.920(g). For purposes of an EFH assessment the documents must include: 1) a description of the proposed action; 2) an analysis of individual and cumulative effects on EFH, Federally managed fisheries, and associated species such as major prey species, including affected life history stages; 3) the District's views regarding effects; and, 4) proposed mitigation, if applicable. The draft documents could incorporate such information by reference to a NEPA document prepared for a similar or related action, supplemented with any relevant new project specific information. Incorporation of information by reference meets EFH consultation requirements provided the proposed action involves similar adverse impacts to EFH in the same geographic area or similar ecological setting, and the referenced document has been provided to NMFS.

In some cases the District prepares notices to supplement NEPA actions or may coordinate on environmental issues prior to initiation of the NEPA review process. When supplemental notices are prepared, they could be modified to reference EFH assessments contained in a companion environmental document or EFH could be addressed separately. Similarly, the District could accomplish "pre-NEPA" consultations by providing NMFS a separate request for EFH consultation and an EFH assessment. In this latter case, a summary of the consultation should be included in any resulting NEPA document.

Finding

Consultation Initiation

The NMFS finds that your agency's NEPA process for Federal works activities can be used to satisfy the consultation requirements of the MSFCMA. Specifically, notification of potential impacts on EFH will occur when the District sends NMFS a draft NEPA document, a project notification, or a separate request for consultation prior to initiating formal NEPA action. In cases involving maintenance activities (especially navigation channels) EFH consultation normally will not be conducted for each event. Rather, consultation will be incorporated into the District's NEPA compliance or public notification events which occur no more frequently than every 5 to 10 years, unless project design parameters change.

Assessment

The evaluation of project impacts on EFH will be addressed in the draft documents in a section or chapter titled "EFH Assessment" or by reference to companion documents. The EFH assessment may also be presented as a separate request for consultation. The information should include both an identification of affected EFH and an assessment of impacts. The EFH discussion may reference pertinent information on the affected environment and environmental consequences when they are provided in other sections, chapters, or companion documents.

Coordination

After receiving an EFH consultation request and assessment, and within the specified public comment period, NMFS will provide the District with a written project evaluation which will include EFH conservation recommendations, when appropriate. NMFS will provide such recommendations as a part of our overall project comments. When EFH issues are raised, they will be contained in a separate section titled "EFH Conservation Recommendations." Written concurrences with District determinations that a project would not adversely impact EFH are not required and will not be provided, although consistent with past practice, NMFS normally will provide a written response indicating that we have no recommendations to offer.

Under Section 305(b)(4)(B) of the MSFCMA, the Jacksonville District has a statutory requirement to respond in writing within 30 days to EFH recommendations made by the NMFS. If the District will not be able to complete a signed Finding of No Significant Impact (FONSI), Record of Decision (ROD), or other final action within 30 days of receiving NMFS EFH Conservation Recommendations, the District should provide NMFS with an interim written response within 30 days. District personnel should then provide a detailed response at least 10 days prior to taking final action (e.g., signing a FONSI or ROD).

Higher Level Review
If a District decision is inconsistent with NMFS EFH conservation recommendations, NMFS will endeavor to resolve any such issues at the field level wherever possible. However, 50 CFR 600.920(j)(2) allows the NOAA Assistant Administrator for Fisheries to request a meeting with a Department of the Army headquarters official to discuss the proposed action and opportunities for resolving any disagreements.

The overall consultation process is briefly outlined in enclosure 1. Also, to assist you in document preparation, I have included, as enclosure 2, a summary of information necessary for an EFH assessment.

Conclusion

If you agree with the procedures described in this finding, a response letter to that effect is requested. Please contact Mr. Rickey Ruebsamen, the Southeast Region's EFH Coordinator, at 727/570-5317, if you have any questions or wish to discuss this finding.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

Enclosures

Enclosure 1

Outline of NMFS - Jacksonville District Process for EFH Consultation for Federal Project Planning and Operations

- COE provides the NMFS with an environmental document, Federal project notice, or "pre-NEPA" notification
  - The COE document indicates that it is intended to initiate EFH consultation
  - Document includes the required components of an EFH assessment
  - NMFS is allowed sufficient time to review and comment

- NMFS provides EFH conservation recommendations, as appropriate, within specified time frames

- COE responds to NMFS EFH conservation recommendations
  - A final response is provided to the NMFS within 30 days, or an interim response may be transmitted if final action on the project can not be completed within that time
  - Final response is provided to the NMFS at least 10 days prior to final action/approval (e.g., signing of a FONSI or ROD)
  - If NMFS recommendations are not accepted, the COE response includes a detailed explanation of why NMFS recommendations are not being followed and a scientific justification for any disagreements over anticipated EFH impacts

- NMFS may seek headquarters-level review of those Jacksonville District decisions contrary to NMFS conservation recommendations

APPENDIX I

United States Army Corps of Engineers
Consultation under the National Historic Preservation Act
with the
Florida State Historic Preservation Officer (2013)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

09 MAY 2013

Mr. Robert Bendus
Division of Historical Resources
State Historic Preservation Officer
500 South Bronough Street
Tallahassee, Florida 32399-0250

Dear Mr. Bendus:

The U.S. Army Corps of Engineers (Corps), Jacksonville District and is renourishing 12.64 miles of critically eroded shoreline located in Brevard County from damage sustained by Hurricane Sandy. The proposed project involves the restoration of the north reach (FDEP Range Markers R-1 to R-53) and the south reach (FDEP Range Markers R-119 to R-137.5) of the Brevard County Shore Protection Project (Figure 1). Severe erosion was experienced along the entire project length. The high erosion rate caused from Hurricane Sandy coupled with the already eroded state of the project area will result in severe damage to protected infrastructure during the next storm season if not repaired beforehand.

The Corps is proposing to use the Canaveral Shoals II Borrow Area, located approximately 5-7 miles southeast of Cape Canaveral, for this project (Figure 1). The Bureau of Ocean Energy Management (BOEM) has authority over the use of this borrow area. Canaveral Shoals II Borrow Area has been used for periodic renourishment since 1999 and as recently as 2005.

Submerged cultural resources surveys previously conducted within Canaveral Shoals Borrow Area II in 1999 (Watts) identified eight potentially significant targets (DHR Project File No. 992156 and 2000-02415). Subsequent diver investigation of these targets in 2001 (DHR Project File No. 2001-316) determined the anomalies to be debris from the Space Program and avoidance was recommended (Watts). A 300 foot buffer was placed around each target during dredging activities. The eight targets will continue to be buffered during the upcoming 2013 dredging activities. Renourishment of the beach will be conducted via pipeline to the beach from a hopper dredge and/or sand rehandling areas.

The Corps has determined that this project will have no effect to historic properties within the north and south reach beach renourishment and Canaveral Shoals Borrow Area II. I request your concurrence on my determination. If there are any questions, please contact Ms. Wendy Weaver at 904-232-2137 or e-mail at wendy.weaver@usace.army.mil.

Sincerely,

Eric P. Summa
Chief, Environmental Branch

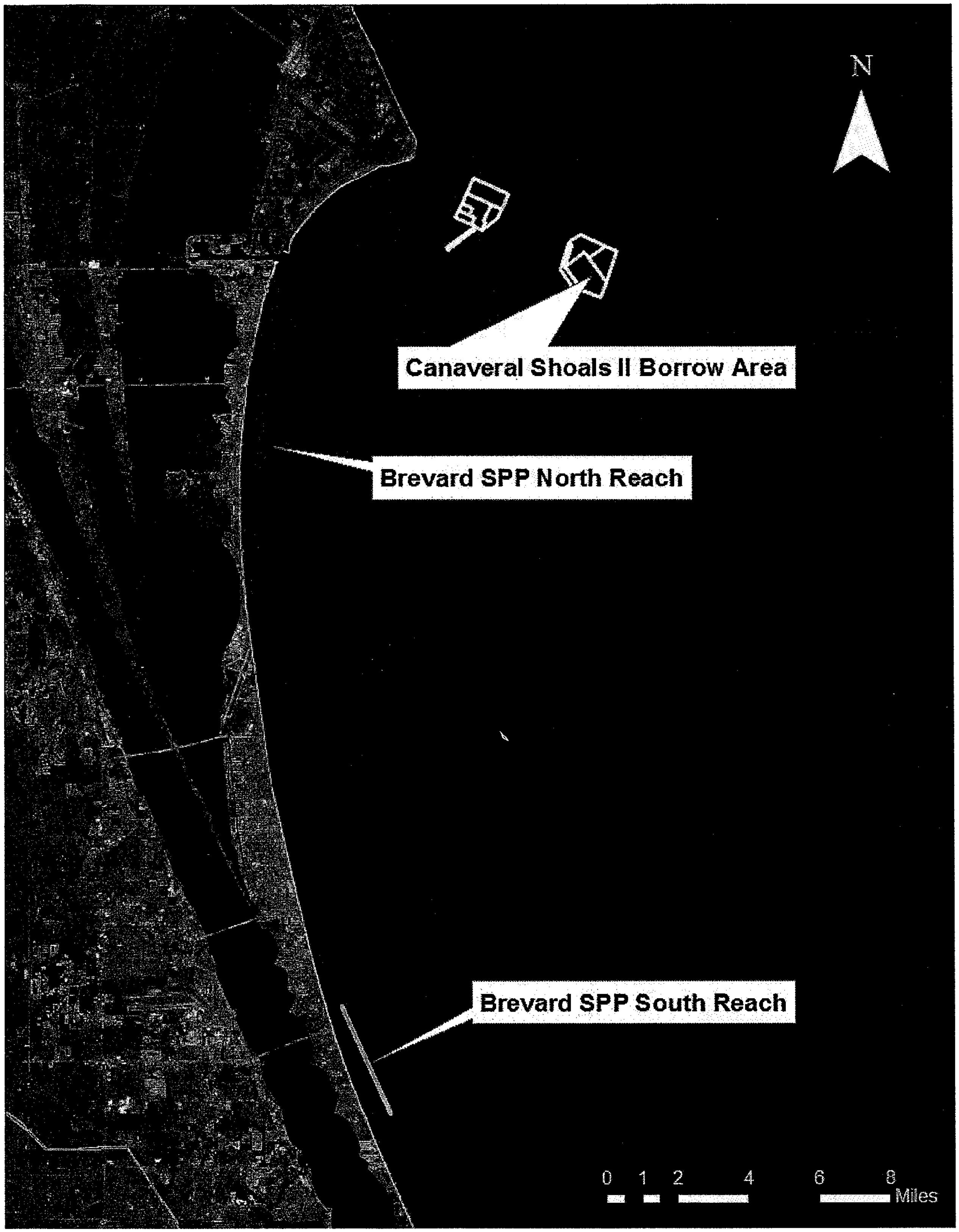

Figure1. Brevard Shore Protection Project Location

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

09 MAY 2013

Planning and Policy Division
Environmental Branch

Mr. Paul Backhouse
Seminole Tribe of Florida
Tribal Historic Preservation Office
30290 Josie Billie Highway
PMP 1004
Clewiston, FL 33440

Dear Mr. Backhouse:

The U.S. Army Corps of Engineers (Corps), Jacksonville District and is renourishing 12.64 miles of critically eroded shoreline located in Brevard County from damage sustained by Hurricane Sandy. The proposed project involves the restoration of the north reach (FDEP Range Markers R-1 to R-53) and the south reach (FDEP Range Markers R-119 to R-137.5) of the Brevard County Shore Protection Project (Figure 1). Severe erosion was experienced along the entire project length. The high erosion rate caused from Hurricane Sandy coupled with the already eroded state of the project area will result in severe damage to protected infrastructure during the next storm season if not repaired beforehand.

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Eric P. Summa
Chief, Environmental Branch

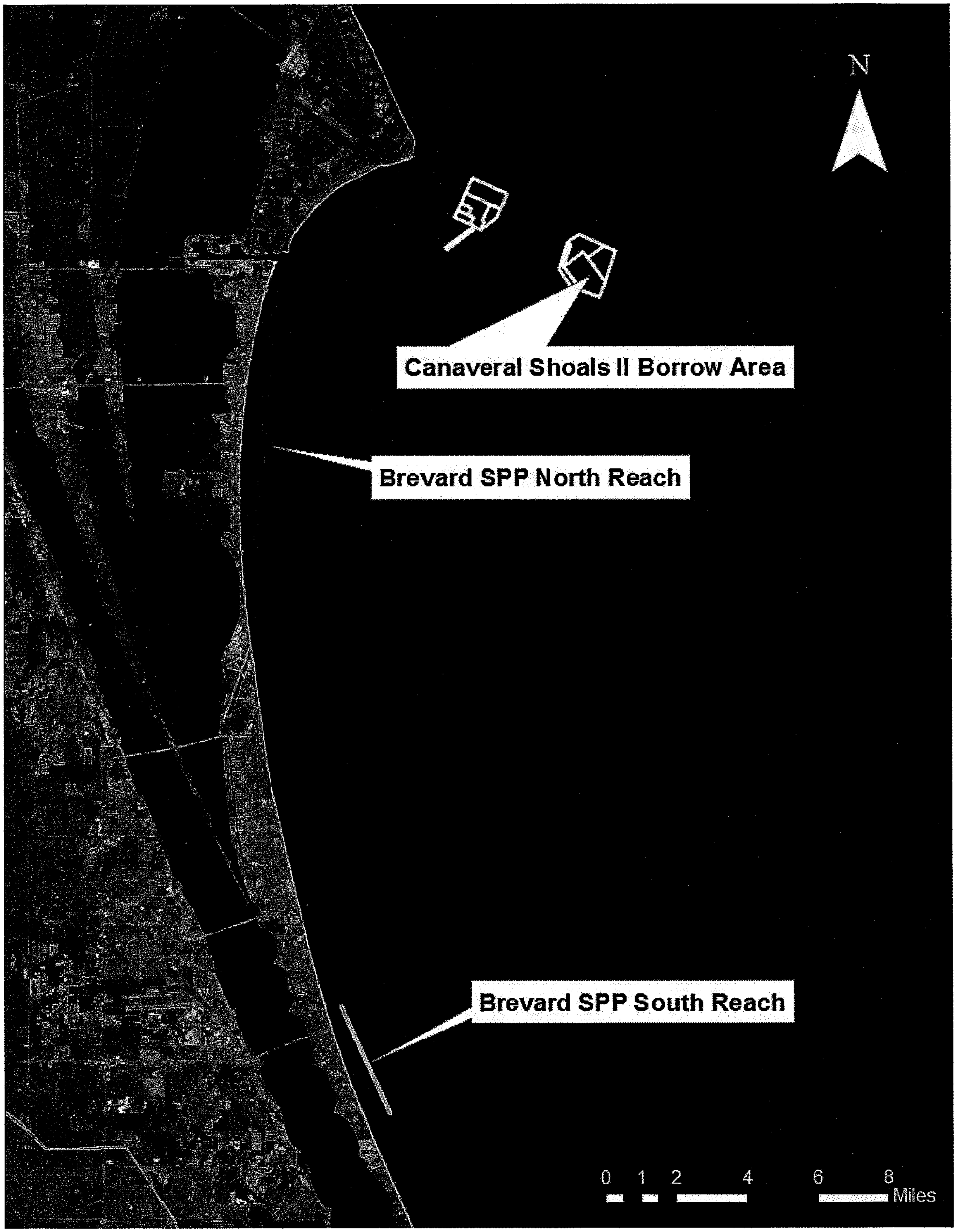

Figure1. Brevard Shore Protection Project Location

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

09 MAY 2013

Planning and Policy Division
Environmental Branch

Mr. Fred Dayhoff, Tribal Representative
NAGPRA, Section 106
Miccosukee Tribe of Indians of Florida
Post Office Box 440021
Tamiami Station
Miami, Florida 33144

Dear Mr. Dayhoff:

The U.S. Army Corps of Engineers (Corps), Jacksonville District and is renourishing 12.64 miles of critically eroded shoreline located in Brevard County from damage sustained by Hurricane Sandy. The proposed project involves the restoration of the north reach (FDEP Range Markers R-1 to R-53) and the south reach (FDEP Range Markers R-119 to R-137.5) of the Brevard County Shore Protection Project (Figure 1). Severe erosion was experienced along the entire project length. The high erosion rate caused from Hurricane Sandy coupled with the already eroded state of the project area will result in severe damage to protected infrastructure during the next storm season if not repaired beforehand.

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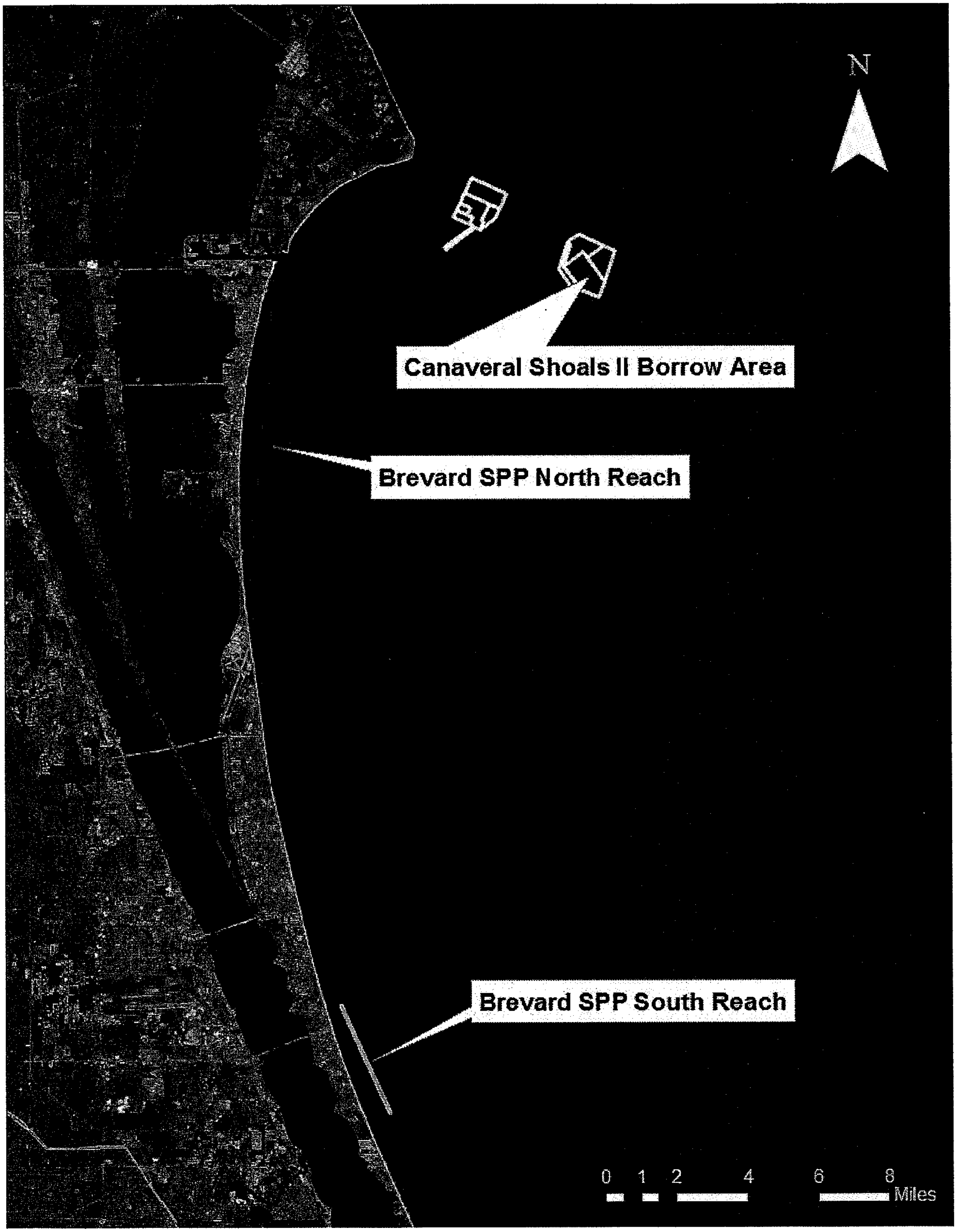
Sincerely,

Eric P. Summa
Chief, Environmental Branch



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