SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT

Draft Biological Assessment

U.S. Army Corps of Engineers
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SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT DRAFT BIOLOGICAL ASSESSMENT

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1.0. INTRODUCTION

1.1. PURPOSE OF BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared to fulfill the U.S. Army Corps of Engineers (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. This BA evaluates the potential impacts that the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (the Project) may have on federally listed species (threatened and endangered), species proposed for listing, and critical habitat that may occur in the Action Area, and describes proposed avoidance, minimization, and conservation measures. This BA has been developed to assist the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) in completing ESA Section 7 consultation for the proposed Project.

The Southern Palm Beach Island Comprehensive Shoreline Stabilization Project includes two projects which will be constructed by two separate Applicants: the Town of Palm Beach and Palm Beach County (County). The USACE has determined that these are similiar actions and is therefore evaluating the environmental effects of these actions together. However, USACE will complete ESA Section 7 consultation for the Town of Palm Beach and County projects separately in association with their respective permit applications. This BA is intended to assist USFWS and NMFS with consultation for both permit applications for actions including the construction of dune restoration and beach nourishment projects, construction of seven (7) low-profile groins (as part of the Palm Beach County project), and artificial reef construction which will likely be required to offset hardbottom impacts.

1.2. PROJECT LOCATION

Palm Beach County is located on Florida's southeast coast approximately 97 km (60 mi) north of Miami (Figure 1-1). There are 38 municipalities within Palm Beach County, four of which are adjacent to the Project Area and located on Palm Beach Island, a 25.3 km (15.7 mi) long barrier island. These four municipalities include, from north to south, the

Towns of Palm Beach, South Palm Beach, Lantana and Manalapan. The Town of Palm Beach prepared comprehensive coastal management plans in 1986 and 1998 which segmented the Town of Palm Beach's shoreline into "reaches" in order to examine erosion problems and develop engineering plans for areas with similar coastal processes. These reaches have remained more or less consistent for the past 25 years, with slight revisions. The 1998 revision expanded the reach concept from the southern limits of the Town of Palm Beach to the southern limits of Palm Beach Island. More recently, the Town of Palm Beach extended Reach 7 into what had been the northern section of Reach 8, so it now includes the Lake Worth Pier; this revision was proposed to reflect the Town of Palm Beach's evolving management strategies. Table 1-1 summarizes the current reach designations on Palm Beach Island (FDEP, 2013a). Reaches 1–8 are located within the Town of Palm Beach and City of Lake Worth, while Reaches 9–11 are associated with the Towns of South Palm Beach, Lantana and Manalapan. The Florida Department of Environmental Protection (FDEP) also utilizes range monuments (R-monuments), a statewide network of survey monuments, to more precisely identify specific locations on the state's shoreline. Palm Beach Island reaches are described by R-monuments, street names and municipalities in Table 1-1.

Table 1-1. Palm Beach Island shoreline reach designation (FDEP, 2013a).

Reach	R-Monuments	Location	Municipality
1	R-76 to R-78+500	Lake Worth Inlet to Onondaga Avenue	Town of Palm Beach
2	R-78 to R-90+400	Onondaga Avenue to El Mirasol	Town of Palm Beach
3	R-90+400 to R-95	El Mirasol to Via Bethesda	Town of Palm Beach
4	R-95 to R-102+300	Via Bethesda to Banyan Road	Town of Palm Beach
5	R-102+300 to R-110+100	Banyan Road to Widener's Curve	Town of Palm Beach
6	R-110+100 to R-116+500	Widener's Curve to Sloan's Curve	Town of Palm Beach
7	R-116+500 to R-128+530	Sloan's Curve to Lake Worth Pier	Town of Palm Beach*
8	R-128+530 to R-134+135	Lake Worth Pier to South Town Limits	Town of Palm Beach*
9	R-134+135 to R-137+400	La Bonne Vie to Lantana Avenue	Town of South Palm Beach/ Town of Lantana
10	R-137+400 to R-145+740	Lantana Avenue to Chillingsworth Curve	Town of Lantana/ Town of Manalapan
11	R-145+740 to R-151+300	Chillingsworth Curve to South Lake Worth Inlet	Town of Manalapan

***The City of Lake Worth has jurisdiction over a small shorefront in this reach.**

The Project Area extends from R-129-210 to R-138+551 for a length of 2.07 miles. As of June 2014, the FDEP has classified this entire Project shoreline as "critically eroded", which is a designation applied to areas where erosion has been determined to threaten development interests (FDEP, 2014). The Project Area beaches, which provide storm protection to residential and public infrastructure and serve as nesting areas for marine turtles, have experienced erosion from hurricanes, tropical storms, and other weather phenomena, such as strong high pressure systems (Nor'easters) and swell events. The annual shoreline change along the Project Area from June 2004 to winter 2011/2012 averaged a loss of 2.25 ft/yr (CPE, 2013). The Project Area and site conditions are strongly influenced by natural coastal processes due to its location within the littoral cell and the amount of sand entrained in the littoral sand transport system. The erosion rates for this area are driven by many factors, including recent storm events, upland retaining walls, loss of dune habitat, disruptions in littoral sand transport, geographic location on the coast and/or in a littoral cell, proximity to a tidal inlet, sea level rise, nearshore beach morphology, and adjacent coastal structures. These factors, combined with the dynamic nature of coastlines, typically result in characteristics such as a narrow, low-profile beach providing minimal storm protection.

Generally, the Project is in a densely populated urbanized residential setting on a coastal island separated from the main Florida peninsula by the Lake Worth Lagoon (LWL). Bridges spanning the LWL provide access to the coastal island and Project Area. Approximately 1.3 million people live within Palm Beach County and 8,348 people live on Palm Beach Island (U.S. Census Bureau, 2010). The shoreline along the upland development is comprised of hotels, condominiums, homes, and public parks.

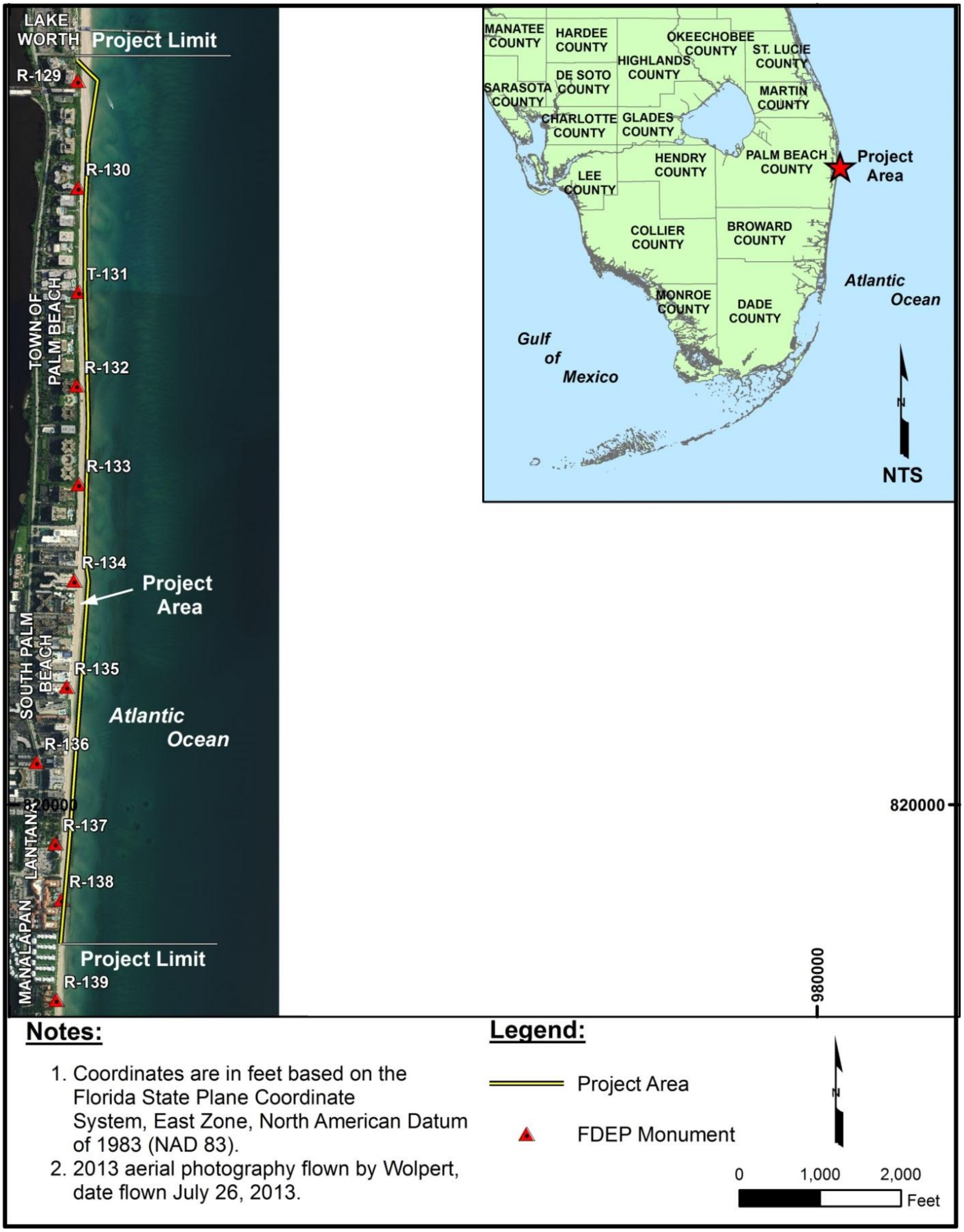


Figure 1-1. Southern Palm Beach Island Comprehensive Shoreline Stabilization Project location map.

1.3. PROPOSED ACTION

The Proposed Action (designated as the Applicants' Preferred Project Alternative, "Project") would use a combination of beach nourishment, dune reconstruction and coastal structures (Figure 1-2). The proposed Project has been designed to enhance stability to existing seawalls and to enhance the existing beach and dune system for storm protection to upland property. Approximately 150,000 cubic yards (cy) of fill will be placed along the shoreline within the Project Area from R-129-210 to R-138+551 (approximately 3.33 km (2.07 mi)). The fill volume will be split between the two Applicants' separate project areas – 75,000 cy of sand in the Town of Palm Beach and 75,000 cy in the County project area within South Palm Beach, Lantana and Manalapan. From north to south, the project would place dune nourishment only from R-129-210 to R-129+150, dune and beach nourishment from R-129+150 to R-131, dune nourishment only from R-131 to R-134+135 (Town of Palm Beach southern limit), and beach nourishment with seven low-profile groins from R-134+135 to R-138+551 (Figure 1-2).

It is anticipated that the delivery mechanism for the nourishment will be a truck-haul operation. The sand source would be a combination of stockpiled dredge material from the Reach 7 Phipps Ocean Park Beach Restoration Project (Phipps) or the Mid-Town Beach Restoration Project (Mid-Town) for placement within the Town of Palm Beach project limits (R-129-210 to R-134+135) and upland sand for placement within the County project limits in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). For the initial construction of the proposed Project, the Town of Palm Beach proposes to utilize an offshore sand stockpile which will be located within the permitted Phipps template, as authorized by USACE Permit No. SAJ-2000-00380 and authorized by FDEP under the BMA (FDEP, 2013a). For subsequent maintenance of the Project, the Town of Palm Beach plans to alternate between utilizing the Phipps stockpile and an offshore sand stockpile within the permitted Mid-Town template as authorized by USACE under Permit No. SAJ-1995-03779 and authorized by FDEP under the BMA (FDEP, 2013a). The Phipps and Mid-Town Projects would utilize either a hopper or cutterhead dredge to obtain beach quality sand from an offshore borrow area. If the project schedules do not coincide, the Town of Palm Beach may truck in sand from upland mines. The County only proposes upland sand for construction of its portion of the Project. This BA considers impacts from transport of sand from both stockpiles and upland mines.

As stated in Section 1.1, the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project includes projects which will be constructed by two separate Applicants: the Town of Palm Beach project area extends from R-129-210 to R-134+135, and the County project area extends from R-134+135 to R-138+551. The total Project Area extends from R-129-210 to R-138+551. This BA considers the larger Action Area, from R-127 to R-141+586, which includes all areas to be affected directly or indirectly by the action, and not merely the immediate area involved in the action (50 CFR 402.02). The Action Area is described in Section 1.4.

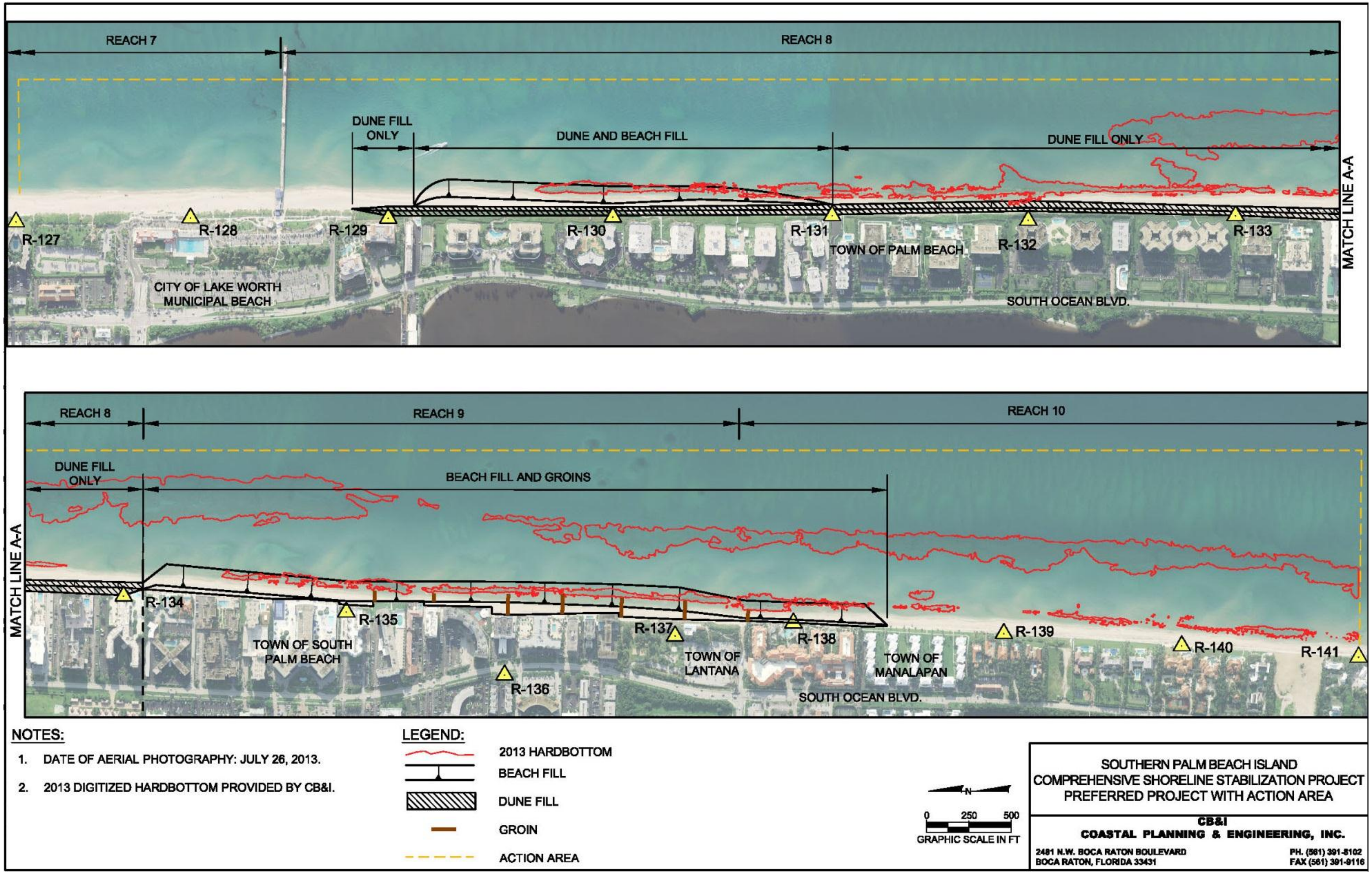


Figure 1-2. Proposed Project.

1.3.1. Truck-Haul Operations

For any alternative including beach and dune fill, potential sand sources include stockpiled offshore dredged material and upland mines, all delivered to the Project Area via truck haul. Utilizing a truck-haul approach for a beach fill project involves several stages of transport: loading of material at the mine site or stockpile, road transport via dump trucks, beachside delivery and stockpiling, transfer from stockpile to off-road vehicles, beach transport, placement, and grading. The only need for in-water work during the truck haul fill process will be if vessels are required during turbidity monitoring.

For the proposed Project, the truck-hauled sand source would be a combination of stockpiled dredge material from the Phipps template or the Mid-Town template for placement within the Town of Palm Beach project limits (R-129-210 to R-134+135) and upland sand for placement within the project limits in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). The Phipps Project (alternating with use of a stockpile from the Mid-Town Project) is planned to occur at the same time as the Project discussed herein, but if the project schedules do not coincide, the Town of Palm Beach may truck in sand from upland mines. The remaining sand fill along the County shoreline in the Towns of South Palm Beach, Lantana and Manalapan would utilize sand from one or more upland mines.

Sand from either source must meet FDEP requirements for beach sand compatibility as per Florida Administrative Code, Rule 62B-41.007(2)(j). These criteria apply to all beaches in Florida so that the sand closely resembles the “native” sand for biological, physical and aesthetic purposes. For the specific Project Area, any sand source must be consistent with the BMA cell-wide sediment quality specifications (Table 1-2) (FDEP, 2013a). The sand source used for the County project must also meet the County's technical sand specifications (provided as Appendix B to the EIS). According to the County’s technical standards, sand must be obtained from a source further than 800 ft landward of the coastal construction control line, must be similar in color to the native beach material, must be free of construction debris, rocks, clay, or other foreign matter, must have less than 1% organic material, must be free of coarse gravel or cobbles, must have a particle size distribution ranging predominantly between 0.074 mm and 4.76 mm, and must be well-drained and free of excess water and have a moisture content of less than 10%. By adhering to the above standards and regulations, no foreign matter or unacceptable material as a component of the fill material is anticipated.

Table 1-2. FDEP sediment quality compliance specifications as per the BMA (FDEP, 2013a).

Sediment Parameter	Parameter Definition	Compliance Value
Mean Grain Size	Min and max values (using moment method calculation)	0.25 mm to 0.60 mm
Maximum Silt Content	Passing #230 sieve	2%
Maximum Fine Gravel Content*	Retained on #4 sieve	5%
Munsell Color Value	Moist value (chroma = 1)	6 or lighter

Note: The beach material shall not contain construction debris, toxic material, other foreign matter, coarse gravel or rocks.
***Shell content is used as the indicator of fine gravel content for the implementation of quality control/quality assurance procedures.**

Delivery of sand via truck haul would require beach access points along State Road (S.R.) A1A large enough to allow passage of dump trucks and heavy machinery. If space at the access area is too limited to allow efficient transfer from long-haul road truck to off-road truck, a conveyor system may be used. Access points are needed to remove sand from the stockpile and to deliver sand to the Project Area. If stockpiled sand is utilized from the Phipps Project, it will be accessed at the 3360 Condominium property (3360 S. Ocean Blvd.). If sand stockpiled from the Mid-Town Project is used, the stockpile will be accessed at the intersection of Peruvian Avenue and S.R. A1A. For placement of truck-hauled sand, two potential access points were identified as suitable along the Project Area shoreline, including one within the Town of Palm Beach project area and one within the County project area. Since 2005, the Town of Palm Beach has truck-hauled sand and placed equipment on the beach in Reach 8 from the 3200 Condominium property (3200 S. Ocean Blvd.). The Lantana Public Beach will act as a staging area for the County project, with access via Dorothy Rissler Road.

For transport to the Project Area, the Applicants will likely employ a ‘mixed fleet’ of long-haul road trucks including two-axle and six-axle dump trucks. Long-haul road trucks are capable of transporting 15-20 cy of material and, when fully loaded, have a gross weight of approximately 20-27 tons, respectively. If more distant sand sources are used, such as mines in northern Florida, it is possible that material would be transported from the mine via railway. Material can be transported as a single railcar, a group of cars, or a unit train of 80-100 cars each. A single railcar can carry 100 tons of material, or about 74 cy. A unit train could transport between 80,000-100,000 tons of sand and would be the most cost-effective rail method. Once delivered to a nearby stockpile area, material may be offloaded from the rail and then re-loaded onto trucks. Another option for delivery of material from domestic upland sand sources is to do so by barge. Although possible, this approach would require many steps to transfer sand to and from the barge as well as truck delivery to the beach - it is unlikely that this method would be used.

In contrast to hydraulically placed beach nourishment, a truck haul operation is complicated by the bulking of the sand. Sand placed hydraulically or reworked by waves is near its maximum density. Sand placed and transported in the dry may not be at the maximum density. Depending on its loading, transporting, and placement processes, the density of the sand may be approximately 10% less than hydraulically placed sand. As the sand is reworked by waves and tides, consolidation will occur. Therefore, an additional volume may be placed to compensate for the expected consolidation.

For a truck haul operation there are several limitations to the construction progress. These include the following: constructing during only daylight work hours, truck availability, traffic congestion on the roads, traffic congestion at the beach access points, and the time associated with re-handling and movement of sand along the beach.

Offshore sand source. A stockpile of dredged material from the Phipps Project (alternating with use of a stockpile from the Mid-Town Project) is the preferred sand source for the Project Area within the Town of Palm Beach limits. The Palm Beach Island Beach Management Agreement (BMA) (FDEP, 2013a) authorizes the dredging and stockpiles for the Phipps and Mid-Town projects, and federal authorizations will be provided under USACE Permit Nos. SAJ-2000-00380 and SAJ-1995-03779 for the

Phipps and Mid-Town projects, respectively. Phipps and Mid-Town projects may dredge sand from North Borrow Area 1 (NBA1), South Borrow Area 2 (SBA2), South Borrow Area 3 (SBA3) (Figure 1-3), or any offshore sand source that is consistent with the BMA cell-wide sediment quality specifications (Table 1-2) (FDEP, 2013a). The stockpiled sand will be located within the permitted Phipps and Mid-Town templates (alternating between the two projects) and will be considered an active stockpile so that sand is removed for transport to the Project Area soon after it is piled. The total proposed volume for placement within the Town of Palm Beach is approximately 75,000 cy, 12,000 cy of which will be placed below mean high water. If timing of the Phipps and Mid-Town projects does not allow for use of dredged sand, the Town of Palm Beach would consider using sand from an upland source.

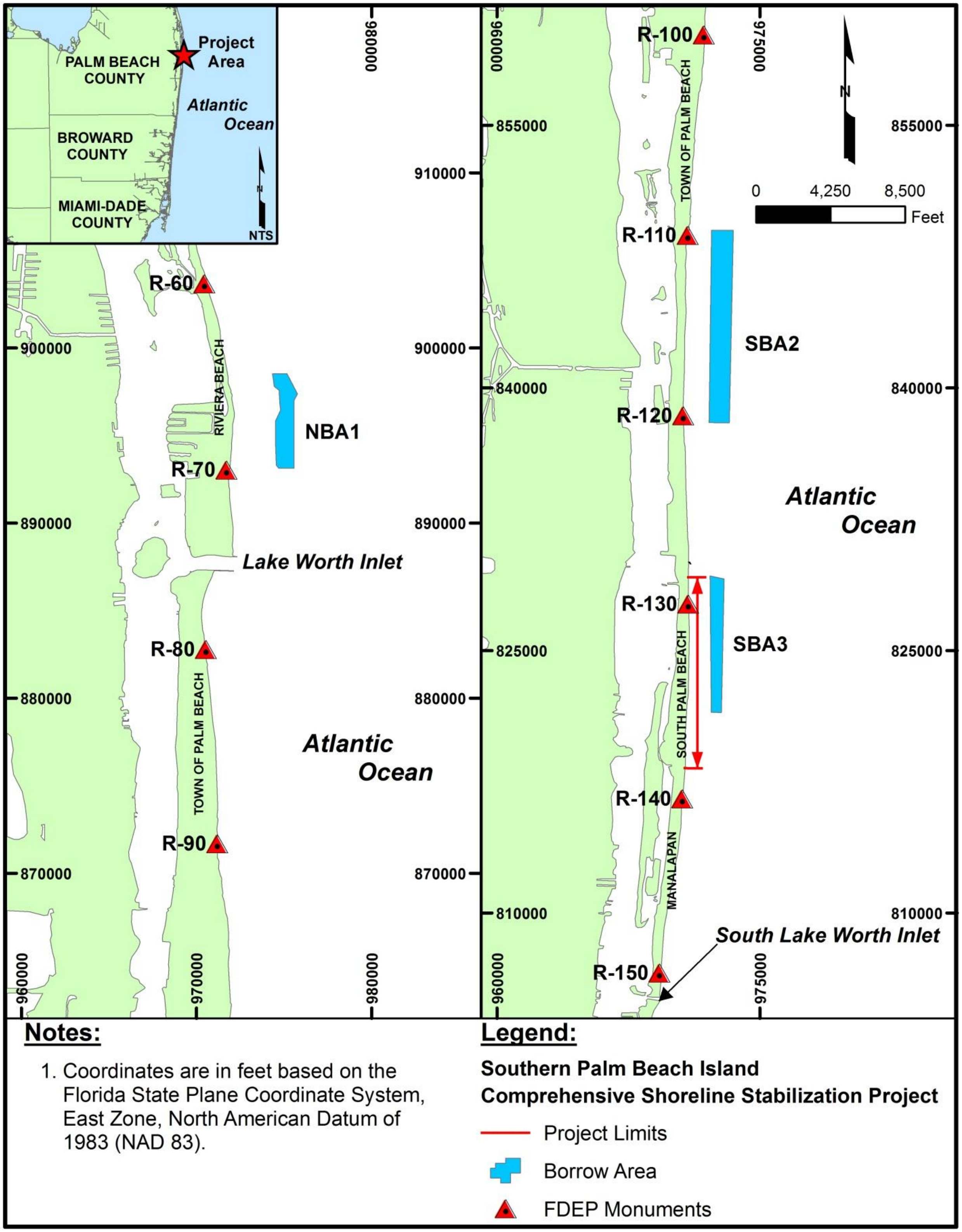


Figure 1-3. Potential borrow areas to be used during Phipps and Mid-Town projects that may supply the sand for the proposed Project within the Town of Palm Beach limits (R-129-210 to R-134+135).

Upland sand source. Use of upland sand allows the greatest flexibility in project planning. Upland sand sources have provided sand for beach and dune restoration projects in Florida for over a decade. Upland sand has historically been used for small projects (less than 50,000 cy) (USACE, 2001), but upland sand has recently been utilized for larger projects in Indian River County, Broward County, and Brevard County, and is currently being considered for a separate 5-mile long project in Broward County. Within Palm Beach County, upland sand has been used for restoration efforts in Coral Cove Park in Tequesta, Singer Island, Town of Palm Beach, South Palm Beach, Lantana, and Delray Beach. Specifically within the Project Area, the Towns of Palm Beach, South Palm Beach, and Lantana have utilized upland sand to maintain dune habitat and protect upland infrastructure.

The sand source for the County project area within the limits of the Towns of South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551) is sand from domestic upland sand quarries within the state of Florida. The sand would be placed on the beach mechanically, rather than hydraulically. There are known sand mines within 100 miles of the Project shoreline that have provided clean, quality material for past nourishment projects in southeast Florida. A study conducted in Broward County found that due to a larger mean grain size and smaller fines content, upland sand is expected to be more stable and produce less turbidity in the nearshore environment than sand obtained from offshore borrow areas (OAI and CPE, 2013).

To identify potential upland sand sources for this Project, several mines will be selected for evaluation based on successful usage for past projects. Each mine will be evaluated based on compliance with the quality guidelines outlined in Table 1-2 and the County's technical sand specifications, sediment characteristics, location relative to the Project Area, compliance with state and federal laws and method of transport available. The County does not have a preferred upland mine; contractors can propose to use any mine as long as the material meets the County's technical sand specifications summarized in Section 1.3.1. Thirteen upland mines located in Florida which have the potential to be evaluated for use for this Project are listed in Table 1-3 and their locations are shown on Figure 1-4; this is not a complete list of potential sand sources, and the sand at these upland mines has not yet been specifically evaluated for use in this Project. The Town of Palm Beach's preferred upland sand mine is E.R. Jahna Industries, Inc. Ortona Sand Mine (Ortona), which has been previously utilized within the Town of Palm Beach. Previous County projects have utilized sand from Ortona and Stewart Mining Industries in Ft. Pierce, as well as from local County preserves.

Table 1-3. Potential upland sand sources.

Company	Mine Name	Distance from Project Area (mi)*
E.R. Jahna Industries, Inc.	Ortona	96
Stewart Mining Industries	Ft. Pierce	79
Stewart Mining Industries	Immokalee	138
Vulcan Materials Co.	Witherspoon	93
Cemex	Davenport	175
Cemex	Palmdale	101
Henry Fischer & Sons Leasing, Inc.	17th St. SW	88
Henry Fischer & Sons Leasing, Inc.	Ranch Road	91
Florida Shell & Fill Company	Diner Ranch	132
JJJ Enterprises	Farabee	135
Cemex	Lake Wales	155
CC Calhoun	Pit 1	154
E.R. Jahna Industries, Inc.	Greenbay	183

*Distance is the shortest driving distance (miles) between each mine and Lantana Municipal Beach Park; actual distance will depend on routes selected by contractor.

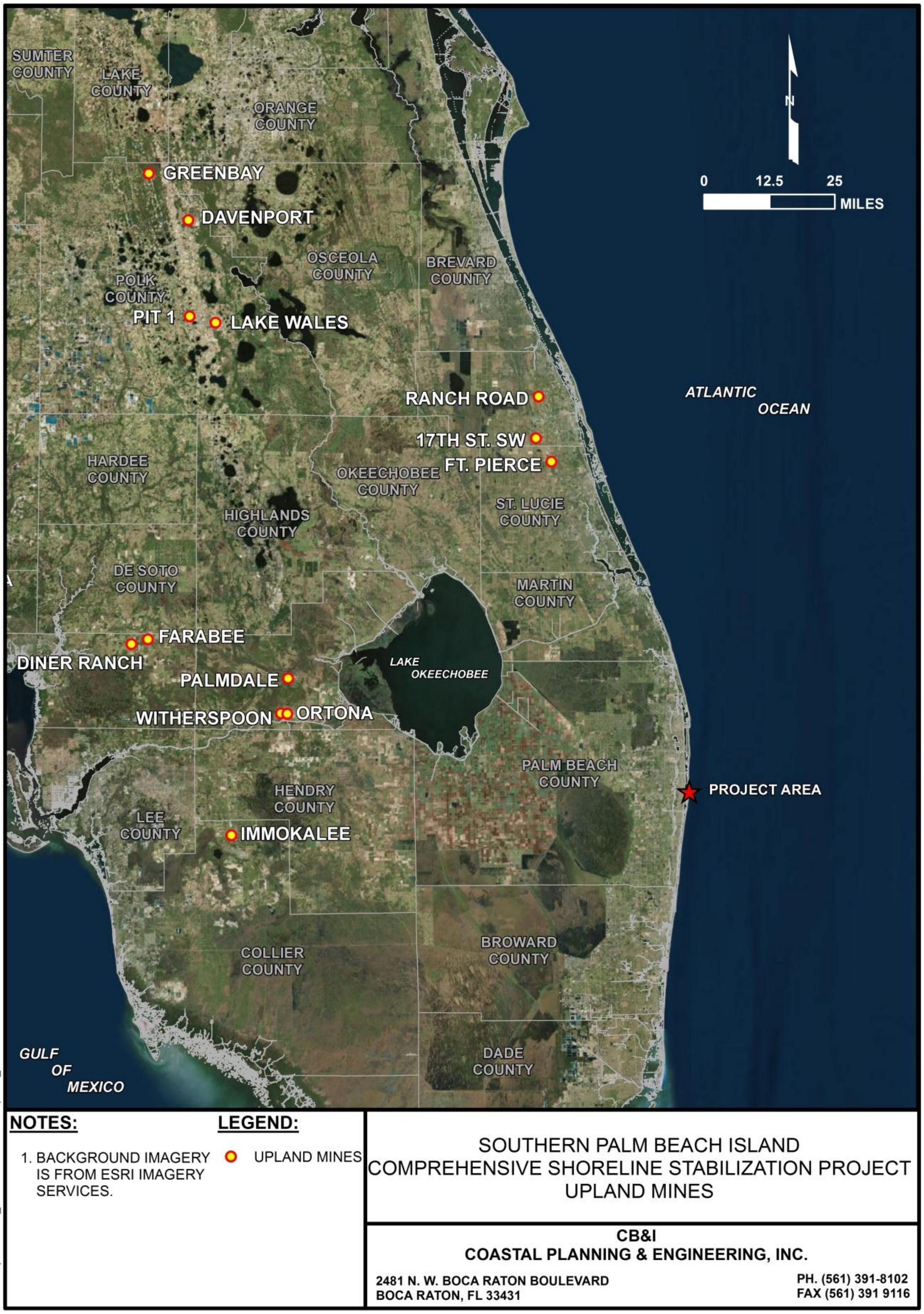


Figure 1-4. Upland sand mines with potentially feasible sources of material that could be considered for a truck-haul project for placement in the proposed Project Area.

One consideration involved with selecting upland sand sources is the availability of material within the mines, as this can affect overall construction rate of the project. The mine(s) selected must have sufficient total and daily production capacity to meet the project needs. Sand mines can stockpile some of the material to ensure that they can keep pace with required delivery rates. Other considerations that affect project efficiency include the distance from the mine to the project, the number of trucks and other machinery at the staging and beach nourishment areas, as well as the number of active access points. In the event that delivery rate exceeds handling time on the beach, it may be useful to employ offsite truck waiting areas to avoid congestion at the access points. Those mines determined to be most suitable based on the state and County sediment guidelines, as well as having sufficient production capacity and a reasonable trucking distance from the Project Area, will be considered.

1.3.2. GROIN CONSTRUCTION

The County portion of this Project also includes the construction of seven (7) groins placed perpendicular to the shoreline extending from the existing seawalls to the post-construction (beach fill) shoreline in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) (Figure 1-2). The groins will be low-profile, meaning that they are designed to be level with the berm and are intended to blend in with the beach. They will be concrete king pile and panel groins with 18 inch (+/-) wide H-piles spaced every 8 to 10 ft. Exact location and length of the groins will depend on the presence of nearshore hardbottom resources at the time of construction, but it is currently estimated that they will be approximately 90 ft long and spaced approximately 300 ft apart. As the sand naturally erodes from the beach, the groins would gradually become partially exposed until the next nourishment. The result will be a disruption of the natural littoral sand transport system along the beach in this area, with sand accretion/sediment deposition occurring on the updrift side and erosion on the downdrift side of the groin field. The construction of the groins may occur from either land-based operations or using in-water construction, or a combination of the two methods.

1.3.3 MEASURES TO MINIMIZE/MITIGATE ENVIRONMENTAL IMPACTS

The Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will utilize beach compatible sand and will be constructed during daylight hours between November 1 and April 30 in order to avoid peak sea turtle nesting season, thereby minimizing impacts to sea turtles.

The proposed Project has also been designed to maximize coastal protection while minimizing impacts to nearshore hardbottom. The Project includes some sections of dune-only construction, including placement of dune fill only between R-131 to R-134+135, which is adjacent to extensive nearshore hardbottom. Of the 150,000 cy of fill volume proposed for the Project, only 36,500 cy will be placed below mean high water (MHW). Although measures have been incorporated into the project design to minimize hardbottom impacts, placement and equilibration of beach sand will impact nearshore hardbottom resources. Hardbottom closest to shore will be directly buried by placement of beach sand immediately following construction, while equilibration (spreading) will impact additional hardbottom (Figure 3-1). Based on engineering and modeling results (Appendix G to the EIS), it is anticipated that the Project may result in permanent impacts to 4.03 ac of hardbottom as well as temporary and secondary impacts to 8.13 ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand (Figure 1-3). Impacts to hardbottom were based on a time average of exposed hardbottom delineated from aerial images between 2003 and 2013. Using the engineering and modeling results, historic exposed hardbottom acreage, and recent benthic characterization data, a preliminary Uniform Mitigation Assessment Method (UMAM) evaluation was conducted (provided as Appendix H to the EIS). This draft UMAM analysis determined that 6.39 acres of mitigation may be required to offset these impacts to intertidal and subtidal hardbottom. The Project, which includes Town of Palm Beach and Palm Beach County projects, has been evaluated in this Biological Assessment and in the EIS as a comprehensive project; however, these projects will be permitted separately. In order to facilitate the permitting of these projects, engineering and modeling analyses were also performed to quantify hardbottom impacts resulting from each separate project. These impacts are presented in Section 5.1.1.2.1 of the EIS.

Appendix I to the EIS provides the Applicants' draft mitigation plans, including potential locations of the artificial reef sites. The artificial reefs will likely be constructed of limestone boulders or boulder pods placed over sand substrate of 1-2 ft thickness. The reefs will be placed at a similar depth as the impacted hardbottom resources and will be constructed with a protective buffer between the artificial and natural reefs.

A dune planting plan for the Town of Palm Beach South End Restoration (Reach 8) Project (CSI, 2011b) was established in December 2011 and may be adopted to evaluate the installation of plants and ensure that planting will be conducted in accordance with the plans and specifications for the proposed Project. Post-construction monitoring will also occur to determine plant survivorship and success.

A complete description of Conservation Measures is provided in Section 7.0.

1.4. ACTION AREA

The Action Area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action (50 CFR 402.02). For the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project, the Action Area to be assessed in this BA includes approximately 5 km (3 mi) of dune and beach habitat and nearshore marine environment from R-127 south to R-141+586 within the southern extent of Reach 8, throughout all of Reach 9, and the northern extent of Reach 10 (the Action Area is indicated by the yellow dashed line in Figure 1-2). The Action Area includes the 3.33 km (2.07 mi) of shoreline and nearshore habitat within the project construction area (direct impact), in addition to adjacent areas to the north and south of the Project where construction equipment may operate on the beach and where impacts to the nearshore environment could occur as a result of sand equilibration (indirect impact). The eastern limit of the Action Area extends out to a maximum of approximately 360 meters (1,181 ft) offshore in order to assess potential impacts to all nearshore hardbottom resources (Figure 1-2). The Action Area also includes the truck routes from the upland mine(s) and from the Phipps and Mid-Town stockpiles, as well as the offshore sites where mitigative artificial reefs will be constructed to offset project impacts to hardbottom.

The Action Area evaluated in this BA does not include the offshore borrow areas which will be the sand source for stockpiles which will be utilized for the Project Area within the Town of Palm Beach, between R-129-210 to R-134+135. These borrow areas will be dredged for the Phipps and Mid-Town projects under authorization of the Palm Beach Island Beach Management Agreement (BMA) (FDEP, 2013a), and federal authorizations will be provided under USACE Permit Nos. SAJ-2000-00380 and SAJ-1995-03779 for the Phipps and Mid-Town projects, respectively. The Action Area also does not include the upland mine (or mines) which will be the sand source for the Project Area between R-134+135 and R-138+551, as these mines are authorized independent of the Project. Each of the mines being considered for the truck-haul alternative will receive full clearance from the State Historic Preservation Officer (SHPO) at the Division of Historical Resources (DHR) before mining activities begin.

The effects associated with utilizing a truck haul methodology from upland mines or stockpiles of offshore sand include the following:

Truck transport from the mine or stockpile area. Truck haul through urban and residential areas potentially creates noise, pollution, traffic congestion, road damage, spilled sand along roadways, and numerous other safety and aesthetic concerns (USACE, 2001).

Traffic. Effects of the associated increase in vehicular traffic may include: air quality degradation, increased petroleum products in stormwater runoff from the roads, increased noise, greater potential for collision with upland wildlife, increased traffic congestion, and reduced vehicular and pedestrian safety as a result of increased truck traffic.

Staging areas. Staging areas provide space to transfer fill material from road-trucks to off-road-trucks and for short-term storage of materials. Off-road-dump trucks would move the fill material from the staging areas to the beach and dump the sand within the construction template for grading by mechanized machinery to appropriate template elevations. The staging areas off the beach may provide temporary storage of equipment during construction. All equipment maintenance would occur off the beach and dune environment at an appropriate off-site location. Timing and sequencing of the Project would include considerations of minimizing traffic disruptions, public park access control, and adjacent property owners.

Noise. The main sources for noise production along the shoreline of the proposed Project Area include breaking surf, boat activity, and the typical noises associated with adjacent residential areas. Noise levels during construction will increase above the background levels due to the presence of construction equipment and personnel.

Heavy trucks, including all log-haul tractor-trailers (semi-trucks), large tow trucks, dump trucks, cement mixers, large transit buses, motor homes with exhaust located at top of vehicle, and other vehicles with the exhaust located above the vehicle (typical exhaust height of 12 to 15 feet) create noise levels of 84 to 86 dBA at 55 mph at 50 feet (Traffic Noise, 2014).

Air pollution. Air pollutants are classified as either primary or secondary depending on how they are formed. Primary pollutants are generated daily and emitted directly from a source into the atmosphere. Primary pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), nitric oxide (NO), sulfur dioxide (SO_2), particulates (PM-10 and PM-2.5), and hydrocarbons (HC). Hydrocarbons are also known as volatile organic compounds (VOC).

Secondary pollutants are created over time as a result of chemical and photochemical reactions in the atmosphere. Ozone (O_3) is a secondary pollutant, formed when NO_2 reacts with HC in the presence of sunlight.

The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards for six “criteria air pollutants”. The State of Florida has adopted the same six criteria pollutants and related standards. The ambient air quality standards for criteria pollutants are shown in Table 1-4. The Southeast Florida Intrastate Air Quality Control Region, which includes the County, is classified as a Federal attainment area (an area designated by EPA as having attained the relevant national ambient air quality standard for a given pollutant).

Table 1-4. Ambient air quality standards.

Air Pollutant	National Standard	
	Primary	**Secondary**
Ozone (O_3)	0.12 ppm, 1-hr. average	0.12 ppm, 1-hr average
Monoxide (CO)	9.0 ppm, 8-hr. average	
	35 ppm, 1-hr. average	
Nitrogen Dioxide (NO2)	0.053 ppm, AAM	0.053 ppm, AAM
Sulfur Dioxide (SO_2)	0.03 ppm, AAM	0.50 ppm, 3-hr. average
	0.14 ppm, 24-hr. average	
Suspended Particulate Matter (PM10)	150 µg/m^3, 24-hr. average	150 µg/m^3, 24-hr.
	50 µg/m^3 AAM	50 µg/m^3 AAM
Lead (Pb)	1.5 µg/m^3, calendar quarter	1.5 µg/m^3

Source: EPA Office of Air Quality Planning and Standards, 2013
Notes: ppm = parts per million by volume, AAM = annual arithmetic mean, µg/m^3 = micrograms per cubic meter

The Project is exempt from the Clean Air Act (CWA) conformity requirements because it is located in a Federal attainment area (EPA, 1973). On July 1, 2000, the State of Florida eliminated the auto emissions test requirement for all vehicles throughout the state (FL DMV, 2013). The typical sea breezes along the Palm Beach coastline readily disperse airborne pollutants. This Project, regardless of the alternative implemented, would not require air quality permits.

1.5. ALTERNATIVES CONSIDERED

The Proposed Action described in Section 1.3 is designated by the Town of Palm Beach and the County as the Applicants' Preferred Project Alternative. Alternatives to the Preferred Project which are also being considered are presented below. These alternatives include scenarios in which only some (or none) of the elements of the Preferred Project are constructed and/or modified. This BA evaluates potential impacts from the Applicants' Preferred Project Alternative (Alternative 2 below), which includes all potential project components: dune only, dune and beach nourishment, and beach nourishment with groins (Figure 1-2). All six project alternatives are described in detail in the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project EIS:

1. No Action Alternative (Status Quo)
2. The Applicants' Preferred Alternative: Beach and Dune Fill with Shoreline Protection Structures Project
3. The Applicants' Preferred Project without Shoreline Protection Structures
4. The Town of Palm Beach Preferred Project and County Increased Sand Volume Project without Shoreline Protection Structures
5. The Town Of Palm Beach Increased Sand Volume Project and County Preferred Project
6. The Town of Palm Beach Increased Sand Volume Project and County Increased Sand Volume Project without Shoreline Protection Structures

1.5.1. ALTERNATIVE 1 – NO ACTION (STATUS QUO)

The No Action alternative must be considered under CEQ Regulations Sec. 1502.14(d). For the proposed Project Area, the No Action alternative does not provide a solution to the existing erosion and shore protection problems. The recreational capacity of the beach, the nesting sea turtle habitat and the nesting and roosting shorebird habitat would be subject to the natural fluctuations in the volumetric quantity of sand within the existing beach profile. Under the No Action alternative, the Applicants would not place sand or construct groins below the mean high water and seasonal high tide line; however, the dunes may continue to be enhanced periodically through placement of small volumes of sand in portions of the Project Area. Efforts to protect the dune and upland infrastructure would be limited to construction activities located wholly in uplands and could include dune restoration, upland retaining walls, shoreline armoring, or other structures or work in uplands.

Stockpiled sand from dredge projects authorized under separate state and federal permits, as well as upland sand, would likely provide the sand sources for continued dune maintenance. The No Action alternative would not include any work, sand, or structures within waters of the U.S., and therefore would not require Department of the Army authorization. This alternative may stabilize the dune area and provide limited storm protection to upland infrastructure; however, based on current and historical shoreline conditions, this approach is insufficient to address the purpose and need of the Project, which are defined in Chapter 1 of the EIS.

1.5.2. ALTERNATIVE 2 – APPLICANTS' PREFERRED PROJECT ALTERNATIVE

The Applicants' Preferred Project alternative proposes to use beach fill placement and coastal protection structures, which may enhance stability to existing seawalls and enhance the existing beach and dune system for storm protection to upland property. This alternative is described above in Section 1.3 – Proposed Action. This alternative is evaluated within this BA. It is estimated that the life expectancy of the Town of Palm Beach's proposed project will be between 2 and 4 years. The estimated life expectancy of the County project will be between 2 and 3 years within the Towns of South Palm Beach, Lantana and Manalapan.

1.5.3. ALTERNATIVE 3 – APPLICANTS' PREFERRED PROJECT WITHOUT SHORELINE PROTECTION STRUCTURES

This alternative provides the same fill volumes and template configurations as Alternative 2 - the Applicants' Preferred Alternative, but would not include construction of the seven low-profile groins between R-134+135 and R-138+551. Without the structures, the project would not provide the level of shoreline stabilization necessary to achieve the purpose and need, effectively diminishing the success of the project as it is currently designed to perform. It is estimated that the life expectancy of this project will be between 2 to 4 years within the Town of Palm Beach and 1 year within the County project area in the Towns of South Palm Beach, Lantana and Manalapan.

1.5.4. ALTERNATIVE 4 – TOWN OF PALM BEACH PREFERRED PROJECT AND COUNTY INCREASED SAND VOLUME PROJECT WITHOUT SHORELINE PROTECTION STRUCTURES

This alternative includes the Preferred Alternative along the Town of Palm Beach shoreline and a larger fill only (no shoreline protection structures) project along the County shoreline within the Towns of South Palm Beach, Lantana and Manalapan. The fill volume along the Town of Palm Beach would remain the same, 75,000 cy. The fill volume from R-134+135 to R-138+551 would increase from 75,000 cy to 160,000 cy. Placing a larger fill volume would achieve the purpose and need for this section of the project by lengthening the nourishment interval to a more reasonable period. Within the Town of Palm Beach, the life expectancy would be between 2 to 4 years. The life expectancy of the sand placed within the County project area in the Towns of South Palm Beach, Lantana and Manalapan would be between 2 and 3 years.

1.5.5. ALTERNATIVE 5 – TOWN OF PALM BEACH INCREASED SAND VOLUME PROJECT AND COUNTY PREFERRED PROJECT

This alternative includes a larger fill project along the Town of Palm Beach shoreline and the County's Preferred Alternative project along the Towns of South Palm Beach, Lantana and Manalapan. The fill volume along the Town of Palm Beach would slightly increase from 75,000 cy to 96,000 cy but the distribution would vary from the preferred alternative design. Placing a larger fill volume addresses comments received during the scoping period and lengthens the nourishment interval. Within the Town of Palm Beach, the life expectancy would be between 3 to 4 years. The life expectancy of the County's project within the Towns of South Palm Beach, Lantana and Manalapan would be between 2 and 3 years.

1.5.6. ALTERNATIVE 6 – TOWN OF PALM BEACH INCREASED SAND VOLUME PROJECT AND COUNTY INCREASED SAND VOLUME PROJECT WITHOUT SHORELINE PROTECTION STRUCTURES

This alternative includes a larger fill project along both project shorelines. The fill volume along the Town of Palm Beach would increase from 75,000 cy to 96,000 cy and the fill volume along the County shoreline within the Towns of South Palm Beach, Lantana and Manalapan would increase from 75,000 cy to 160,000 cy. Placing a larger fill volume addresses comments received during the scoping period and lengthens the nourishment interval. Within the Town of Palm Beach, the life expectancy would be between 3 to 4 years. The life expectancy of the sand placed within the County project area in the Towns of South Palm Beach, Lantana and Manalapan would be between 2 and 3 years.

2.0. PREVIOUS COORDINATION

2.1. BRIEF OVERVIEW OF BEACH NOURISHMENT AND COASTAL STRUCTURES ON PALM BEACH ISLAND

The Palm Beach Island shoreline has a long history of chronic beach erosion. The Lake Worth Inlet was cut at the northern end of the island in 1917 and the South Lake Worth Inlet was cut in 1927 at the southern end of the island. Jetties were constructed at each inlet in order to slow the rate at which the inlets refilled with sand. In addition, beach quality sand was dredged from the Palm Beach Inlet and disposed of offshore for decades. The inlets, jetties and offshore disposal of beach compatible sand, combined with natural forces, have led to the erosion of Palm Beach Island's shoreline. To offset the sand losses caused by both inlets, sand transfer plants were constructed on each inlet's north jetty to bypass some of the detained sand across the inlet to eroded beaches south of the inlets (FDEP, 2013a; PBC-ERM, 2003).

Several efforts have been undertaken by the County, municipalities, and private property owners to combat erosion along the Palm Beach Island shoreline. Coastal protection efforts have included construction of structures such as groins and seawalls as well as dune restoration and beach nourishment projects. The USACE periodically dredges the Lake Worth Inlet to improve navigation, periodically placing the beach quality sand from those activities on immediately adjacent eroded beaches or in the nearshore environment (FDEP, 2013a).

Historically, beach erosion control and inlet management activities have been regulated by the FDEP and USACE on a project-by-project basis. In an effort to adopt a more holistic approach to ecosystem management that could address the full scope of Palm Beach Island's shoreline erosion problems, in 2012 the Town of Palm Beach and the County requested that FDEP enter into a binding Beach Management Agreement (BMA) for beach nourishment, inlet sand bypassing, and dune restoration projects along the Palm Beach Island shoreline. A primary goal of the BMA is to develop a coordinated, long-term process that facilitates predictable approval of qualifying coastal erosion control and inlet management activities within the Palm Beach Island coastal cell (Lake Worth Inlet to the South Lake Worth Inlet). The final BMA, executed on September 26, 2013, includes authorization from FDEP for maintenance dredging of the Lake Worth Inlet with placement on downdrift beaches, construction of an improved sand transfer plant at Lake Worth Inlet, repair and removal of groins throughout the cell, nourishment of the Mid-Town Project, nourishment of the Phipps Ocean Park Project, and dune restoration (FDEP, 2013a).

A summary of recent Palm Beach Island projects which are related to the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project is provided in Section 2.2 of this BA.

2.2. RELATED PALM BEACH ISLAND PROJECTS

Town of Palm Beach (Reaches 7 and 8)

A Joint Coastal Permit (JCP) application was submitted in 2001 to nourish Reach 7 in the Town of Palm Beach. The issued permits (FDEP Permit No. 0165332-001-JC, USACE Permit No. SAJ-2000-00380) and subsequent modifications allowed beach and dune fill in Reach 7 (Phipps Ocean Park Beach Restoration Project) and dune fill only in Reach 8 due to concerns over potential hardbottom impacts. The Phipps Project was constructed in 2006 between R-118-700 and R-126. The Reaches 7 and 8 dune project, known as the FDEP Hurricane Recovery Program Dune Restoration Project, was also constructed in 2006 with offshore sand from the Phipps Project from R-116.5 to R-119-300, R-126 to R-127+100, and R-129+200 to R-133+500. In 2011, another modification was issued to restore the dune in Reach 8 between R-129 and R-133 using an upland sand source (FDEP, 2013a). Table 2-1 summarizes recent, beach nourishment projects constructed on Palm Beach Island which are related to the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project.

The Town of Palm Beach submitted a JCP application to place beach fill on Reach 8 in June 2005 (FDEP File No. 0250572-001-JC, USACE File No. SAJ-2005-7908). The project was originally proposed to extend for the entire length of Reach 8 (T-125 to R-134+350) to restore the eroded portions of shoreline within Reach 8 with approximately one million cy of sand dredged from an offshore source. However, in order to avoid or minimize impacts to nearshore hardbottom resources at the south end of the Project Area, the project was redesigned with a southern limit at R-132. In addition, the City of Lake Worth requested that they be removed from the project resulting in a gap or no fill area between R-127+597 and R-128+954. The proposed project failed to receive a 401 water quality certification by the FDEP, and was subsequently withdrawn from further review by the USACE. In 2010, the Town of Palm Beach prepared a conceptual design which addressed the 401 Water Quality Certification concerns and was submitted to the FDEP and the USACE in September 2010 for authorization. On February 4, 2013, the FDEP issued permit for the North Reach 8 Beach Restoration Project (Permit No. 0250572-003-JC) authorizing nourishment of 670 m (2,200 ft) of Town of Palm Beach shoreline from FDEP monuments R-125 to R-127+60 ft with approximately 132,700 cy of sand truck hauled from an upland source. The USACE is actively reviewing the project and is coordinating with NMFS (as of July 2014).

Table 2-1. Recent beach nourishment projects on Palm Beach Island.

Date	Project	Project Extents	Volume (cy)	Sand Source
1995	Mid-Town Beach Renourishment and Groin Field[1]	R-95 to R-100	880,000	Offshore Borrow Area
2003	Mid-Town Expanded Beach Renourishment	R-90.5 to R-101	1,273,100	Offshore Borrow Area
2003	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	1,000	Upland
2004	Mid-Town Dune Restoration	R-96 to R-97	200	Upland
2005	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	3,132	Upland
2005	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	5,814	Upland
2006	Mid-Town Beach Renourishment	R-90 to R-94.2; R-94.5 to R-101	893,000	Offshore Borrow Area
2006	Phipps Ocean Park Beach Restoration[2]	R-118+700 to R-126	1,100,000	Offshore Borrow Area
2006	FDEP Hurricane Recovery Program Dune Restoration Project	R-116.5 to R-119-300; R-126 to R-127+100; R-129+200 to R-133+500	141,458	Offshore Borrow Area
2007	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	6,750	Upland
2008	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	11,000	Upland
2009	South Palm Beach/Lantana Dune Restoration	R-135+460 to R-137+410	10,000	Upland
2011	Phipps Ocean Park Beach and Dune Restoration	Dune R-129 to R-133	56,000	Upland

[1] Mid-Town Beach Experimental PEP Reef constructed 1992, was removed in 1995.
[2] As mitigation, a 3.1 acre artificial reef was constructed in 2004; additional 0.8 ac artificial reef constructed in 2007 as additional mitigation required by USACE.

Town of Palm Beach (Mid-Town, Reaches 3 and 4)

The Town of Palm Beach constructed the first Mid-Town project (non-federal project) in 1995, placing 880,000 cy of sand dredged from an offshore borrow area on the shoreline from R-95 to R-100 (FDEP, 2013a). A groin field was also installed during the 1995 project. In 2003, the Mid-Town project (Reaches 3 and 4) was expanded to include placement of 1.2 million cy of sand dredged from an offshore borrow area on the Mid-Town beaches from R-90.5 to R-101 (FDEP, 2013a). In 2004 a joint County/Town of Palm Beach dune restoration project took place along Old South Ocean Boulevard between R-96 and R-97 within the Mid-Town section of Palm Beach Island. The project involved exotic tree removal, placement of over 200 cy of sand from the Juno Dunes Natural Area, and placement of native vegetation (PBC-ERM, 2004). In response to hurricanes Frances, Jeanne, and Wilma in 2004-2005, the Town of Palm Beach constructed an emergency berm and dune repair project in 2006 which included placement of 893,000 cy of sand dredged from an offshore borrow area on the Mid-Town beaches from R-90 to R-94.2 and R-94.5 to R-101 (Table 2-1) (FDEP, 2013a). The Town of Palm Beach plans to construct the next Mid-Town project winter 2014/15.

Towns of South Palm Beach and Lantana

There have been six dune restoration projects completed in the Towns of South Palm Beach and Lantana since 2003 (Table 2-1). The project area for the six County projects ran from R-135+460 to R-137+410; however, the first restoration completed in 2003 did not include sand placement at Lantana Public Beach (exotic vegetation removal only), while all subsequent projects included placement of fill here. In addition, the Mayfair House Condominium, which is located within this Project Area, never participated in any of the restorations. Therefore, this property was bypassed during each event (Miranda, pers. comm., 2013).

Palm Beach Island Beach Management Agreement (BMA)

The Palm Beach Island Beach Management Agreement (BMA) includes FDEP, the Town of Palm Beach and Palm Beach County, and implements a programmatic pilot program approach to managing the erosion that allows the local and county municipalities to protect their beaches by adding sand. FDEP will authorize periodic beach nourishment to maintain the beach restoration project located in the southern portion of Reach 7 in the Town of Palm Beach between R-119 and R-125 and periodic placement of sand to maintain the restored dune in the northern portion of Reach 7, from R-116 to R-119. In addition, FDEP will authorize beach restoration and periodic beach nourishment between R-125 and the northern boundary of the Lake Worth Municipal Park at R-127 (northern segment of Reach 8). Approval for construction and maintenance of these three contiguous segments has been granted by the FDEP through the BMA. The projects may be conducted separately or together and material may be stockpiled on the berm between R-119 and R-126 to replenish the restored dune (FDEP, 2013a). Authorization to obtain beach-compatible sand for the stockpile has been provided for offshore borrow areas NBA1, SBA2, SBA3, or any offshore source consistent with the BMA cell-wide sand specifications.

2.3. CURRENT CONSULTATION FOR THE SOUTHERN PALM BEACH ISLAND COMPREHENSIVE SHORELINE STABILIZATION PROJECT

The Town of Palm Beach submitted a permit application to nourish two portions of Reach 8 in 2010 (SAJ-2005-07908). The northern portion included R-125 to R-127+60 and the southern portion included R-129+150 to R-135+350. The final permit authorized the northern portion only. The Town of Palm Beach is now seeking authorization to construct the southern portion of Reach 8 from R-129-210 to R-134+135, which is adjacent to Palm Beach County's proposed project (SAJ-2008-04086). Under this file number, the County proposed to construct breakwaters between R-132 and R-138+551 in 2008. This project was withdrawn and a revised application for construction of beach nourishment with low profile groins between R-134+135 and R-138+551 was submitted in September 2014.

The USACE is responsible for reviewing these projects because they involve filling, dredging, and/or construction of coastal structures within waters of the United States, and as proposed, constitute a "major federal action". The USACE determined that these two projects are "similar actions" and therefore the environmental effects and alternatives of these projects should be evaluated together. The comprehensive project comprises approximately 2.07 miles of shoreline and nearshore environment from FDEP monuments R-129-210 to R-138+551. The Town of Palm Beach and the County (the Applicants and local sponsors) are seeking federal authorization to construct the project, which is known as the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (the Project).

The Town of Palm Beach's and the County's projects are each standalone projects, but because they are adjacent to one another they have been deemed similar actions in terms of the National Environmental Policy Act (NEPA). Therefore, the USACE is evaluating the anticipated combined direct and indirect effects of both projects together through the preparation of a single comprehensive study. The USACE determined the proposed beach stabilization project, including the anticipated scope of the project and the resulting scope of effects (including cumulative, direct, and indirect effects), could significantly affect the quality of the human environment and determined an Environmental Impact Statement (EIS) was necessary to identify, evaluate, and disclose the array of anticipated environmental effects associated with the proposals.

On July 3, 2013, the USACE published a Notice of Intent (NOI) (78 FR 40128) to prepare a Draft Environmental Impact Statement (DEIS) for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project. The DEIS will be prepared in compliance with the National Environmental Policy Act (NEPA) to identify and assess the effects of the Proposed Action and its alternatives in order to provide a basis for rendering an informed decision on the proposed Project. The USACE's decision will be to either issue, issue with modifications or deny Department of the Army (DA) permits for the Proposed Action. The DEIS is intended to be sufficient in scope to address federal, state and local environmental requirements concerning the Proposed Action.

The NOI announced the initiation of a 45-day scoping and commenting period and included a notification to stakeholders and all interested parties that a public scoping meeting would be held on August 12, 2013. The USACE invited Federal agencies, American Indian Tribal Nations, state and local governments, and other interested private organizations and parties to attend the public scoping meeting and provide comments in order to ensure that all significant issues are identified and the full range of issues related to the permit request are addressed. Pursuant to NEPA requirements, this scoping meeting was held on August 12, 2013 at the Town of Palm Beach Town Hall. It provided an opportunity to the public to submit comments on the scope of the EIS, the alternatives to be considered and the environmental and socioeconomic issues to be addressed. Following the scoping meeting, the scoping comment period continued through September 3, 2013. A scoping report summarizing comments received during the scoping period (July 3–September 3, 2013) was submitted to USACE on October 4, 2013 (CB&I, 2013).

On August 7, 2013, the USACE emailed NMFS requesting review of and concurrence with a draft list of species to be included in the BA. NMFS responded on August 9, 2013, by sending a list of endangered and threatened species and critical habitats under NMFS jurisdiction in the Florida-Atlantic region (Mincey, pers. comm., 2013).

On August 7, 2013, the USACE emailed USFWS requesting review of and concurrence with a draft list of species to be included in the BA. USACE received a response from USFWS on August 15, 2013, concurring with the species list for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Howe, pers. comm., 2013).

3.0. DESCRIPTION OF AFFECTED ENVIRONMENT

This section provides a description of the existing environmental resources located within the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Action Area, with emphasis on those natural resources that are capable of supporting listed and proposed threatened and endangered species and critical habitat. This section focuses on the dune, beach and nearshore marine environments between R-127 and R-141+586 (Figure 1-2), which may be impacted by construction of the Project. The Action Area also includes the truck routes from the upland mines and stockpiles to the Project Area. The Action Area does not include borrow areas or upland mines; therefore environmental impacts associated with the offshore borrow areas and upland mines will not be evaluated in this BA. The borrow areas which will be the sand source for the Project Area between (R-129-210 to R-134+135) will be dredged for the Phipps (USACE Permit No. SAJ-2000-00380) and Mid-Town (USACE Permit No. SAJ-1995-03779) projects under authorization of the Palm Beach Island Beach Management Agreement (BMA) (FDEP, 2013a).The upland mine (or mines) which will be the sand source for the Project Area between R-134+135 and R-138+551 are commercial mines which are authorized independent of the Project.

3.1. DUNE ENVIRONMENT

Barrier islands are dynamic environments, with topographic and vegetation profiles dictated by the interaction of plant growth and physical processes such as wind-driven sand movement and salt spray, and wave-driven erosion and accretion. The dunes in a barrier island system are the vegetated mounds of unconsolidated sediments that lie landward of the active beach. Dune formation occurs when winds carrying beach sediments encounter resistance from vegetation, thereby causing the wind to deposit this material. Dunes are comprised of finer sand, while sand in the berm and beach face is coarser. Dunes are dynamic geologic features that continually accrete and erode from factors such as seasonal and episodic fluctuations in wave height and storm activity (Rogers and Nash, 2003).

Beach and dune vegetation are known to provide habitat for a variety of mammals including the raccoon (*Prycon lotor*) and house mouse (*Mus musculus*), as well as many bird species. Dune habitat is present within sections of the Action Area (Photographs 3-1a and 3-1b).

Photographs 3-1a and 3-1b. Select dune habitats located within Action Area.

Much of the native dune system within the Action Area has been lost to beach erosion and upland development. Severe erosion of the frontal dune community was observed during a 2005 dune survey within Reach 8 (T-125 to R-134). Dune vegetation documented during the survey included primarily seagrape (*Coccoloba uvifera*), as well as sea oats (*Uniola paniculata*), inkberry (*Scaevola plumieri* L.), bitter panicum grass (*Panicum amarum*), bay cedar (*Suriana maritima*) and seashore elder (*Iva imbricata*). A restored dune area adjacent to the Lake Worth Pier parking lot (R- 128 to R-128+800) was also vegetated with bitter panicum and sea oats. Seagrape and inkberry were most prevalent and typically found above eroded and undercut embankments. No vegetation was documented seaward of exposed seawalls in the study area (CPE and CSI, 2011). A dune vegetation survey was also conducted in South Palm Beach (R-134 to R-141) in 2006 (CPE, 2007). That survey showed that 78% of the study area contained hardened structures (seawalls and revetments) and the remaining 22% of the area included vegetated dune faces; only minimal, scattered vegetation was observed waterward of the structures. The vegetation observed during the 2006 survey included a combination of native species typical to South Florida beach dunes and several invasive species; half flower (*Scaveola plumieri*) was the most significant invasive species observed (CPE, 2007). Table 3-1 lists the dune and plant species observed during the 2005 Town of Palm Beach Reach 8 and 2006 South Palm Beach surveys (CPE and CSI, 2011; CPE, 2007). No threatened or endangered plants were identified during the dune surveys.

In 2007, several species of dune vegetation were planted in both Reach 7 and Reach 8 as part of the Phipps Ocean Park Beach Restoration Project and FDEP Emergency Dune Restoration Project. Approximately 80% of the plants were sea oats, and the remaining 20% consisted of 14 other species (CPE, 2009). A list of the planted species is also provided in Table 3-1. No threatened or endangered plants were identified during the dune surveys.

Most recently, in November 2013, a dune vegetation investigation was performed within the Action Area. During this survey, areas of interest where vegetation was identified in aerial photography were ground-truthed by biologists. The 2013 Habitat Characterization Report (CB&I, 2014) is provided as Appendix D to the EIS. Exposed and buried seawalls are intermittently spaced along the shoreline from R-129 to just south of R-133. Dune vegetation exists on the seaward side of buried seawalls in this area. The shoreline includes exposed seawalls south of R-133 to R-141. The dune located immediately south of Lake Worth Pier was determined to be dominated by sea oats while the dune located immediately north of the seawall at R-129 was dominated by bitter panicum grass. Seagrapes were the dominant dune vegetation identified throughout the remainder of the survey area, which terminated at R-133+500 where dune habitat ended and upland properties bordered by sea walls began (and continued south to the end of the Action Area at R-141+586). One exception, near R-133, was observed where dune vegetation was sparse. The endangered plant species beach jacquemontia (*Jacquemontia reclinata*) was not present within the surveyed area (CB&I, 2014). Table 3-1 lists the dune and plant species observed during the 2005, 2006 and 2013 dune surveys as well as the species planted in 2007 (CPE and CSI, 2011a; CB&I, 2014). Figure 3-1 shows the location of all existing dune vegetation and seawalls within the Action Area (CB&I, 2014). The two truck haul access points for the Town of Palm Beach are located on condominium properties that have dune habitat dominated by sea grapes. Sand placement activities and land-based groin construction operations have the potential to impact the upland habitat at these access points. The access point for the County is located at the Lantana Public Beach where only buried seawall is present, therefore there is no potential impact to dune habitat at this location.

Table 3-1. Dune vegetation within the Action Area (CPE, 2007, 2009; CPE and CSI, 2011; CB&I, 2014).

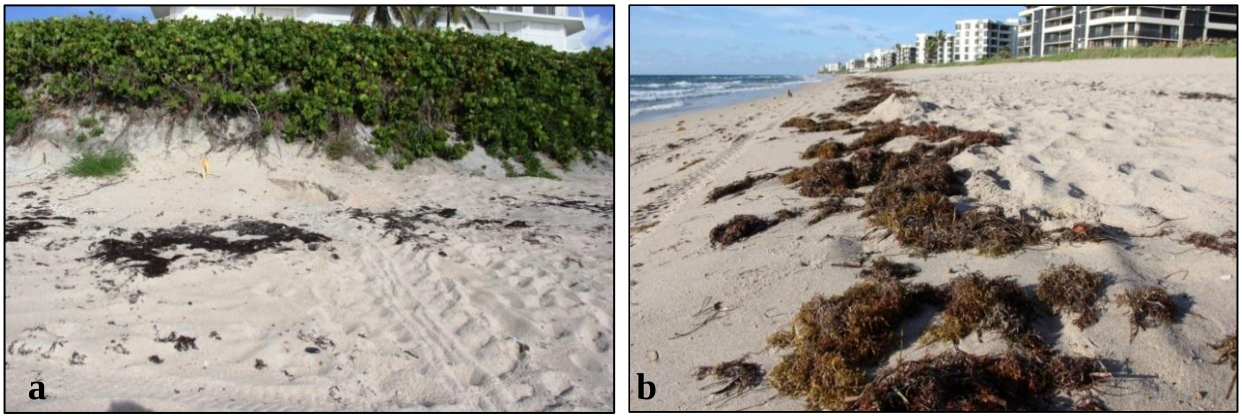
Observed Species (2005, 2006 and 2014)		Planted Species (2007)	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Seagrape	*Coccoloba uvifera*	Bay bean	*Canavalia rosea*
Seashore elder	*Iva imbricata*	Beach cordgrass	*Spartina patens*
Bitter panicum	*Panicum amarum*	Beach elder	*Iva imbricata*
Inkberry	*Scaevola plumieri L.*	Beach verbena	*Verbena maritime*
Bay cedar	*Suriana maritime*	Bitter panicum	*Panicum amarum*
Sea oats	*Uniola paniculata*	Blanket flower	*Gaillardia pulchella*
Bay bean	*Canavalia rosea*	Dune sunflower	*Helianthus debilis*
Beach spurge	*Chamaesyce mesembryanthemifolia*	Railroad vine	*Ipomoea pes-caprae*
Silver buttonwood	*Conocarpus erectus*	Sea lavender	*Limonium carolinianum*
Beach croton	*Croton punctatus*	Sea oats	*Uniola paniculata*
Crowfoot grass	*Dactyloctenium aegyptium*	Shore paspalum	*Pasplam distichum*
Salt grass	*Distichlis spicata*	Virginia dropseed	*Sporobolus virginicus*
Spider lily	*Hymenocallis latifolia*	Beach morning glory	*Ipomoea imperati*
Railroad vine	*Ipomoea pes-caprae*	Sea purslane	*Sesuvium portulacastrum*
Beach Peanut	*Okenia hypogeaea*		
Purslane	*Portulaca oleracea*		
Half flower	*Scaveola sericea*		
Sea pickle	*Sesuvium portulacastrum*		
Spanish bayonet	*Yucca aloifolia*		

3.2. BEACH ENVIRONMENT

Beaches are formed by the deposition and accumulation of sand by way of coastal currents and wave transport. A beach is a dynamic environment that is intermittently eroded during winter in periods of rough seas and strong winds and accreted during the calmer spring and summer months. Biological abundance varies seasonally and is generally highest in summer and lowest in winter (Matta, 1977; Reilly and Bellis, 1983).

The intertidal zone, or wet beach, of oceanfront barrier island beaches is the area periodically exposed and submerged by waves, varying frequently and with lunar tide cycles. These areas are comprised mainly of sandy bottoms that serve as habitat to many benthic and infaunal organisms, as well as foraging grounds for birds and finfish. The benthic and infaunal organisms found within the intertidal/swash zone are adapted to the harsh conditions of a wave-swept environment such as heavy sediment loading and movement. Organisms common to this environment include polychaetes, amphipods, isopods and interstitial organisms that feed on bacteria and unicellular algae. In addition, mole crabs (*Emerita talpoida*), coquina clams (*Donax spp*.) and ghost crabs (*Ocypode quadrata*) can be found in this community (Gorzelany and Nelson, 1987; Irlandi and Arnold, 2008). These macroinvertebrates provide important ecological services such as cycling of organic matter and trophic transfer of production to surf zone fishes and shorebirds (Leber, 1982).

The dry (upper) beach begins at the berm (mean high water) and slopes gently upwards to the foot of the dune. Burrowing organisms such as sand fleas, isopods, ghost crabs and other transient organisms dominate the fauna in this zone. The dry beach area provides recreational areas for humans and nesting grounds for sea turtles (Photograph 3-2a). A variety of seabirds and shorebirds also depend on the beach and dune environment for nesting and foraging purposes. Florida seabirds, such as the least tern (*Sternula antillarum*), black skimmer (*Rynchops nige*r), royal tern (*Thalasseus maxima*) and sandwich tern (*Thalasseus sandvicensis*) nest on open beach areas. Florida shorebirds, such as the American oystercatcher (*Haematopus palliatus*), snowy plover (*Charadrius alexandrines*), Wilson's plover (*Charadrius wilsonia*) and willet (*Trina semipalmata*) nest within the wrack line (Photograph 3-2b), on open beach, within dune vegetation or even in marsh grasses (FWC, 2010; 2013c). While many resident and migratory shorebird species seasonally utilize beach habitats for feeding and roosting, beach nesting of shorebirds in the Action Area has not been reported by the Audubon Society Christmas Bird Count, Florida Fish and Wildlife Conservation Commission (FWC) Breeding Bird Atlas, the Shorebirds and Seabird Monitoring/Reporting website, or the Florida Natural Areas Inventory. Shorebird surveys were conducted in September 2006 by CZR, Inc. along the shoreline between R-134 and R-141 in support of the Town of South Palm Beach and Town of Lantana Erosion Control Study (CPE, 2007). Results of these surveys are presented in Table 3-2. No shorebird nesting was observed during the 2006 surveys.



Photographs 3-2a and 3-2b. A recently-laid sea turtle nest (a) and wrack line (b) on the beach within the Action Area.

Table 3-2. Results of 2006 shorebird surveys, R-134 through R-141 (CPE, 2007).

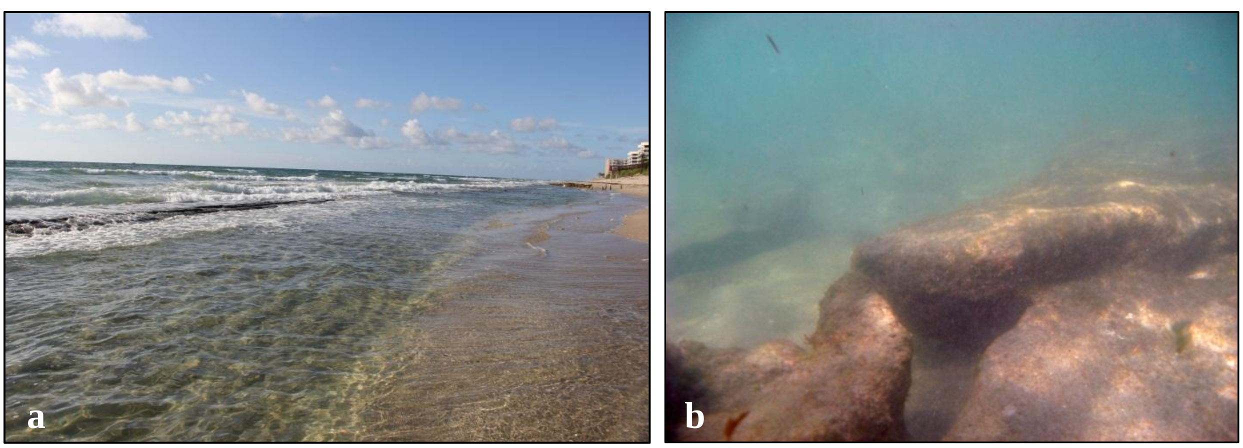
Common Name	Scientific Name
Barn swallow	*Hirundo rustica*
Boat-tailed grackle	*Quiscalus major*
Bonaparte's gull	*Larus philadelphia*
Brown pelican	*Pelecanus occidentalis*
Common tern	*Sterna hirundo*
Fish crow	*Corvus ossifragus*
Foster's tern	*Sterna forsteri*
Gull-billed tern	*Gelochelidon nilotica*
Herring gull	*Larus argentatus*
Osprey	*Pandion haliaetus*
Purple martin	*Progne subis*
Ring-billed gull	*Larus delawarensis*
Royal tern	*Sterna maxima*
Ruddy turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Sandwich tern	*Sterna sandvicensis*
Yellow-crowned night heron	*Nyctanassa violacea*
Unidentified terns	*Sterna spp.*

3.3. INTERTIDAL AND SUBTIDAL HARDBOTTOM HABITAT

The term "hardbottom" refers to areas of solid substratum in the marine environment which provide habitat utilized by sea turtles, fish, and a wide range of marine organisms. Hardbottom is widely distributed in Florida, found from intertidal and subtidal areas to the continental shelf edge; the presence or absence is dictated by the underlying geology of the area. Nearshore hardbottom habitat is classified by FDEP to include the “200-400 meter-wide strip from the shoreline, ranging from the supralittoral zone to the depth of -4 meters”, intermediate hardbottom exists “from the depth of -4 meters to the depth of closure (approximately -8 meters)”, and offshore hardbottom is located in “water depths deeper than -8 meters, beyond the depth of closure to -12 meters” (FDEP, 2013a). Nearshore, hardbottom is found in much of southeast and central Florida, including portions of Broward, Palm Beach, Martin, St. Lucie, Indian River and Brevard Counties. Along most of the East Coast of Florida, the Pleistocene Anastasia Formation forms the main coastal bedrock outcrop (Finkl 1993; Esteves and Finkl, 1999). Anastasia limestone is comprised of sediments and mollusk shells (primarily the coquina clam *Donax)* that accumulated on shorelines 80,000-120,000 years ago (CSA, 2009). Formations that are exposed in the surf zone tend to have smooth surfaces that are abraded by wave and current action. In Palm Beach County, shoreline occurrences of the Anastasia Formation can be found between the Lake Worth Inlet and the South Lake Worth Inlet (also called Boynton Inlet) and occur in a range of morphological expressions of coquina, including inshore and offshore rock reefs (Finkl and Warner, 2005). These rock exposures are quite often ephemeral, exhibiting periodic burial and exposure. The dynamics are largely storm driven with periodicities related to occurrences of high-energy events such as northeasters, tropical storms, and hurricanes (CPE and CSI, 2011).

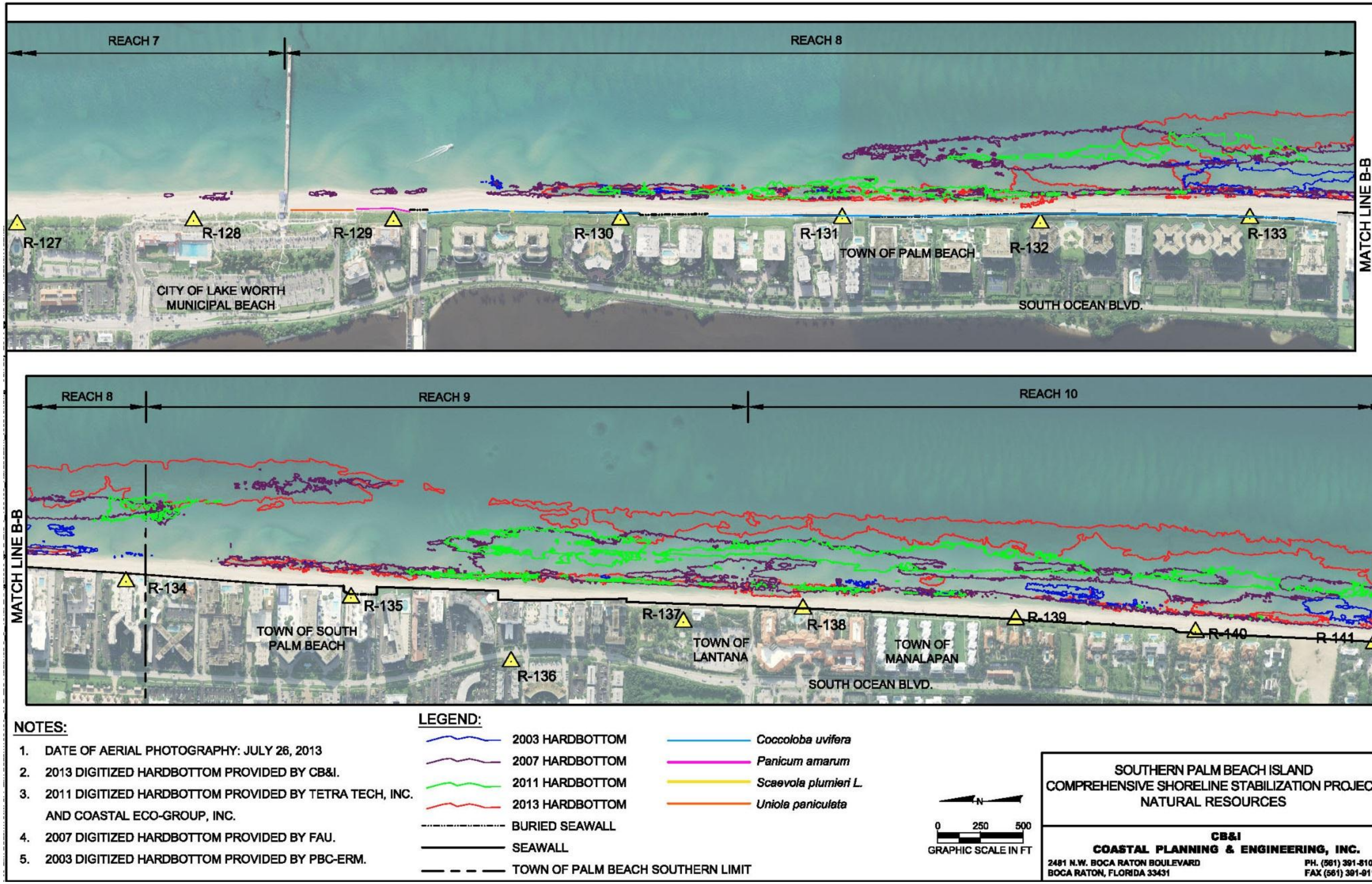
The nearshore hardbottom within Palm Beach County includes areas of wormrock, formed by tube building sabellariid tubeworms (*Phragmatopoma*) (USACE, 2012). Epibenthic communities associated with hardbottom and associated wormrock often include macroalgae, sponges, octocorals, stony corals, bryozoans and tunicates. These communities do not actively accrete reefs, but can add rugosity to an environment through destructive processes such as bioerosion (Hutchings, 1986). Intertidal and very shallow subtidal areas in east Florida sometimes host the scleractinian coral species *Siderastrea* spp., two species of zoanthids (*Palythoa caribaeorum* and *Zoanthus* *pulchellus*) and several species of anemones; these species have a higher tolerance for the fluctuation in salinity and temperature that occur in the these habitats (CSA, 2009).

Areas of intertidal and subtidal hardbottom habitat, including associated wormrock, are present within the Action Area of the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (Figure 3-1; Photographs 3-3a and 3-3b). The hardbottom resources delineated through aerials, and most recently characterized in 2013, are all located within 400 m (1,312 ft) from the shoreline in depths generally less than -4 m; these resources are considered "nearshore hardbottom" (FDEP, 2013a). These resources are highly ephemeral, fluctuating seasonally and during storm events. Rectified aerial photographs were used to delineate exposed hardbottom communities present in Palm Beach for the past 10 years in order to estimate changes in hardbottom exposure over time (FDEP, 2013b). Based on delineation of aerials, there has been a time-averaged 25.39 acres of exposed hardbottom within the Action Area (R-127 to R-141+586) between January 2003 and July 2013, including a minimum of 3.06 acres in January 2009 and a maximum of 51.20 acres in January 2006 (Figure 3-1). Within this area, less than a tenth of an acre has remained persistently exposed through all aerial delineations, further demonstrating the ephemeral nature of the nearshore hardbottom.



Photographs 3-3a and 3-3b. Intertidal (a) and subtidal (b) hardbottom habitat within the Action Area.

In addition to aerial delineation of hardbottom resources, *in situ* hardbottom biological monitoring has been conducted in association with several beach nourishment projects on Palm Beach Island, and a recent survey was conducted in October 2013 in order to provide updated data for planning and permitting of the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project (CB&I, 2014). In general, observations show that nearshore hardbottom relief is low, averaging 15 cm or less (CPE, 2007; 2010; 2014). Surveys of the benthic community have shown high cover of turf algae and sediment along transects, followed by bare hard substrate, wormrock (*Phragmatopoma caudata*), and macroalgae. Common macroalgae genera include *Padina, Dictyota, Hypnea, Dasycladus*, *Laurencia* and *Halimeda.* Also observed on the nearshore hardbottom, but typically with less than 1% cover, were tunicates, sponges, zoanthids, bryozoans, scleractinian (stony) corals and octocorals. The scleractinian species most frequently observed on the intertidal and subtidal hardbottom are *Siderastrea siderea* and *S. radians* and *Solenastrea bournoni*. The most common genus of octocorals observed is *Pseudopterogorgia,* with colonies of *Pterogorgia, Muricea* and *Eunicea* sometimes documented, as well (CPE, 2005a, 2006, 2007; CB&I, 2014; CPE and CSI, 2011).



NOTES:

1. DATE OF AERIAL PHOTOGRAPHY: JULY 26, 2013
2. 2013 DIGITIZED HARDBOTTOM PROVIDED BY CB&I.
3. 2011 DIGITIZED HARDBOTTOM PROVIDED BY TETRA TECH, INC. AND COASTAL ECO-GROUP, INC.
4. 2007 DIGITIZED HARDBOTTOM PROVIDED BY FAU.
5. 2003 DIGITIZED HARDBOTTOM PROVIDED BY PBC-ERM.

Figure 3-1. Nearshore hardbottom and dune resources.

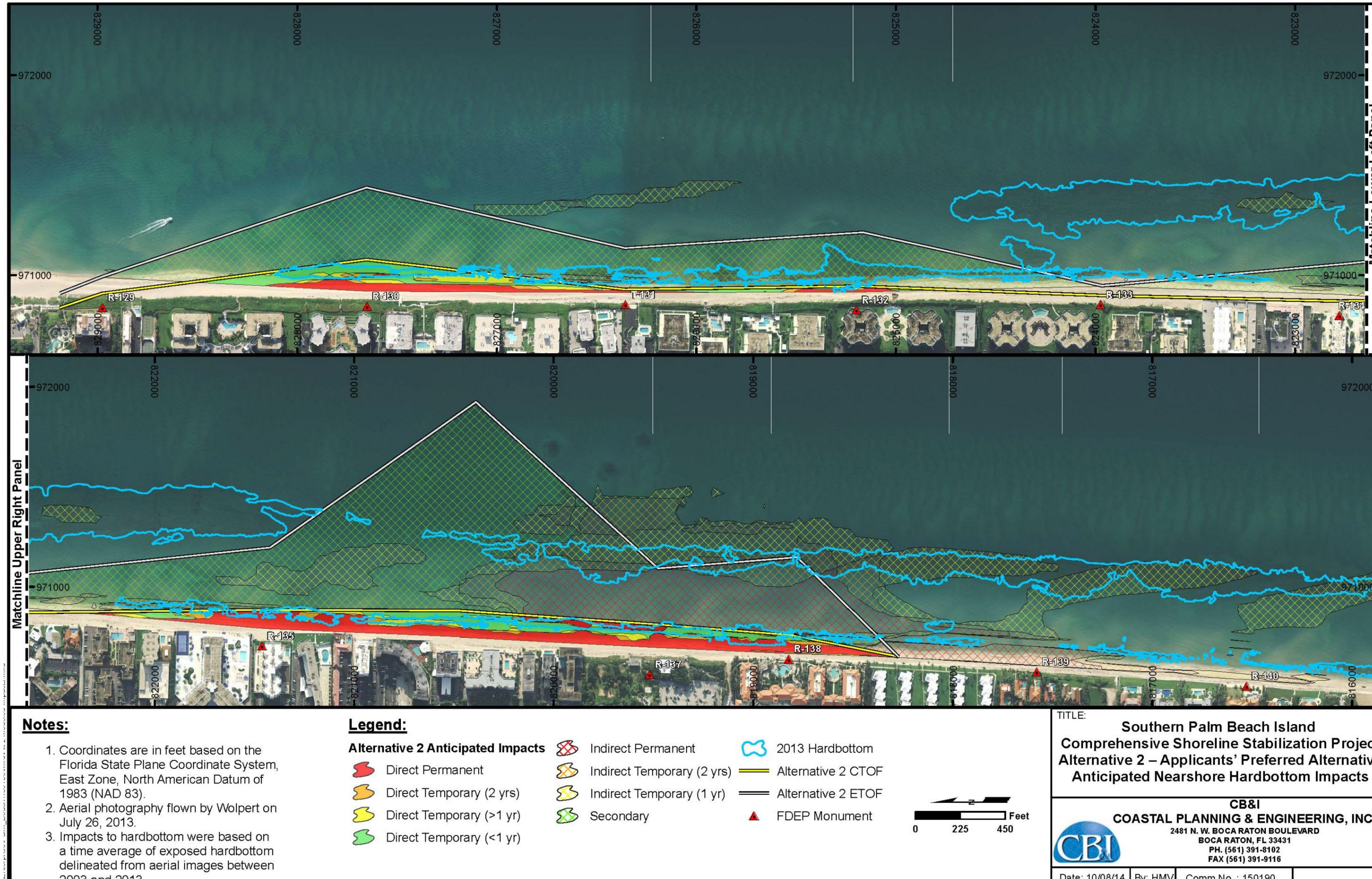


Figure 3-2. Anticipated impacts to nearshore hardbottom resources from Alternative 2 – Applicants' Preferred Project.

Placement and equilibration of beach sand will impact nearshore hardbottom resources. Hardbottom closest to shore will be directly buried by placement of beach sand immediately following construction, while equilibration will impact additional hardbottom (Figure 3-1). Based on engineering and modeling results (Appendix G to the EIS), it is anticipated that the Project may result in permanent impacts to 4.03 ac of hardbottom as well as temporary and secondary impacts to 8.13 ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand (Figure 1-3). Impacts to hardbottom were based on a time average of exposed hardbottom delineated from aerial images between 2003 and 2013. Using the engineering and modeling results, historic exposed hardbottom acreage, and recent benthic characterization data, a preliminary Uniform Mitigation Assessment Method (UMAM) evaluation was conducted (provided as Appendix H to the EIS). This draft UMAM analysis determined that 6.39 acres of mitigation may be required to offset these impacts to intertidal and subtidal hardbottom.

3.4. UN-VEGETATED BOTTOM

A large portion of the nearshore marine habitat within the Action Area is composed of unconsolidated softbottom habitat. Unvegetated softbottom intertidal and subtidal areas are important habitats for benthic organisms living on (epibenthos) or within (infauna) the sediment. This faunal community is an important element in the food web, providing prey for wading birds, shorebirds and fish. Shallow subtidal softbottom environments are strongly impacted by water turbulence, suspended sediments and unstable substrate, causing low species diversity and faunal abundance. Shallow subtidal softbottom habitat is dominated by a mix of polychaetes (primarily spionids), gastropods (*Oliva* sp., *Terebra* sp.), portunid crabs (*Arenus* sp., *Callinectes* sp. and *Ovalipes* sp.) and burrowing shrimp (*Callianassa* sp.). In slightly deeper water (1-3 m (3-10 ft) depth), the dominant fauna are polychaetes, haustoriid and other amphipod groups, and the bivalves *Donax* sp. and *Tellina* sp. (Marsh et al., 1980; Goldberg et al., 1985; Gorzelany and Nelson, 1987; Nelson, 1985).

A review of infaunal studies revealed that invertebrate recovery following placement of dredged material in relatively stable, unstressed marine environments generally takes between one and four years, while recovery in more naturally stressed areas is faster, often achieved within nine months (Bolam and Rees, 2003).

4.0. DESCRIPTION OF LISTED SPECIES AND CRITICAL HABITAT

This section describes federally listed and proposed threatened and endangered species and designated and proposed critical habitat within the vicinity of the Action Area for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project. Table 4-1 summarizes the species which were determined by USACE, NMFS and USFWS as potentially occurring in the Action Area (Mincey, pers. comm., 2013; Howe, pers. comm., 2013). Species and critical habitat which may occur in southeast Florida but are not likely to occur in the Action Area are not included in Table 4-1, and are discussed in Section 4.1. Current species conditions and results of surveys within the Action Area are presented in Section 5.0.

Table 4-1. Federally listed and proposed species, and critical habitat (CH) potentially occurring in the Action Area.

Common Name	Scientific Name	Federal Listing Status
SEA TURTLES		
Loggerhead	*Caretta caretta*	T[1]/CH[2,3]
Green	*Chelonia mydas*	E[4]
Leatherback	*Dermochelys coriacea*	E
Hawksbill	*Eretmochelys imbricata*	E
Kemp's Ridley	*Lepidochelys kempii*	E
FISH		
Smalltooth sawfish	*Pristis pectinata*	E
MAMMALS		
Florida manatee	*Trichechus manatus latirostris*	E
Florida panther	*Puma concolor coryi*	E
CORALS		
Staghorn coral	*Acropora cervicornis*	T[5]
Elkhorn coral	*Acropora palmata*	T[5]
Boulder star coral	*Orbicella annularis*	T
Mountainous star coral	*Orbicella faveolata*	T
Star coral complex	*Orbicella franksi*	T
Pillar coral	*Dendrogyra cylindrus*	T
Rough cactus coral	*Mycetophyllia ferox*	T
BIRDS		
Piping plover	*Charadrius melodus*	T/E[6]
Rufa red knot	*Calidris canutus rufa*	Proposed T
PLANTS		
Beach jacquemontia	*Jacquemontia reclinata*	E

[1] Northwest Atlantic Ocean (NWA) distinct population segment (DPS). On September 22, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single threatened species to nine distinct population segments (DPSs) listed as either threatened or endangered (FR 76 58868). The NWA DPS was listed as threatened.

[2] On July 10, 2014, USFWS designated critical habitat (nesting beach) for NWA loggerhead sea turtle DPS (79 FR 39755). The Action Area is located with unit LOGG-T-FL-12.

[3] On July 10, 2014 NMFS designated critical habitat (nearshore marine) for the NWA loggerhead sea turtle DPS within the Atlantic Ocean and the Gulf of Mexico (79 FR 39855). The Action Area falls within the LOGG-N-19 unit.

[4] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

[5] The northern limit of Acropora critical habitat is South Lake Worth Inlet, south of the Action Area for the proposed Project.

[6] Piping plovers are listed as threatened, except for the Great Lakes population which is listed as endangered; Florida provides overwintering habitat for both threatened and endangered populations.

4.1. SPECIES AND CRITICAL HABITAT ELIMINATED FROM FURTHER CONSIDERATION

Species and critical habitat which may occur in southeast Florida or the Atlantic waters off the Florida coast but are not likely to occur in the Action Area were eliminated from further consideration and therefore were not included in Table 4-1. The Applicants' Preferred Project alternative described in Section 1.3 utilizes both stockpiled sand from an offshore borrow area and an upland sand source for the proposed truck haul nourishment project. Due to the unlikelihood of potential impacts to whales from this construction method, listed whale species are not discussed in further detail in this analysis. In addition, Johnson's seagrass (*Halophila johnsonii*) has not historically been documented within the vicinity of the Action Area. The current range of Gulf sturgeon (*Acipenser oxyrinchus desoto*) is in the Gulf of Mexico, extending from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi respectively, east to the Suwannee River in Florida (NMFS and USFWS, 2009). The geographic range of the shortnose sturgeon (*Acipenser brevirostrum)* is from the Saint John River, New Brunswick, Canada to the St. Johns River, Florida (NMFS, 1998). The eastern indigo snake (*Drymarchon corais couperi*) is not known to occur in the vicinity of the Action Area due to the intense coastal development, and so this species has also been eliminated from further consideration. Due to the fact that these species are unlikely to be found in the vicinity of the Action Area, it has been determined that the Proposed Action will have "no effect" on whales, Johnson's seagrass, Gulf sturgeon, shortnose sturgeon or the eastern indigo snake. Therefore, these species will not be evaluated further in this document.

4.2. SEA TURTLES

Five species of sea turtles can be found in Florida waters: loggerhead (*Caretta caretta*), green, *(Chelonia mydas)*, leatherback *(Dermochelys coriacea)*, hawksbill *(Eretmochelys imbricata)* and Kemp's ridley *(Lepidochelys kempii)*. The USFWS has listed green (Florida breeding populations), leatherback, hawksbill and Kemp's Ridley sea turtles as Endangered, and the Northwest Atlantic (NWA) population of loggerheads as

Threatened. The sea turtle nesting season in Palm Beach County is from March 1 to October 31st. Leatherbacks typically nest early in the season followed by loggerheads and greens. Loggerheads arrive in substantial numbers in May. Nesting continues through the summer months and tapers off in early September (PBC-ERM, 2013a). Each sea turtle species is discussed further in the following sections.

4.2.1. LOGGERHEAD SEA TURTLES

The loggerhead sea turtle (*Caretta caretta*) was listed on July 28, 1978 as a threatened species under the ESA (43 FR 32800). On September 22, 2011, NMFS and USFWS established a Final Rule to list nine Distinct Population Segments (DPS) of loggerhead sea turtles that qualify as ‘‘species’’ for listing as endangered or threatened under the Endangered Species Act (ESA) (76 FR 58868). Under this rule, four DPSs were listed Threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and the Southwest Indian Ocean) and five were listed as Endangered (Northeast Atlantic Ocean, Mediterranean Sea, North Indian Ocean, North Pacific Ocean and South Pacific Ocean). The population of loggerheads found in the Action Area is the Northwest Atlantic Ocean (NWA) DPS.

Adults and sub-adults have a large, reddish-brown carapace. Scales on the top and sides of the head and on top of the flippers are also reddish-brown, but have yellow borders. The neck, shoulders, and limb bases are dull brown on top and medium yellow on the sides and bottom. The plastron is also medium yellow. Adult average size of loggerhead adults in the southeast U.S. is approximately 1 m (3.3 ft) straight carapace length; average weight is 116 kg (256 lbs). The relative size of a loggerhead’s head, when compared to the rest of its body, is substantially larger than other sea turtle species (NMFS and USFWS, 2007a, 2008). Adults reach sexual maturity at about 35 years old, and nesting occurs between April and September.

The loggerhead is found throughout the temperate and tropical regions of the Atlantic, Pacific and Indian Oceans and is the most abundant sea turtle occurring in U.S. waters. Recent data suggest that there are only two locations with greater than 10,000 nesting females: south Florida and Masirah Island in Oman. In the southeast U.S., nesting is estimated at approximately 68,000 to 90,000 nests per year (NMFS, 2013e), with the majority occurring on over 2,400 km (1,491 mi) of beaches: North Carolina (531 km (330 mi)), South Carolina (303 km (188 mi)), Georgia (164 km (102 mi)), Florida (1,327 km (825 mi)), and Alabama (78 km (49 mi)). Approximately 80% of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach and Broward). Loggerheads lay the vast majority of nests in Florida, accounting for nearly 90% of the statewide total in 2012, with green and leatherback turtles accounting for the remainder of nests. Females lay between three to five clutches per season, and incubation ranges from about 42 to 75 days (NMFS and USFWS, 2008; NMFS, 2013e). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S., the Bahamas, Greater Antilles, and Yucatán, and throughout the Gulf of Mexico (NMFS and USFWS, 2008).

The primary threats to loggerhead sea turtle recovery include: bottom trawl, pelagic longline, demersal longline, and demersal large mesh gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; light pollution; and predation by native and exotic species (NMFS and USFWS, 2008).

Loggerhead Designated Critical Habitat

USFWS-Designated Terrestrial Habitat. USFWS proposed critical habitat for the NWA DPS of the loggerhead sea turtle under the Endangered Species Act (ESA) on March 25, 2013, (78 FR 17999) and published the final critical habitat designation on July 10, 2014 (79 FR 39755). The USFWS-designated terrestrial critical habitat includes 88 nesting beaches in coastal counties located in North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi. These beaches account for 48% of an estimated 1,531 miles of coastal beach shoreline used by loggerheads, and about 84% of the documented numbers of nests, within these six states.

Five designated critical habitat areas (LOGG-T-FL units 10-14) include nesting beaches within Palm Beach County (Figure 4-1). Unit LOGG-T-FL-12 includes the nesting beach between Lake Worth Inlet and South Lake Worth Inlet (Boynton Inlet) from the MHW line to the tow of the secondary dune or developed structures. USFWS Unit LOGG-T-FL-12 includes the Action Area for this Project.

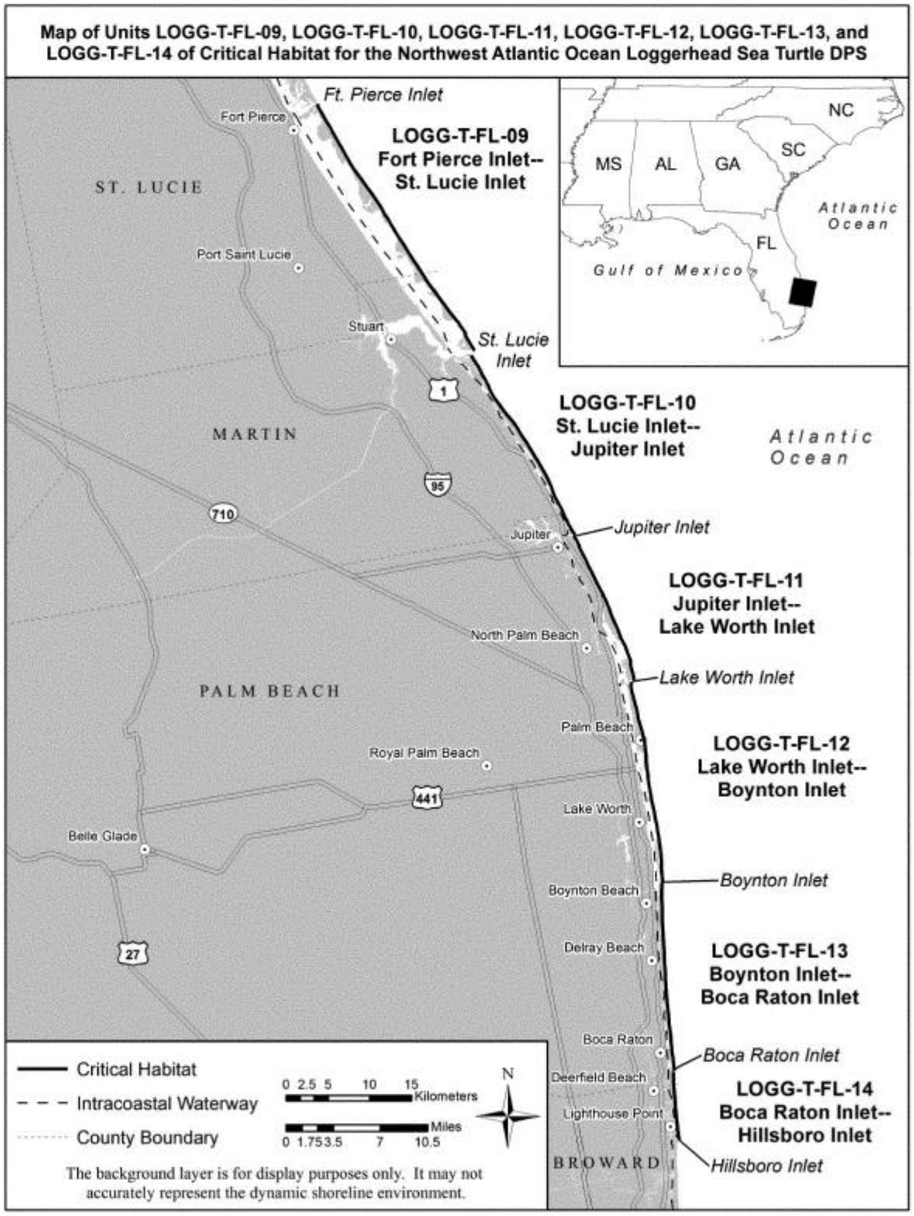


Figure 4-1. USFWS-designated critical habitat units for the loggerhead sea turtle NWA DPS including Palm Beach County units (79 FR 39755).

As part of the critical habitat designation process the physical and biological features of terrestrial environments are identified in areas occupied at the time of listing that are essential to the conservation of the loggerhead sea turtle. Specifically, the focus is on the primary constituent elements (PCE) of those features. PCEs are defined as the specific elements that are essential to the conservation of the species and provide for a species' life-history processes (79 FR 39755). The USFWS has determined four terrestrial PCEs for NWA DPS of the loggerhead sea turtle:

(1) Primary Constituent Element 1 - Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings and (b) is located above mean high water to avoid being inundated frequently by high tides.
(2) Primary Constituent Element 2 - Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and a moisture content conducive to embryo development.
(3) Primary Constituent Element 3 - Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and hatchlings and post-nesting females orient to the sea.
(4) Primary Constituent Element 4 – Natural coastal processes or artificially created or maintained habitat mimicking natural conditions.

USFWS also determined that protection and special management considerations are required within critical habitat areas to address threats to the essential features of loggerhead sea turtle terrestrial habitat. The primary threats that may impact the habitat are grouped into 12 categories. Nine of these categories apply to the LOGG-T-FL-12 unit: recreational beach use; predation; beach and sand placement activities; in-water and shoreline alterations; coastal development; artificial lighting; beach erosion; climate change; and human-caused disasters and response to natural and human-caused disasters (79 FR 39755).

NMFS-Designated Marine Habitat. NMFS proposed critical habitat for the NWA DPS of the loggerhead sea turtle NWA DPS within the Atlantic Ocean and the Gulf of Mexico under the Endangered Species Act (ESA) on July 18, 2013, (78 FR 43005) and published the final critical habitat designation on July 10, 2014 (79 FR 39855). The NMFS-designated marine critical habitat includes some nearshore reproductive areas directly off of nesting beaches from North Carolina through Mississippi, winter habitat in North Carolina, breeding habitat in Florida, constricted migratory corridors in North Carolina and Florida, and Sargassum habitat, which is home to the majority of juvenile turtles, in the western Gulf of Mexico and in U.S. waters within the Gulf Stream in the Atlantic Ocean. Unit LOGG-N-19 includes the nearshore reproductive habitat, constricted migratory habitat and breeding habitat from the Martin County/Palm Beach County line south to Hillsboro Inlet. This unit includes the Action Area of the proposed Project.

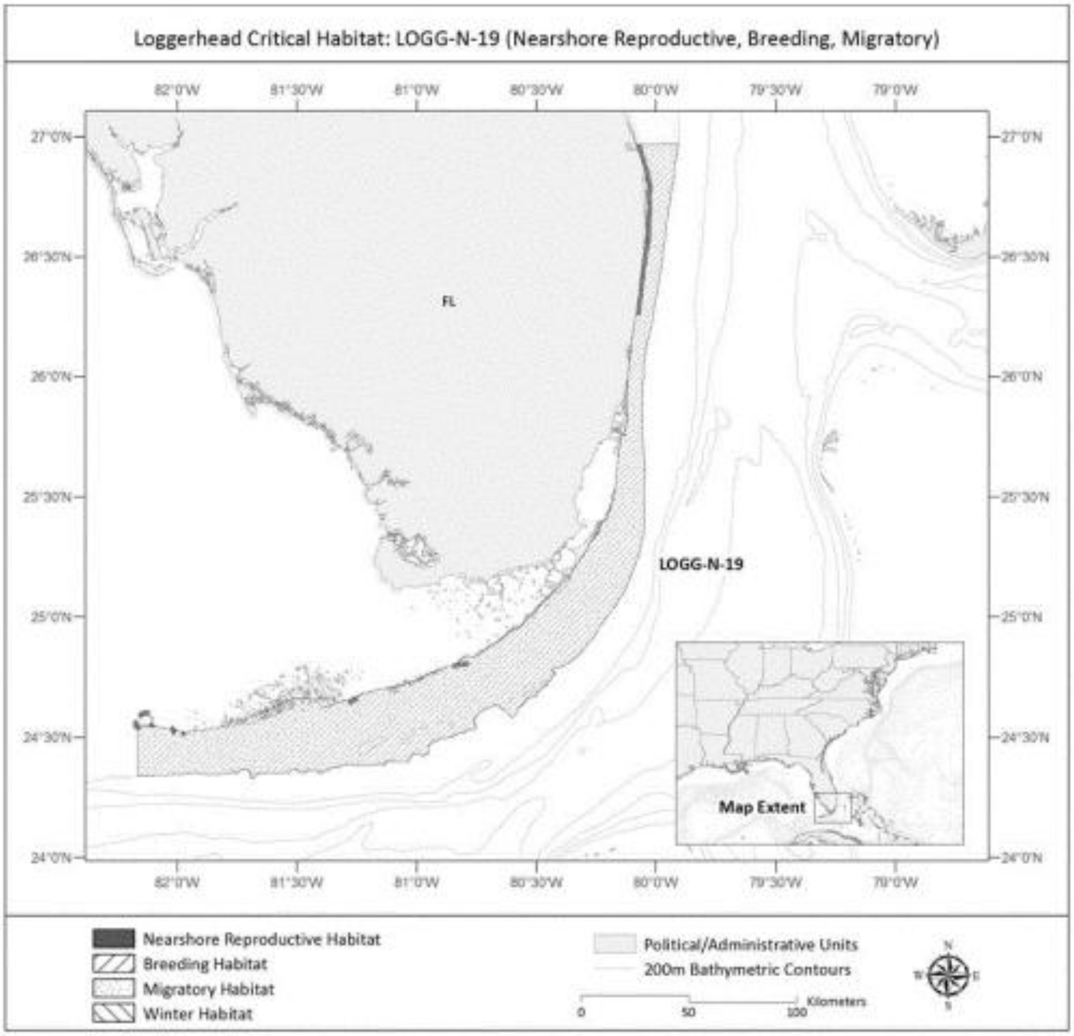


Figure 4-2. NMFS-designated critical habitat unit LOGG-N-19 for the loggerhead sea turtle NWA DPS (79 FR 39855).

NMFS determined PCEs for the Nertic (nearshore reproductive, foraging, winter, breeding and migratory) and *Sargassum* Habitats of the NWA DPS of the loggerhead sea turtle (79 FR 39855):

Nearshore Reproductive Habitat

(1) Primary Constituent Element 1 - Nearshore waters directly off the highest density nesting beaches and their adjacent beaches as identified in 50 CFR 17.95(c) to 1.6 km (1 mile) offshore.

(2) Primary Constituent Element 2 - Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward to open water.
(3) Primary Constituent Element 3 – Waters with minimal manmade structures that could promote predators (*i.e.*, nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation and/or create excessive longshore currents.

Foraging Habitat

(1) Primary Constituent Element 1 – Sufficient prey availability and quality, such as benthic invertebrates, including crabs (spider, rock, lady, hermit, blue, horeshoe), mollusks, echinoderms and sea pens).
(2) Primary Constituent Element 2 – Water temperatures to support loggerhead inhabitance, generally above 10°C.

Winter Habitat

(1) Primary Constituent Element 1 – Water temperatures above 10°C from November through April.
(2) Primary Constituent Element 2 – Continental shelf waters in proximity to the western boundary of the Gulf Stream.
(3) Primary Constituent Element 3 – Water depths between 20 and 100 m.

Breeding Habitat

(1) Primary Constituent Element 1 – High densities of reproductive male and female loggerheads.
(2) Primary Constituent Element 2 – Proximity to primary Florida migratory corridor.
(3) Primary Constituent Element 3 – Proximity to Florida nesting grounds.

Constricted Migratory Habitat

(1) Primary Constituent Element 1 – Constricted continental shelf area relative to nearby continental shelf waters that concentrate migratory pathways.
(2) Primary Constituent Element 2 – Passage conditions to allow for migration and from nesting, breeding, and/or foraging areas.

Sargassum Habitat

(1) Primary Constituent Element 1 – Convergence zones, surface-water downwelling areas, the margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water temparatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerheads.
(2) Primary Constituent Element 2 – *Sargassum* in concentrations that support adequate prey abundance and cover.
(3) Primary Constituent Element 3 – Available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods.
(4) Primary Constituent Element 4 – Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerheads, i.e., >10 m. depth.

NMFS also determined that protection and special management considerations are required within critical habitat areas to address threats to the essential features of loggerhead sea turtle marine habitats. The primary threats that may impact the reproductive, breeding and migratory marine habitats within LOGG-N-19 include: offshore structures; lights on land or in the water; oil spills and response activities; fishing; dredge and disposal activities; and climate change (79 FR 39855).

4.2.2. GREEN SEA TURTLES

The green sea turtle (*Chelonia mydas*) was federally listed as a protected species on July 28, 1978 (43 FR 32800) under the ESA. 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. Green turtles are the largest of all the hard-shelled sea turtles, but have a comparatively small head. While hatchlings are just 50 mm (2 in) long, adults can grow to more than 0.9 m (3 ft) long and weigh 136-159 kg (300-350 lbs) (NMFS, 2013a). Characteristics that distinguish the green turtle from other marine turtle species are a smooth carapace with four pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes (NMFS and USFWS, 1991). A green turtle's carapace is smooth and can be shades of black, gray, green, brown and yellow. Their plastron is yellowish white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron. Adult green turtles differ from other sea turtles in that they are herbivorous, feeding primarily on seagrass and algae. This diet is thought to give them greenish colored fat, from which they take their name (NMFS and USFWS, 1991; NMFS, 2013a).

The green turtle has a worldwide distribution in tropical and subtropical waters. Green turtles are thought to inhabit coastal areas of more than 140 countries. In U.S. Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore waters from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico. Nesting occurs in over 80 countries. The two largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Great Barrier Reef in Australia (NMFS, 2013a). Major green turtle nesting colonies in the western Atlantic/Caribbean occur on the Yucatan Peninsula (Mexico), Tortuguero (Costa Rica), Aves Island (Venezuela), Galibi Reserve (Suriname) and Isla Trinidade (Brazil) (NMFS and USFWS, 2007b). In the U.S., green turtles nest primarily along the central and southeast coast of Florida; present estimates range from 200-1,100 females nesting annually (NMFS, 2013a). Scientists estimate green turtles reach sexual maturity anywhere between 20 and 50 years, at which time females begin returning to their natal beaches every 2-4 years to lay eggs. In the southeastern U.S., females generally nest between June and September, while peak nesting occurs in June and July. During the nesting season, females nest at approximately two week intervals, laying an average of five clutches. In Florida, green turtle nests contain an average of 135 eggs, which will incubate for approximately 2 months before hatching (NMFS, 2013a).

Green sea turtles are threatened by impacts to the nesting and marine environment. Threats include: loss or degradation of nesting habitat from coastal development; beach nourishment and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and 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 (NMFS and USFWS, 1991; 2007b).

In 1998, NMFS designated critical habitat for the green sea turtle to include the coastal waters around Culebra Island, Puerto Rico (63 FR 46693). There is no green sea turtle critical habitat in the vicinity of the Action Area for the proposed Project.

4.2.3. LEATHERBACK SEA TURTLES

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on June 2, 1970 (35 FR 8491). Adult leatherbacks are highly migratory and are believed to be the most pelagic of all sea turtles (NMFS and USFWS, 1992). The leatherback turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. It is also found in small numbers as far north as British Columbia, Newfoundland and the British Isles, and as far south as Australia, Cape of Good Hope and Argentina (USFWS, 2013b). The leatherback is the largest turtle and the largest living reptile in the world. Mature adults can be as long as 2 m (6.5

ft) and weigh almost 900 kg (2,000 lbs). The leatherback is the only sea turtle that lacks a hard, bony shell; its carapace consists of leathery, oil saturated connective tissue overlaying loosely interlocking dermal bones. The carapace has seven longitudinal ridges and tapers to a blunt point. Adult leatherbacks are primarily black with a pinkish white mottled ventral surface and pale white and pink spotting on the top of the head. The front flippers lack claws and scales and are proportionally longer than in other sea turtles, and the back flippers are paddle-shaped. The ridged carapace and large flippers are characteristics that make the leatherback uniquely equipped for long distance foraging migrations (NMFS, 2013d).

Nesting grounds are distributed worldwide. The largest nesting populations in the Atlantic are located in Suriname and French Guiana (5,000-20,000 females nesting/year) and Gabon (15,730-41,373 females nesting/year). In the Pacific the largest nesting populations are located in Papua, Solomon Islands, Papua New Guinea, Vanuatu, and Indonesia (2,700-4,500 females nesting/year). In the United States, small nesting populations occur in Florida (63-754 nests/year), Sandy Point, U.S. Virgin Islands (143-1,008 nests/year), and Puerto Rico, including Culebra (32-395 nests/year) and mainland (131-1,291 nests/year) (NMFS, 2013h) . The U.S. Caribbean, primarily Puerto Rico and the U.S. Virgin Islands, and southeast Florida support minor nesting colonies, but represent the most significant nesting activity within the U.S. Adult leatherbacks are capable of tolerating a wide range of water temperatures and have been sighted along the entire continental coast of the United States as far north as the Gulf of Maine and south to Puerto Rico, the U.S. Virgin Islands, and into the Gulf of Mexico (NMFS and USFWS, 2007c; NMFS, 2013d). Females nest several times during a nesting season, laying clutches of approximately 100 eggs on sandy, tropical beaches. The incubation period for leatherback sea turtles ranges from about 55-75 days (NMFS, 2013d).

Leatherback turtles face threats on both nesting beaches and in the marine environment. The crash of the Pacific leatherback population, once the world's largest population, is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. The primary threats to leatherbacks worldwide continue to be long-term harvest and incidental capture in fishing gear. Harvest of eggs and adults occurs on nesting beaches while juveniles and adults are harvested on feeding grounds. Incidental capture primarily occurs in gillnets, but also in trawls, traps and pots, longlines, and dredges. Together these threats are serious ongoing sources of mortality that adversely affect the species' recovery (NMFS, 2013d). Other factors threatening leatherbacks include loss or degradation of nesting habitat from coastal development, disorientation of hatchlings by beachfront lighting, excessive nest predation by native and non-native predators, marine pollution and debris and watercraft strikes (NMFS and USFWS, 1992; 2007c).

In 1978, USFWS initially designated 0.3 km (0.2 mi) of land at Sandy Point Beach on the Western end of St. Croix in the Virgin Islands as critical habitat for the leatherback sea turtle. In 1979, the National Marine Fisheries Service (NMFS) extended critical habitat to the coastal waters adjacent to Sandy Point (44 FR 17710). The designation was again revised in 2012 to include approximately 16,910 mi^2 (43,798 km^2) along the California coast, and 25,004 mi^2 (64,760 km^2) of coastline between Washington and Oregon (77 FR 4170). There is no leatherback critical habitat in the vicinity of the Action Area.

4.2.4. HAWKSBILL SEA TURTLES

The hawksbill sea turtle (*Eretmochelys imbricata*) was listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill turtle is small to medium-sized compared to other sea turtle species. Adults weigh 45-68 kg (100-150 lbs) on average, but can grow as large as 91 kg (200 lbs). The carapace of an adult ranges from 63-90 cm (25-35 in) in length and has a "tortoiseshell" coloring, ranging from dark to golden brown, with streaks of orange, red, and/or black. The shells of hatchlings are 25-50 mm (1-2 in) long and are mostly brown and somewhat heart-shaped. The plastron is clear yellow. The hawksbill turtle's head is elongated and tapers to a point, with a beak-like mouth that gives the species its name. The shape of the mouth allows the hawksbill turtle to reach into holes and crevices of coral reefs to find sponges, their primary food source as adults, and other invertebrates. Hawksbill turtles are unique among sea turtles in that they have two pairs of prefrontal scales on the top of the head and each of the flippers usually has two claws (NMFS and USFWS, 1993; NMFS, 2013b).

This species is most commonly associated with healthy coral reefs and is found in tropical and subtropical seas of the Atlantic, Pacific and Indian Oceans. Hawksbills are widely distributed throughout the Caribbean Sea and western Atlantic Ocean, regularly occurring in southern Florida and the Gulf of Mexico (especially Texas), in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil (NMFS and USFWS, 1993; NMFS 2013b).

Hawksbills are solitary nesters, thus determining population trends or estimates on nesting beaches is difficult. The largest populations of hawksbills are found in the Caribbean, the Republic of Seychelles, Indonesia and Australia, and the largest nesting population of hawksbills occurs in Australia. The most significant nesting within the U.S. occurs in Puerto Rico and the U.S. Virgin Islands, specifically on Mona Island and Buck Island, respectively. Nesting also occurs on beaches in St. Croix and on St. John, St. Thomas, Culebra Island, Vieques Island and mainland Puerto Rico. Within the continental U.S., nesting is rare and restricted to the southeast coast of Florida and the Florida Keys. No nesting occurs on the west coast of the U.S. mainland. In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam. In addition to nesting beaches in the U.S. Caribbean, hawksbills nest at numerous other sites throughout the Caribbean, with the majority of nesting occurring in Mexico and Cuba (NMFS and USFWS, 1993; NMFS, 2013b). Female hawksbills return to their natal beaches every 2-3 years, generally laying 3-5 nests per season, each nest containing an average of 130 eggs. Hawksbill turtles usually nest high up on the beach under or in the beach/dune vegetation on both calm and turbulent beaches. They commonly nest on pocket beaches with little or no sand. Incubation for hawksbill sea turtles lasts for about 60 days (NMFS and USFWS, 1993; NMFS, 2013b).

The decline of the hawksbill species has been primarily due to human exploitation for tortoiseshell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. Current threats to hawksbills also include loss or degradation of nesting habitat from coastal development, construction of buildings and pilings, beach armoring and renourishment, and sand extraction. These factors may directly, through loss of beach habitat, or indirectly, through changing thermal profiles and increasing erosion, serve to decrease the amount of nesting area available to nesting females, and may evoke a change in the natural behaviors of adults and hatchlings. Sea-level rise resulting from climate change may increase practices to fortify the coast, further exacerbating the problem (NMFS and USFSW, 2013).

In addition, coastal development is usually accompanied by artificial lighting. The presence of lights on or adjacent to nesting beaches alters the behavior of nesting adults (of all sea turtle species) and is often fatal to emerging hatchlings as they are attracted to light sources and drawn away from the water or may even cause them to change course offshore. In many countries, coastal development and artificial lighting are responsible for substantial hatchling mortality (NMFS and USFWS, 2013). Another major threat to hawksbills is habitat loss of coral reef communities, which provide food resources and habitat. Coral reefs are vulnerable to destruction and degradation caused by human activities (e.g. pollution, vessel groundings, global climate change). While previously thought to be obligate reef dwellers, hawksbills may occupy a range of habitats that include coral reefs or other hard bottom habitats, seagrass, algal beds, mangrove bays and creeks. In the Caribbean, seagrass beds, which are thought to be peripheral habitat for hawksbills, sustain hawksbill foraging aggregations comparable to reef habitat. Although not as common as coral reef or hard-bottom habitat, Bjorndal and Bolten (2010) state that hawksbills historically may have used seagrass habitat but abandoned it as green turtle populations collapsed and the pastures went ungrazed decreasing the value of the habitat for hawksbills. Nonetheless, seagrass pastures may become more important as coral reefs decline (NMFS and USFWS, 2013).

Critical habitat for the hawksbill sea turtle has been designated in coastal waters surrounding Mona and Monito Islands, Puerto Rico (63 FR 46693). There is no hawksbill critical habitat in the vicinity of the Action Area.

4.2.5. KEMP'S RIDLEY SEA TURTLES

The Kemp's ridley sea turtle (*Lepidochelys kempii*) was first listed endangered throughout its range on December 2, 1970 under the Endangered Species Conservation Act of 1970, and subsequently under the Endangered Species Act of 1973 (43 FR 32800) (NMFS et al., 2011; NMFS, 2013c). This species was also listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on July 1, 1975, which prohibited all commercial international trade. The International Union for the Conservation of Nature lists the Kemp's ridley as Critically Endangered (NMFS, 2013c). The smallest living sea turtle, the Kemp's ridley has a straight carapace length around 65 cm (26 in), with the adult's shell almost as wide as it is long. The dorsal carapace is round to heart-shaped and distinctly light gray. 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. The Atlantic waters off the eastern seaboard of the U.S. serve as important foraging grounds for juvenile stages, ranging from New England to Florida. Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the U.S. (NMFS et al., 2011). Male turtles migrate between breeding and foraging grounds that span many different parts of the Gulf of Mexico, while females have been tracked migrating from nesting grounds to foraging grounds ranging from the Yucatan Peninsula to southern Florida (NMFS 2013c).

Nesting aggregations of Kemp's ridley turtles occur at Rancho Nuevo in Tamaulipas, Mexico, where 95% of worldwide nesting occurs for this species. These nesting aggregations (known as "arribadas") are synchronized events unique to the *Lepidochelys* genus. Nesting also occurs in Veracruz, Mexico, and Texas, U.S., but on a much smaller scale. Nesting occurs from May to July, and females lay two to three clutches of approximately 100 eggs, which incubate for 50 to 60 days (NMFS, 2013c).

After leaving the nesting beach, hatchlings 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 20 cm (8 in) in length, at which size they enter coastal shallow water habitats. As juveniles, Kemp's ridley turtles feed primarily on crabs, clams, mussels and shrimp and are most commonly found in productive coastal and estuarine areas. Adults primarily prey on swimming crabs, but may also eat fish, jellyfish, and mollusks (NMFS, 2013c).

Due to mainly anthropogenic causes, this species experienced dramatic declines in numbers from 1948 to the early 2000's. In 1947, video footage of nesting activity captured the arrival of upwards of 40,000 females near Rancho Nuevo (NMFS, 2013c). Collapse of the species was evident twenty years later when only 5,000 nesting females were observed. By the mid 1980's the population declined to record lows, with 702 nests representing only 300 females, recorded in 1985. Today, under strict protection, the population appears to be in the early stages of recovery. Nesting has drastically increased since the 1980's, and over 20,000 nests were recorded at nesting beaches in Tamaulipas, Mexico in 2009. However, only 13,302 nests were recorded in 2010 at this location (NMFS et al., 2011). In Texas, nesting data from 2005 to 2010 indicate approximately 5,500 females are nesting annually, a dramatic increase from the 81 nests recorded from 1948-2001 (Shaver and Caillouet Jr., 1998).

The Kemp's ridley population is exponentially increasing (NMFS et al., 2011), which may be indicative of the success of several fishing regulations designed to reduce impact to sea turtles in the commercial fisheries. The Kemp's ridley has also benefitted from conservation efforts enacted by the Mexican government since the 1960's, including a ban on the take of any sea turtle species and designation of the Rancho Nuevo nesting beach as Natural Protected Area in 2002. If survival rates occur at the present rate, population models predict the population will grow at a rate of 19%.

NMFS and USFWS were jointly petitioned in February of 2010 to designate critical habitat for the Kemp's ridley sea turtles' nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean. This petition is currently being reviewed (NMFS, 2013c).

4.3. SMALLTOOTH SAWFISH

The smalltooth sawfish (*Pristis pectinata*) is a tropical marine and estuarine elasmobranch fish that inhabits the waters of the eastern United States, the northwestern terminus of their Atlantic range. On April 1, 2003 NMFS published a final rule to list the U.S. distinct population segment as an endangered species under the ESA (68 FR 15674). The smalltooth sawfish commonly reaches 5.5 m (18 ft) in length and may grow to 7 m (25 ft) (NMFS, 2013f). Little is known about the life history of these animals, but they may live up to 25-30 years, maturing after about 10 years. Like many elasmobranchs, smalltooth sawfish are ovoviviparous, meaning the mother holds the eggs inside of her until the young are ready to be born, usually in litters of 15-20 pups.

Sawfish species inhabit shallow coastal waters of tropical seas and estuaries throughout the world. Specifically, they are usually found in shallow waters very close to shore over muddy and sandy bottoms within sheltered bays, on shallow banks, and in estuaries or river mouths (NMFS, 2013f). Juvenile sawfish use shallow, well-vegetated habitats, such as mangrove forests, as important nursery areas. Smalltooth sawfish have been reported in the Pacific and Atlantic Oceans and Gulf of Mexico; however, the U.S. population is found only in the Atlantic Ocean and Gulf of Mexico. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras. Now, however, this species is most commonly found within the Everglades region at the southern tip of the state (NMFS, 2013f). Sawfish encounters have also been recorded within Florida Bay and the Florida Keys, in depths ranging from less than 3 m (10 ft) to greater than 21 m (70 ft), within a variety of habitats including mud, sand, seagrass, limestone hardbottom, rock, coral reef and sponge bottom. Some individuals were also observed near a culvert pipe, seafans, and artificial reefs a freshwater spring, and an oil rig (Poulakis and Seitz, 2004). Although sawfish were once a common sight off Florida’s coastline, they have become less common during the last century because they were unintentionally overfished.

Their long “saws”, referred to scientifically as “rostrums” or "rostra", were easily entangled in any kind of fishing gear. Sawfish rostrums have also been popular trophy items. Since these fish produce few young, it has been a challenge for their population to recover after being depleted (FWC, 2013a). Many of the habitats that serve as important nursery areas for juveniles have been modified or lost due to development of the waterfront in Florida and other southeastern states, likely contributing to the decline of this species (NMFS, 2013f). Based on the contraction in range and anecdotal data, it is likely that the population is currently at a level less than 5% of its size at the time of European settlement (NMFS, 2009).

Critical habitat was designated for the smalltooth sawfish on September 2, 2009, and includes two units: the Charlotte Harbor Estuary Unit and the Ten Thousand Islands/Everglades Unit. These two units are located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay (73 FR 45353) (Figure 4-3). There is no smalltooth sawfish critical habitat in the vicinity of the Action Area for the proposed Project.

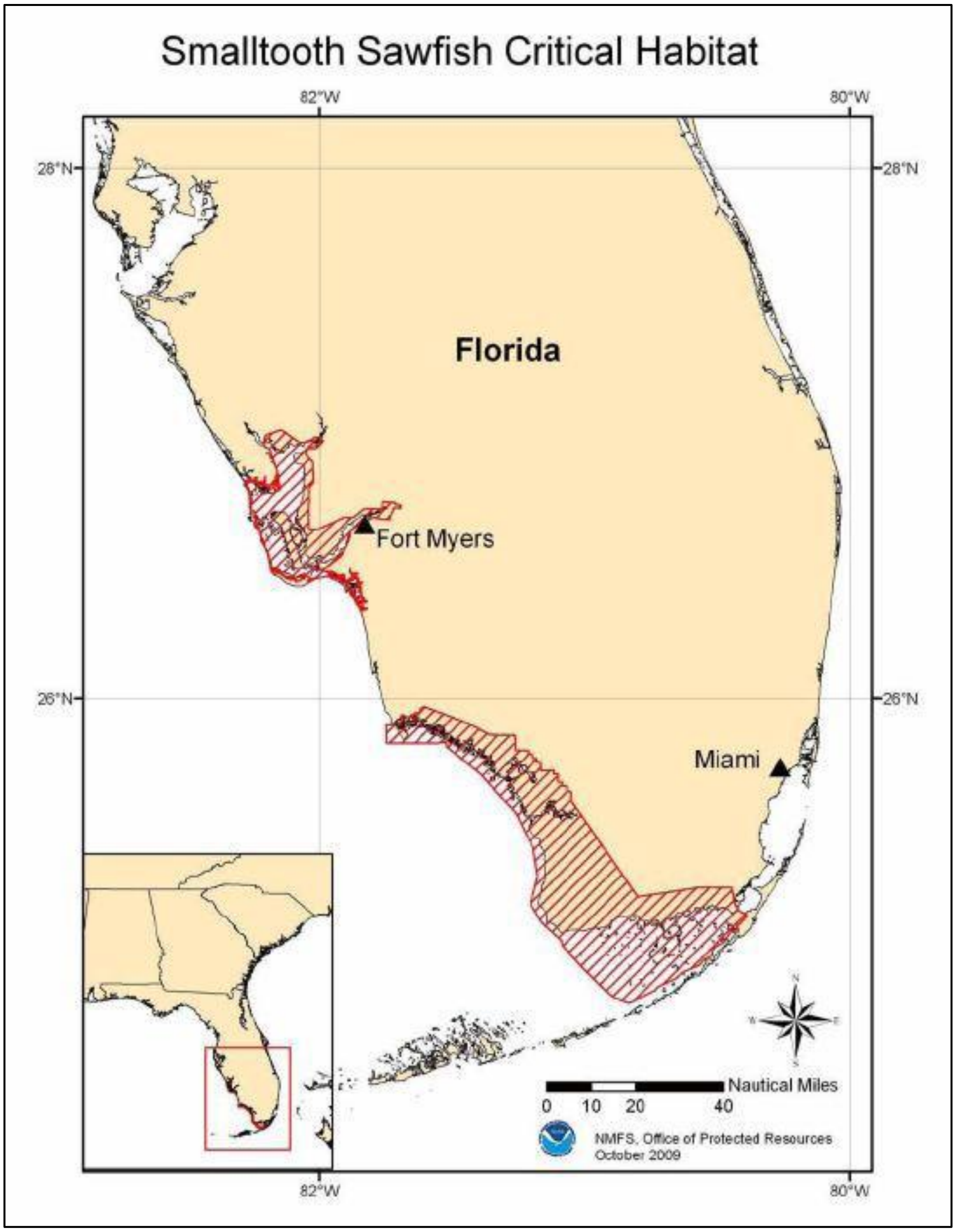


Figure 4-3. Critical habitat for the smalltooth sawfish (73 FR 45353) (NMFS, 2013f).

4.4. MAMMALS

4.4.1. FLORIDA MANATEE

The Florida manatee (*Trichechus manatus*) was first listed as endangered under the Federal Endangered Species Preservation Act of 1966 (32 FR 4001), later superseded by the 1969 Endangered Species Conservation Act. Previously, however, Florida prohibited the killing of manatees in 1893, making it one of the first wildlife species in the U.S. to receive protection. In 1973 manatees were listed under the ESA. They are also protected under the Marine Mammal Protection Act (MMPA) of 1972. The West Indian manatee includes two distinct subspecies, the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*Trichechus manatus manatus*). The USFWS published a five-year review of the Florida manatee population in 2007, which stated that the best available science shows the overall population of the Florida Manatee has increased and the Antillean manatee levels are stable, and neither subspecies is currently in danger of becoming extinct within all or a significant portion of their range. The USFWS concluded that the West Indian manatee species' status better fits the ESA definition of threatened and as such has recommended reclassification (USFWS, 2007b); however, this species is currently still listed as endangered.

The Florida manatee is found in freshwater, brackish, and marine environments. Typical coastal and inland habitats include coastal tidal rivers and streams, mangrove swamps, salt marshes, freshwater springs, and vegetated bottoms. Manatees' diet includes submerged, emergent, and floating vegetation. Shallow grass beds, with ready access to deep channels, are generally preferred feeding areas in coastal and riverine habitats. In coastal Georgia and northeastern Florida, manatees feed in salt marshes on smooth cordgrass (*Spartina alterniflora*) by timing feeding periods with high tide. Manatees use springs and freshwater runoff sites for drinking water; secluded canals, creeks, embayments, and lagoons for resting, cavorting, mating, calving and nurturing their young; and open waterways and channels as travel corridors (USFWS, 2001; 2007b).

Florida manatees occupy different habitats during various times of the year. During the winter, cold temperatures keep the population concentrated in peninsular Florida and many manatees rely on the warm water from natural springs and power plant outfalls. During the summer they expand their range and, on rare occasions, are seen as far north as Rhode Island on the Atlantic coast and as far west as Texas on the Gulf coast (USFWS, 2001; 2007b). The Florida manatee population appears to be divided into at least two somewhat isolated areas, one on the Atlantic coast and the other on the Gulf coast of Florida; the populations are broken down further into regional groups, with the Northwest and Southwest groups on the Gulf Coast and Atlantic and Upper St. Johns River groups on the Atlantic coast (USFWS, 2001). Each of these “subpopulations” is composed of individual manatees that tend to return to the same warm-water sites each winter and have similar non-winter distribution patterns. Exchange of individuals between these subpopulations is considered to be limited during winter months, based on telemetry data (USFWS, 2007b).

The most significant threat to Florida manatees is death or injury from boat strikes (USFWS, 2001). In the Northwest Region, which includes Alabama waters, adult mortality is almost equally divided between human-related and natural causes, with watercraft collision (direct impact and/or propeller) being the primary cause of human-induced mortality. For non-adults, perinatal mortality is the most common cause of death, with watercraft collisions ranked second (USFWS, 2007b). Other human-related threats include entrapment and/or crushing in water control structures (e.g. gates and, locks), and entanglement in fishing lines and crab pot lines. Natural threats include exposure to cold and red tide, which can result in mortality through cold stress syndrome and brevitoxicosis, respectively (USFWS, 2007b). In Florida, many manatees depend on warm-water refuges; however, the long-term availability of these refuges is uncertain if minimum flows and levels are not established for natural springs and as deregulation of the power industry in Florida occurs (USFWS, 2001).

Critical habitat was designated in 1976 for the Florida manatee (50 CFR Part 17.95(a)). This was one of the first ESA designations of critical habitat for an endangered species and the first for an endangered marine mammal (USFWS, 2001). On March 16, 2012, the USFWS established a manatee refuge in the waters of Kings Bay, its tributaries and connected waters in Citrus County, Florida (77 FR 15617). The closest critical habitat to the north includes all of Lake Worth in Palm Beach County, from its northernmost point immediately south from the intersection of U.S. Highway 1 and Florida State Highway A1A southward to its southernmost point immediately north of Boynton Beach. The closest critical habitat to the south includes the mainland of Dade County, as well as

Biscayne Bay and all adjoining lakes, rivers, canals and waterways from the southern tip of Key Biscayne northward to and including Maule Lake in Dade County (50 CFR Part 17.95(a)). There is no critical habitat for the Florida manatee within the Action Area.

4.4.2. FLORIDA PANTHER

The Florida panther (*Puma concolor coryi)*, federally listed as endangered, is one of the smaller cougar species in the western hemisphere. There are currently only 100-160 Florida panthers left in the wild. Adult males can reach a length of 2.1 m (7 ft) with a shoulder height between 60-70 cm (24-28 in), and an average weight of 52.6 kg (116 lbs). Females are smaller, as they only reach a length of up to 1.8 m (6 ft) and a weight of 34 kg (75 lbs). Adult Florida panthers have a reddish-brown back, dark tan sides, and a pale gray belly. Kittens have a gray colored body, with black or brown spots, and five stripes that go around the tail. Panthers are never black in coloration (USFWS, 2008).

Florida panthers are carnivores and their diet consists primarily of deer, raccoons, wild hogs, armadillos, and rabbits. Florida panther home ranges average 194 and 388 km^2 (75 and 150 mi^2) for females and males, respectively. There is some overlap amongst home ranges, particularly for females, but males are typically intolerant of other males.

Florida panthers are solitary in nature, except for females with kittens, and they do not form pair bonds with mates. The total gestation time is 92-96 days with one to four kittens per litter. Births occur throughout the year, but mainly occur in late spring. Dens are usually created in a palmetto thicket. Females do not breed again until their young are 1.5-2 years old. Females reach sexual maturity at 1.5-2.5 years old, while males reach sexual maturity around 3 years old.

Female panthers have a higher survival rate and therefore tend to live longer than male panthers. Ages at death average 7.5 years for females and just over 5 years for males. The oldest known wild panthers were 20 and 14 years old at death for a female and male panther, respectively.

Habitat loss and hunting have led to the panther's near extinction. Low wild population numbers led to decreased genetic diversity and inbreeding. A plan to restore the genetic health of Florida panthers was implemented in 1995. Genetic restoration involved the release of eight female pumas (*Puma concolor stanleyana*) from Texas in 1995 into available panther habitat in south Florida. The Texas subspecies was selected for this Project because they represented the closest puma population to Florida, and historically, the Florida panther subspecies bordered the Texas population and interbreeding occurred naturally between them. Five of the eight Texas females reproduced successfully, resulting in a minimum of 20 kittens. By 2003, the last three surviving Texas females were removed from the wild Florida population; no Texas pumas remain in the wild in Florida today. Habitat loss and fragmentation continue to be major threats to the Florida panther, along with inbreeding, insufficient large prey, disease and environmental contaminants (FWC, 2014a; PantherNet, 2014).

4.5. CORALS

Two species of coral, *Acropora cervicornis* and *A. palmata*, have been listed as threatened under the ESA since 2006, and five additional Caribbean corals were recently listed in August 2014 as threatened: *Orbicella annularis, O. faveolata, O. franski, Dendrogyra cylindrus* and *Mycetephyllia ferox* (Table 4-1).

4.5.1. ACROPORID CORALS

In 2006, staghorn coral (*A. cervicornis*) and elkhorn coral (*A. palmata)* were listed as threatened under the ESA (71 FR 26852, May 9, 2006). In 2008, NMFS designated critical habitat for these two species (73 FR 72210, November 26, 2008), which includes the hardbottom and reef resources located approximately 2.5 miles south of the proposed Project Area. On December 7, 2012, NMFS proposed that the two species of *Acropora* already listed under the ESA be reclassified from threatened to endangered (77 FR 73219). However, on August 27, 2014, NMFS determined these species still warrant a threatened listing, and did not reclassify them (50 CFR Part 223).

These species have played crucial roles on Caribbean reefs, currently as habitat providers and historically as reef-building organisms. Staghorn and elkhorn coral were once the most abundant species on Caribbean and Florida Keys coral reefs in terms of accretion and reef structure. Rapid growth rates and reproductive strategies exhibited by both species were essential to enabling reefs to keep pace with environmental changes. Staghorn coral, one of the fastest growing corals in the western Atlantic, may exhibit growth rates from 10-20 cm (4-8 in) per year. The primary method of reproduction is via asexual fragmentation, in which new colonies form when branches are broken off and reattach to the substrate. Elkhorn coral may grow as much as 5-10 cm (2-4 in) per year. Similarly, the primary reproductive mode for this species is asexual fragmentation. In both species, sexual reproduction also occurs once a year via mass broadcast spawning of gametes into the water column between August and September. Colonies are simultaneous hermaphrodites and release millions of gametes during the spawning season (NMFS, 2013g).

Environmental influences have driven the morphological differences between the two species. Staghorn coral occurs in back reef and forereef environments in depths from 0-30 m (0-98 ft), and habitat is limited by wave activity, suspended sediments and light availability. Prior to the mid 1980’s, forereef zones at depths of 5-25 m (16-82 ft) were dominated by extensive stands of staghorn coral. This species characteristically grows in antler-like colonies with cylindrical, fragile branches of 1-4 cm (0.4-1.6 in) in diameter. Elkhorn coral, by contrast, typically occurs in reef crest and forereef environments exposed to heavy surf, in depths less than 6 m (20 ft). Colonies grow in robust, antler-like formations with thick, sturdy branches that can reach 2-10 cm (0.8-3.9 in) in thickness (NMFS, 2013g).

In general, the two species have the same geographic range with a few exceptions. Both are found throughout mainland south Florida, the Florida Keys, the Bahamas, and the Caribbean islands, as well as the eastern coasts of Mexico, Belize, Honduras, Nicaragua, Costa Rica, Panama and Venezuela. In southeast Florida, staghorn coral has been documented as far north as Palm Beach County in deeper (17 m (56 ft)) water

(CEG, 2009) and is distributed south and west throughout the coral and hardbottom habitats of the Florida Keys, through Tortugas Bank. Elkhorn coral has been reported as far north as Broward County, Florida (Precht and Aronson, 2004), and extending discontinuously southward to Venezuela.

Since the 1980's, population declines have been drastic, and it has been estimated that 90-95% of these corals have been lost (EOL, 2013). Major threats to staghorn and elkhorn coral include disease, coral bleaching, predation, climate change, storm damage and human activity. All of these factors have created a synergistic effect that greatly diminishes the survival and reproductive success of these corals (Precht and Aaronson, 2004). Natural recovery of coral is a slow process and may never occur with these species because there are so many inhibitors to its survival.

The predominance of asexual methods of reproduction in these species combined with limited larval dispersal has led to the development of populations with low genetic diversity and potentially increased susceptibility toward disease (Vollmer and Palumbi, 2007). Diseases that affect elkhorn coral include white pox disease, white band disease, and black band disease. White pox disease only affects elkhorn coral and is caused by a fecal enterobacterium, *Serratia marcescens* (Patterson et al., 2002). The disease is very contagious and commonly moves from one colony to its nearest neighbor. White pox creates white lesions on the coral skeleton and results in an average tissue loss of 2.5 cm^2 (0.39 in^2) per day but can cause as much tissue loss as 10.5 cm^2 (1.63 in^2) per day (Patterson et al., 2002). White band disease and black band disease have also greatly reduced the abundance of elkhorn coral by causing catastrophic losses (Reefball, 2013). A rapidly progressing condition referred to as rapid tissue loss has been observed over large areas in the Florida Keys (Williams and Miller, 2005) and southeast Florida (Smith and Thomas, 2008). This condition is characterized by a sloughing off of tissue that progresses rapidly (on average 4 cm branch length per day) throughout the colony.

Predators of elkhorn and staghorn coral include coral eating snails (*Coralliophila abbreviata*), polychaetes such as the bearded fireworm and damselfish. Predation by these organisms reduces the growth and reproductive abilities of the coral. Predation can eventually lead to the death of the coral colony.

Critical habitat for threatened staghorn and elkhorn coral was designated on November 26, 2008 in four areas: Florida, Puerto Rico, St. John/St. Thomas and St. Croix. In Florida, critical habitat is divided into three sub-areas (71 FR 72210). Sub-Area A ranges from South Lake Worth Inlet in Palm Beach County to Government Cut in Miami-Dade County, from the inshore boundary at the 1.8 m (6 ft) contour out to the seaward boundary at the 30 m (98 ft) contour. The northern limit of critical habitat for these species is South Lake Worth Inlet, located approximately 4 km (2.5 mi) south of the proposed Project Area (Figure 4-4). *Acropora* critical habitat is not located within the Action Area of the proposed Project.

Designation of the critical habitat also requires the identification of the physical or biological features that our essential to the conservation of the species. The primary constituent element (PCE) essential for the conservation of staghorn and elkhorn corals is substrate of suitable quality and availability to support larval settlement and recruitment and reattachment and recruitment of asexual fragments. For purposes of this definition, “substrate of suitable quality and availability” is defined as natural consolidated hard substrate or dead coral skeleton that is free from fleshy or turf macroalgae cover and sediment cover (50 CFR 223 and 226).

NMFS published a Draft Recovery Plan for Staghorn and Elkhorn Corals on September 5, 2014 (79 FR 53019), which describes actions beneficial for the conservation and recovery of *Acropora palmata* and *A. cervicornis.*

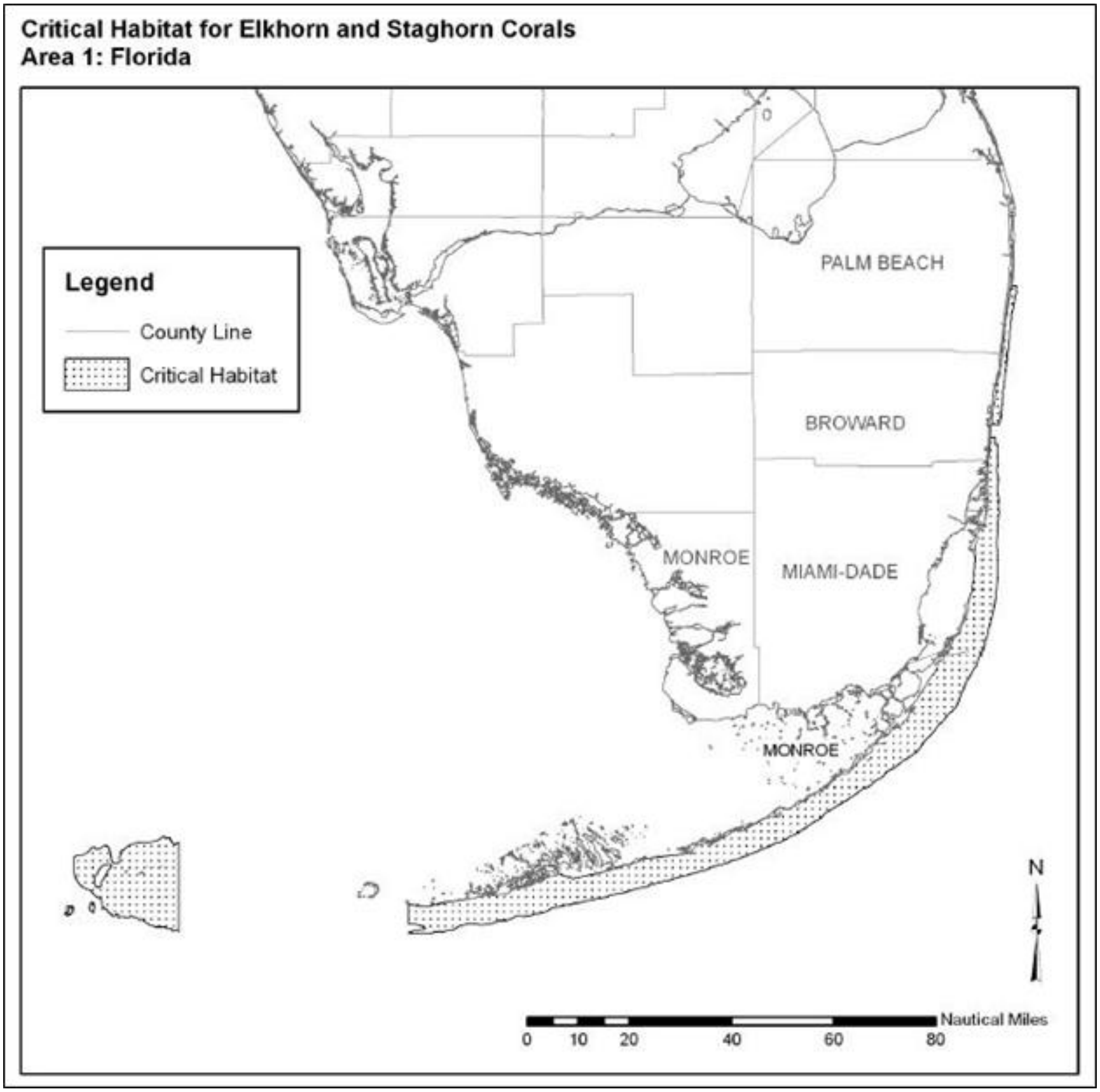


Figure 4-4. Critical habitat in Florida for staghorn (*Acropora cervicornis*) and elkhorn coral (*A. palmata*) (71 FR 72210) (NMFS, 2013g).

4.5.2. RECENTLY LISTED CARIBBEAN CORAL SPECIES

On October 20, 2009, the Center for Biological Diversity petitioned NMFS to list 83 coral species as threatened or endangered under the ESA. NMFS identified 82 of the corals as candidate species and established a Biological Review Team (BRT) to prepare a Status Review Report to examine those 82 candidate coral species and evaluate extinction risks for each of them. Of those 82 species, NMFS proposed listing for 66 coral species: 59 in the Pacific (7 as endangered, 52 as threatened) and 7 in the Caribbean (5 as endangered, 2 as threatened) (December 2012, 77 FR 73219). On August 27, 2014, NMFS published their Final Rule (50 CFR Part 223) listing 20 of the proposed 66 coral species as threatened under the ESA (in addition to *Acropora palmata* and *A. cervicornis,* which were already listed). These newly listed threateded coral species include 15 in the Indo-Pacific and five in the Caribbean.

The following information on the species biology of the five newly listed Caribbean coral species: *Orbicella annularis, O. faveolata, O. franski, Dendrogyra cylindrus* and *Mycetephyllia ferox*. This information is gathered from the NOAA-NMFS Coral Status Review Report of 82 Candidate Coral Species Petitioned under the ESA (Brainard et al., 2011) unless otherwise cited.

Orbicella annularis complex

*Orbicella annularis (*formerly *Montastraea annularis)* has historically been one of the primary reef framework builders of the western Atlantic and Caribbean. Its depth range is from 1 m (3.3 ft) to over 30 m (100 ft) and it has multiple growth forms ranging from columnar to massive to plating. Based on their morphology, depth range, ecology and behavior with subsequent support from reproductive and genetic studies, these growth forms were partitioned into three separate species in the early 1990s: *Montastraea annularis, M. faveolata* and *M. franksi* (now all renamed under the genus *Orbicella).*

The *Orbicella annularis* complex characterizes the “buttress zone” and “annularis zone” in the classical descriptions of Caribbean reefs and has been described as very abundant in these zones. Declines became obvious in the 1990s and 2000s and were most often associated with combined disease and bleaching events. They exhibit dramatically low productivity (low growth and extremely low recruitment), which puts them at high extinction risk due to any substantial declines in adult populations.

In Florida, several studies spanning nearly 30 years imply extreme declines in the Florida Keys (80% to 90%) between the late 1970s and 2003. Parameters measured revealed declines in absolute cover, colony shrinkage, and virtually no recruitment.

Additionally, further dramatic losses occurred in this region during the cold weather event in January 2010. Similar declines have been documented in the U.S. Virgin Islands, Belize and Colombia as well as on relatively remote Caribbean reefs such as Navassa Island National Wildlife Refuge and offshore islands in Puerto Rico.

All three species are hermaphroditic broadcast spawners. Reproduction is characterized by small eggs and larvae and very slow post-settlement growth rates, which may contribute to extremely low post-settlement survivorship. It is thought that only *O. annularis* is capable of some degree of fragmentation/fission and clonal reproduction.

The *Orbicella annularis* complex has been shown to be highly-to-moderately susceptible to bleaching, which was highlighted during the well-documented mortalities in these species following severe mass-bleaching in 2005 due to thermal stress. Disease outbreaks of white-plague and yellow-band have also resulted in population declines to these species. Degraded water quality (increased nutrients and/or toxins) and increased turbidity and sedimentation associated with land-based sources of pollution has resulted in decreased growth rates and increase susceptibility to bleaching and disease.

Orbicella annularis. Boulder star coral (*O. annularis,* formerly *Montastrea annularis*) is restricted to the western Atlantic and occurs throughout the Caribbean, including Florida, the Bahamas and Flower Garden Banks but may be absent in Bermuda. It has been reported in water depths ranging from 0.5-20 m (1.6-66 ft) and is generally described with a shallower distribution than the other two species in the complex.

Orbicella annularis colonies grow in columns that exhibit rapid and regular upward growth. Based on the 2011 Status Review, very low productivity (growth and recruitment), dramatic recent declines and its restriction to the highly disturbed/degraded wider Caribbean region and its preference for shallow habitats (yielding greater exposure to surface-based threats) are the main factors that increase the extinction risk for *O. annularis.*

Orbicella faveolata. Mountainous star coral (*O. faveolata,* formerly *Montastrea faveolata*) is restricted to the western Atlantic and occurs throughout the Caribbean, including Florida, the Bahamas, Flower Garden Banks and the entire Caribbean coastline. It is documented on most reef habitats ranging in water depths from 0.5-40 m (1.6-131 ft). It has been reported as the most abundant coral in forereef environments between 10-20 m (33-66 ft).

In many life history characteristics, including growth rates, tissue regeneration and egg size, *O. faveolata* is considered to be intermediate between its two sister species. Based on the 2011 Status Review, extremely low productivity (growth and recruitment), dramatic recent declines and its restriction to the highly disturbed/degraded wider Caribbean region are the main factors that increase the extinction risk for *M. faveolata.*

Orbicella franksi. Star coral (*O. franksi,* formerly *Montastrea franksi*) is restricted to the western Atlantic and found throughout the Caribbean, including Florida, the Bahamas, Bermuda, Flower Garden Banks and the entire Caribbean coastline. It has been reported in water depths from 5-50 m (16-164 ft) and is often a dominant component of Caribbean mesophotic reefs. *Orbicella franksi* tends to have a deeper distribution than its two sister species.

Based on the Status Review, extremely low productivity (growth and recruitment), dramatic recent declines and its restriction to the highly disturbed/degraded wider Caribbean region are the main factors that increase the extinction risk for *O. franksi.*

Dendrogyra cylindrus

Pillar coral (*D*. *cylindrus*) is restricted to the western Atlantic and is present throughout the greater Caribbean, including Florida, but is one of the Caribbean genera absent from the southwest Gulf of Mexico. A single colony (in poor condition) is known in Bermuda. It is reported in most reef environments but is more common on forereef spur-and-groove habitats in the Florida Keys rather than in nearshore hardbottom and reef habitats. It has been documented in water depths between 2-25 m (7-82 ft).

Dendrogyra cylindrus is reported as uncommon but conspicuous with isolated colonies scattered across a range of habitat types. In Florida, the overall density is estimated at approximately 0.6 colonies per 10 m^2. They are described as having gonochoric spawning but their low density does not support successful reproduction; however, they are effective in propagation through fragmentation. Annual growth rates range from 12-20 mm (0.5-0.8 in) in the Florida Keys up to 0.8 cm yr^{-1} (0.3 in yr^{-1}) elsewhere in the Caribbean.

Conflicting reports and low density make understanding the susceptibility of *D. cylindrus* to elevated temperatures difficult; however, it is known to be sensitive to cold shock. Based on the Status Review, the overall low population density and low population size combined with a gonochoric spawning mode, corresponding lack of observed sexual recruitment, and susceptibility to observed disease mortality are the main factors that increase the extinction risk for *D. cylindrus.*

Mycetophyllia ferox

Rough cactus coral (*M*. *ferox*) is restricted to the western Atlantic with reports throughout most of the Caribbean, including Florida, although it has not been documented in the Flower Garden Banks or in Bermuda. It has been reported to occur in shallow reef habitats ranging from 5-30 m (16-100 ft) water depths.

The species is described as uncommon or rare contributing less than 0.1% species contribution and occurs at densities less than 0.8 colonies per 10 m^2 in Florida. Studies conducted in the Florida Keys show a dramatic decline since the mid-1990s and it has been suggested that *M. ferox* was much more abundant in the upper Florida Keys in the early mid-1970s compared to current observations, but that it was highly affected by disease.

Mycetophyllia ferox has been reported as susceptible to acute and sub-acute white plague disease, which was positively correlated with water temperature. Based on the 2011 Status Review, disease, rare abundance, and observed declines in abundance are the main factors that increase the extinction risk for *M. ferox.*

Although land-based sources of pollution (nutrients, sediments, toxins, and salinity) may not produce extinction on a global scale, they produce stresses that act in concert and are influenced by other biological and hydrological factors. Collectively, they may pose significant threats at local scales and reduce the resilience of corals to bleaching. While ocean acidification has not been demonstrated to have caused appreciable declines in coral populations so far, the Biological Review Team established by NMFS who prepared the Status Review Report considers it to be a significant threat to corals by 2100 (Brainard et al., 2011).

4.6. BIRDS

4.6.1. PIPING PLOVERS

Piping plovers (*Charadrius melodus*) are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes region and on the river-bank systems and prairie wetlands of the Northern Great Plains. Piping plover breeding populations were federally listed as threatened and endangered in 1986. The Northern Great Plains and Atlantic Coast breeding populations are threatened, and the Great Lakes population is endangered. Piping plovers from all three breeding populations winter along South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand and/or mud flats with no or very sparse vegetation. Piping plovers are considered threatened throughout their wintering range (USFWS, 2009). This species is also federally protected under the Migratory Bird Treaty Act (MBTA) 0f 1918, and is State-listed in Florida as threatened.

Piping plovers are approximately seven inches long with pale gray to sandy-brown plumage on their backs and crown, and white plumage on their underparts. Breeding birds have a single black breastband, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During winter, the black bands disappear, the legs fade to pale yellow, and the bill becomes mostly black (USFWS, 2013a). Plovers arrive on the breeding grounds during mid-March through mid-May, where they typically remain for 3-4 months per year. They nest above the high tide line on coastal beaches, sandflats at the ends of sandspits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and washover areas cut into or between dunes. They lay 3-4 eggs in shallow scraped depressions lined with light colored pebbles and shell fragments; the eggs hatch within 30 days. Plovers depart for the wintering grounds from mid-July through late October. Breeding and wintering plovers feed on exposed wet sand in wash zones, intertidal ocean beach, wrack lines, washover areas, mud-, sand- and algal flats, and shorelines of streams, ephemeral ponds, lagoons, and salt marshes by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening. Small sand dunes, debris, and sparse vegetation within adjacent beaches provide shelter from wind and extreme temperatures (USFWS, 1996, 2013a).

The initial decline of the piping plover population in the nineteenth century was due primarily to hunting for the millinery trade; however, shooting of the piping plover and other migratory birds has been prohibited since passage of the MBTA. Major threats to the species are now loss and degradation of breeding and foraging habitat attributed to development and shoreline stabilization. Disturbance by human activity and pets cause direct and indirect mortality of eggs and chicks, and predation is also a major threat to piping plover reproductive success (USFWS, 2013a, 2009). The listing of all three breeding populations is evidence of the drastic declines observed in piping plovers in recent decades.

Critical habitat was designated for the Great Lakes breeding population in 2001 (66 FR 22938), and for the Northern Great Plains breeding population in 2002 (67 FR 57638). Critical habitat for wintering piping plovers (including individuals from the Great Lakes, Northern Great Plains, and Atlantic Coast breeding populations) was designated along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas in July 2001 (66 FR 36038). The initial critical habitat designations were challenged and subsequently amended in North Carolina in 2008 (73 FR 62816) and Texas in 2009 (74 FR 23476). The closest critical habitat unit to the Action Area is critical habitat Unit FL-33. This unit is located within St. Lucie Inlet in Martin County, more than 35 miles north of the Action Area for the proposed Project (Figure 4-5). There is no piping plover critical habitat in the vicinity of the Action Area.

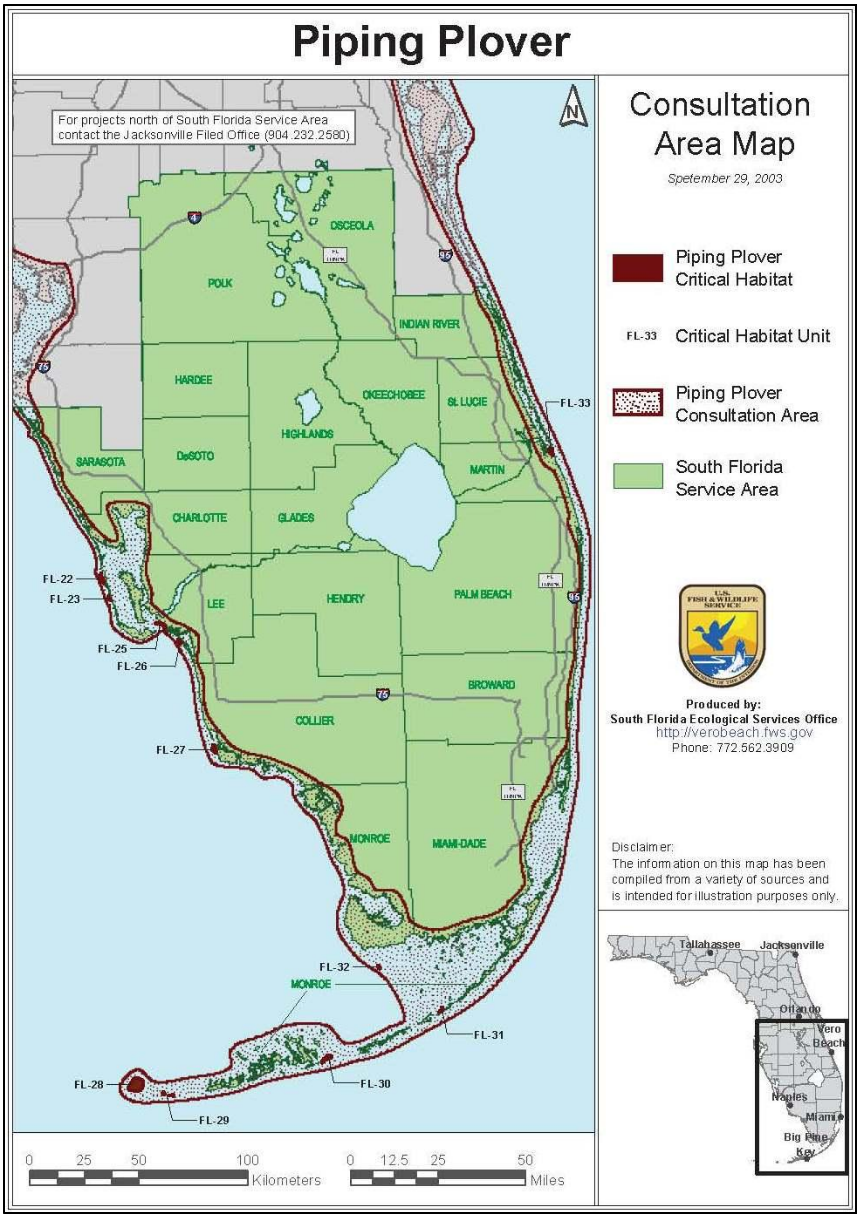


Figure 4-5. Piping plover consultation area including Critical Habitat Unit FL-33 (USFWS, 2003).

4.6.2. RUFA RED KNOT

The red knot (*Calidris canutus*) was added to the list of Federal ESA candidate species in 2006. A proposed rule to list the rufa supbspecies (*Calidris canutus rufa*) as threatened under the ESA was published on September 30, 2013. Rufa red knots are also federally protected under the MBTA.

At nine to ten inches long, the rufa red knot is a large, bulky sandpiper with a short, straight, black bill (Audubon, 2013). During the breeding season, the legs are dark brown to black, and the breast and belly are a characteristic russet color that ranges from salmon-red to brick-red. Males are typically brighter shades of red, with a more distinct line through the eye. When not breeding, the two sexes look similar with plain gray above and dirty white below with faint, dark streaking. As with most shorebirds, the long-winged, strong-flying knots fly in groups, occasionally with other species. Rufa red knots feed on invertebrates, especially bivalves, small snails, crustaceans, horseshoe crab eggs and, on breeding grounds, terrestrial invertebrates (USFWS, 2013g).

The primary wintering areas for the rufa red knot include the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf coasts of the U.S. The rufa red knot breeds in the tundra of the central Canadian Arctic. Some of these shorebirds fly more than 15,000 km (9,300 mi) from south to north every spring and reverse the trip every autumn, making the rufa red knot one of the longest-distance migrating animals. Migrating rufa red knots can complete non-stop flights of 2,400 km (1,500 mi) or more, converging on critical stopover areas to rest and refuel along the way. Large flocks of rufa red knots arrive at stopover areas along the Delaware Bay and New Jersey's Atlantic coast each spring, with many of the birds having flown directly from northern Brazil. The spring migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich, easily digestible food source which allows the rufa red knots to lay down fat and protein reserves both to fuel the 3,000 km (1864 mi) flight to the arctic breeding grounds and ensure their survival after they arrive at a time when food availability is often low.

Mussel beds on New Jersey's southern Atlantic coast are also an important food source for migrating knots. Birds arrive at stopover areas with depleted energy reserves and must quickly rebuild their body fat to complete their migration to Arctic breeding areas. During their brief 10 to 14-day spring stay in the mid-Atlantic, rufa red knots can nearly double their body weight (Niles et. al, 2008; USFWS, 2013g).

The declining population of the rufa red knot is directly related to the increased harvest of horseshoe crabs as bait for the conch pot and eel fisheries in the mid-Atlantic (Niles et. al, 2008). Threats to the rufa red knot also include sea level rise; coastal development; shoreline stabilization; dredging; reduced food availability at stopover areas; disturbance by vehicles, people, dogs, aircraft, and boats; and climate change (USFWS, 2013g).

For the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project, the USACE requests a conference opinion from USFWS regarding the rufa red knot. Since the listing may take place before the Project is complete, this process will consider potential impacts to this species now in order to avoid re-initiation of formal consultation at a later date, which could delay or interrupt project construction.

4.7. BEACH JACQUEMONTIA

There are approximately 100 species of the genus *Jacquemontia*, most of which are found in tropical and subtropical America. *Jacquemontia reclinata* is the only species found along the beaches of southeastern Florida and is endemic to the coastal barrier islands in southeast Florida from Palm Beach to Miami-Dade Counties. It is commonly known as beach jacquemontia or beach clustervine. This species is a perennial vine with a woody base and non-woody, twining stems up to six feet long. Leaves are alternate, estipulate, spirally arranged, and almost always petiolate reaching 1-3 cm (0.4-1.2 in) in length and 0.5-2.5 cm (0.2-1.0 in) in breadth and characterized as fleshy and rounded with blunted or indented tips. The flowers are white or pinkish, approximately 2.5 cm across, and deeply five-lobed with a short tube. *J. reclinata* requires open areas that are typically found on the crest and lee sides of stable dunes but may also invade and restabilize maritime hammock or costal strand communities that have been disturbed by tropical storms, hurricanes and possibly fire.

The range of *J. reclinata* extends from Jupiter Island to Key Biscayne, a distance of approximately 85 miles. Florida's east coast barrier islands in this range are entirely urbanized except for a few small parks and private estates (FTG, 2003). *Jacquemontia reclinata* was listed as federally endangered in 1993 (58 FR 62050), and is also state-listed as endangered (USFWS, 1999). The vast majority of beach coastal strand and maritime hammock vegetation, the primary habitat of this species, has been destroyed by residential and commercial construction, development of recreational areas, and beach erosion. This species is further threatened by invasion of exotic plant species including Australian pine, carrotwood, Brazilian pepper and turf grass. All but one of the wild populations exists on public lands in parks or conservation areas. The most recent surveys indicate that studied populations were declining in total number of individuals, total area occupied and stem density. There has been a 13% decline in total wild populations since 2000 (USFWS, 2007a). Protection and management of this species involves removal of exotics, protecting coastal habitats from development by conservation purchases or easements, and establishing new populations of this species in protected areas. Reintroductions of *J. reclinata* have increased the number of plants in the wild, although survival after transplant is quite variable (2-97%), due to mortality caused by human and natural factors (USFWS, 2007a).

5.0. DESCRIPTION OF CURRENT CONDITIONS FOR LISTED SPECIES

This section describes the current status of those species listed in Table 4-1. The current conditions of each species are described, with data presented when available for any listed or proposed species known to occur in the Action Area for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project.

5.1. SEA TURTLES

Nesting sea turtles and emergent hatchlings are present annually on the beaches of Palm Beach County during the nesting season (March 1 - October 31). In 2013, Palm Beach County accounted for 22.4% of the nesting in the state (FWC, 2013e). In the same year, loggerhead, green and leatherback sea turtles accounted for 65.8%, 33.2% and 1.0%, respectively, of the nesting in the County (FWC, 2013e). These three species are known to regularly nest on Palm Beach County beaches. Table 5-1 summarizes the sea turtle monitoring data collected within the Action Area (R-127 to R-141+586) between 2009 and 2013. The data provided by FWC/FWRI encompass the survey areas starting in R.G. Kreusler Memorial Park (R-127) extending south to South Lake Worth Inlet (also called Boynton Inlet) (R-151). The nesting data are not reported by R monument during the sea turtle nesting monitoring surveys; rather the total number of nests and false crawls are reported for an area that includes South Palm Beach, Lantana, and all of Manalapan. Therefore, in order to estimate the nesting within the Action Area, the Manalapan survey area (~ 4.2 km (2.6 mi)) data were scaled to include only the portion of Manalapan south to R-141+586 (~1.3 km (0.8 mi)), rather than reporting the nests for the entire length of the Manalapan shoreline. Based on coordination with FWC, presenting a portion of Manalapan survey area as a fraction of the entire area is an appropriate way to estimate nesting; however, it should be noted that this method assumes even distribution of nesting along the Manalapan survey shoreline, and so would not account for any areas that may experience higher (or lower) nesting densities than other areas (Brost, pers. comm., 2013).

Table 5-1. Sea turtle nests and non-nesting emergences (NNE) by species from 2009 to 2013 within the Action Area (R-127 to R-141+586).

Year	Loggerhead		Green		Leatherback	
	Nests	NNE	Nests	NNE	Nests	NNE
2009	776	1265	44	73	19	12
2010	856	1428	60	82	7	6
2011	1097	1659	127	94	15	3
2012	1269	2026	63	39	18	3
2013	1335	1437	172	108	4	0

5.1.1. LOGGERHEAD SEA TURTLES

Loggerheads are found in the open ocean offshore of Palm Beach County due to the warm temperatures of south Florida's waters and the availability of foraging grounds provided by predominant sea turtle species in the area. Loggerhead females typically select nesting sites on coastlines adjacent to warm-temperate currents. In South Florida, the demographically independent loggerhead nesting population occurs from 29°N on the east coast to Sarasota County on the west coast (TEWG, 2000). In the 2013 nesting season, loggerhead nesting represented 65.8% of the overall nests surveyed in the County (FWC, 2013e). Loggerheads deposited 16,986 nests in the County in 2013, which was the second highest count since 1998, and exceeds the previous 15-year average of 13,731 by approximately 3,000 nests. Figure 5-1 displays the overall upward trend in the number of loggerhead nests recorded each year since 1998.

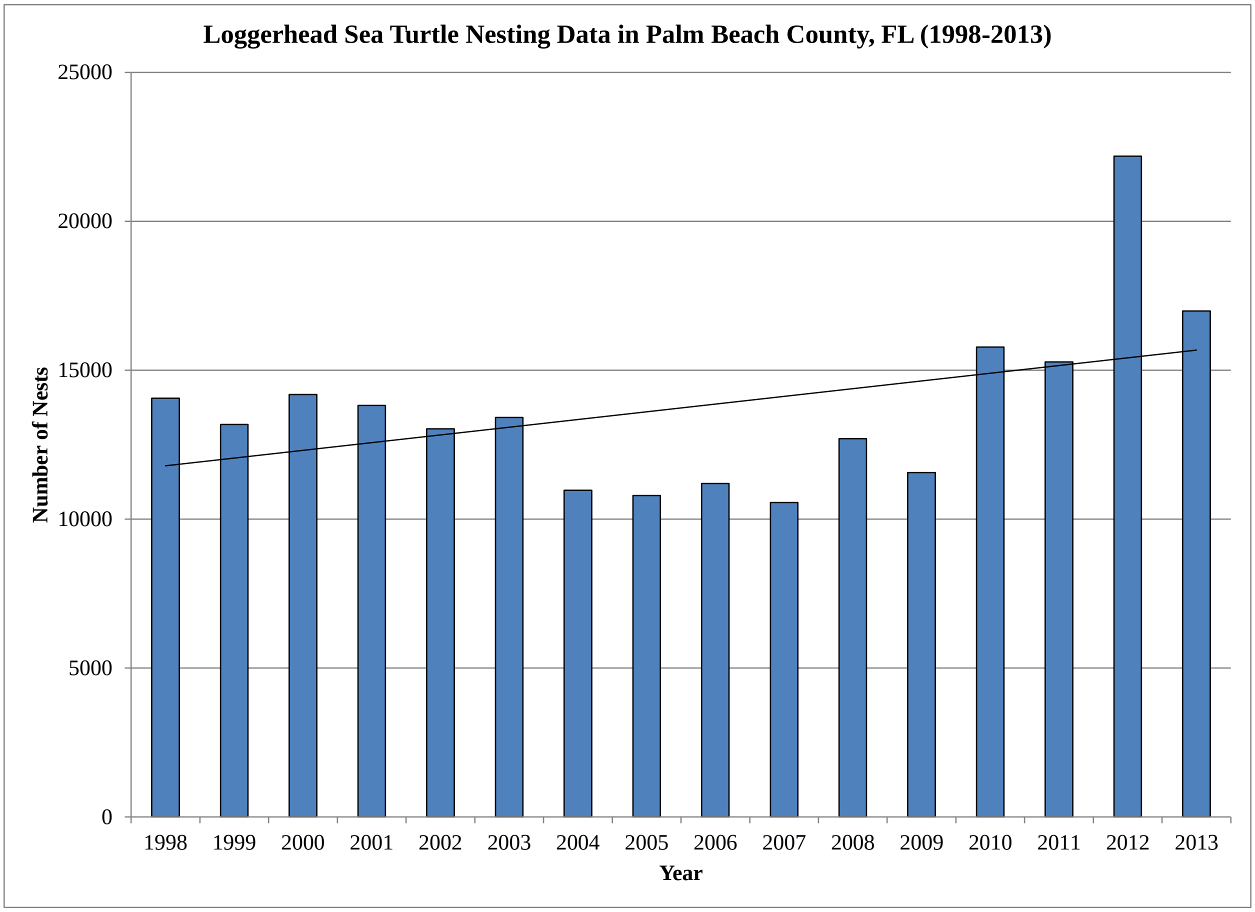


Figure 5-1. Loggerhead sea turtle nesting data for Palm Beach County (1998-2013); the black line represents a slightly increasing linear trend in the number of nests per year PBC-ERM, 2013a).

Within the Action Area, loggerhead nesting typically occurs between May and August. Table 5-1 summarizes the loggerhead nesting data within the Action Area (R-127 to R-141+586) between 2009 and 2013. These data show that loggerhead nesting activity has steadily increased within Action Area since 2009.

5.1.2. GREEN SEA TURTLES

Green turtles deposited 8,572 nests in the County in 2013, the highest count since 1998. There is an overall upward trend in annual number of green sea turtle nests from 1998-2013 (Figure 5-2). Representative of this trend, the 2013 nesting total exceeded the previous 15-year average of 2,254 by over 6,000 nests. Green sea turtle nesting within the Action Area is presented in Table 5-1.

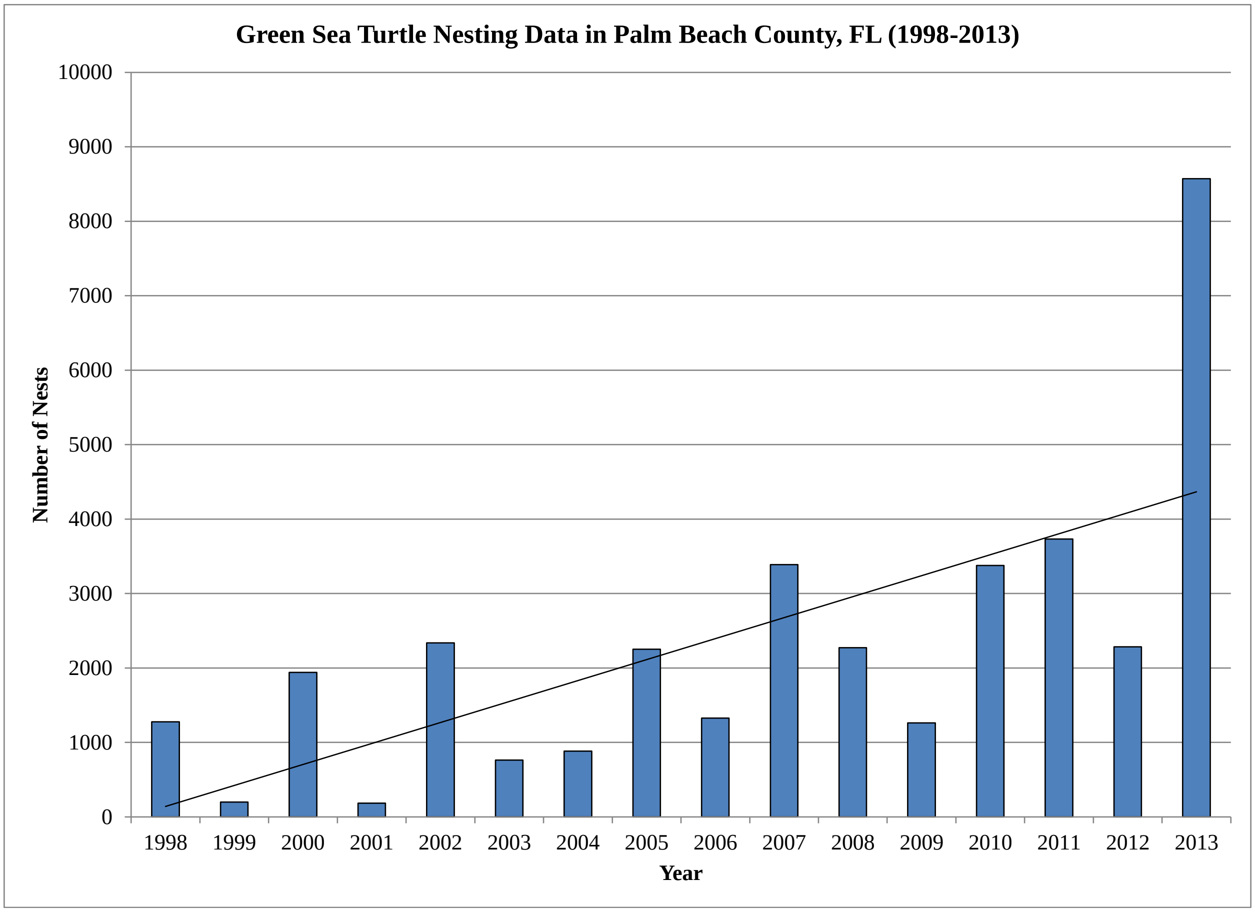


Figure 5-2. Green sea turtle nesting data for Palm Beach County (1998-2013); the black line represents an increasing linear trend in the number of nests per year (PBC-ERM, 2013a).

5.1.3. LEATHERBACK SEA TURTLES

Leatherbacks deposited 253 nests in Palm Beach County in 2013, which was slightly below the previous 15-year average of 324 nests. There is an overall upward trend in yearly number of leatherback sea turtle nests from 1998-2013 (Figure 5-3).

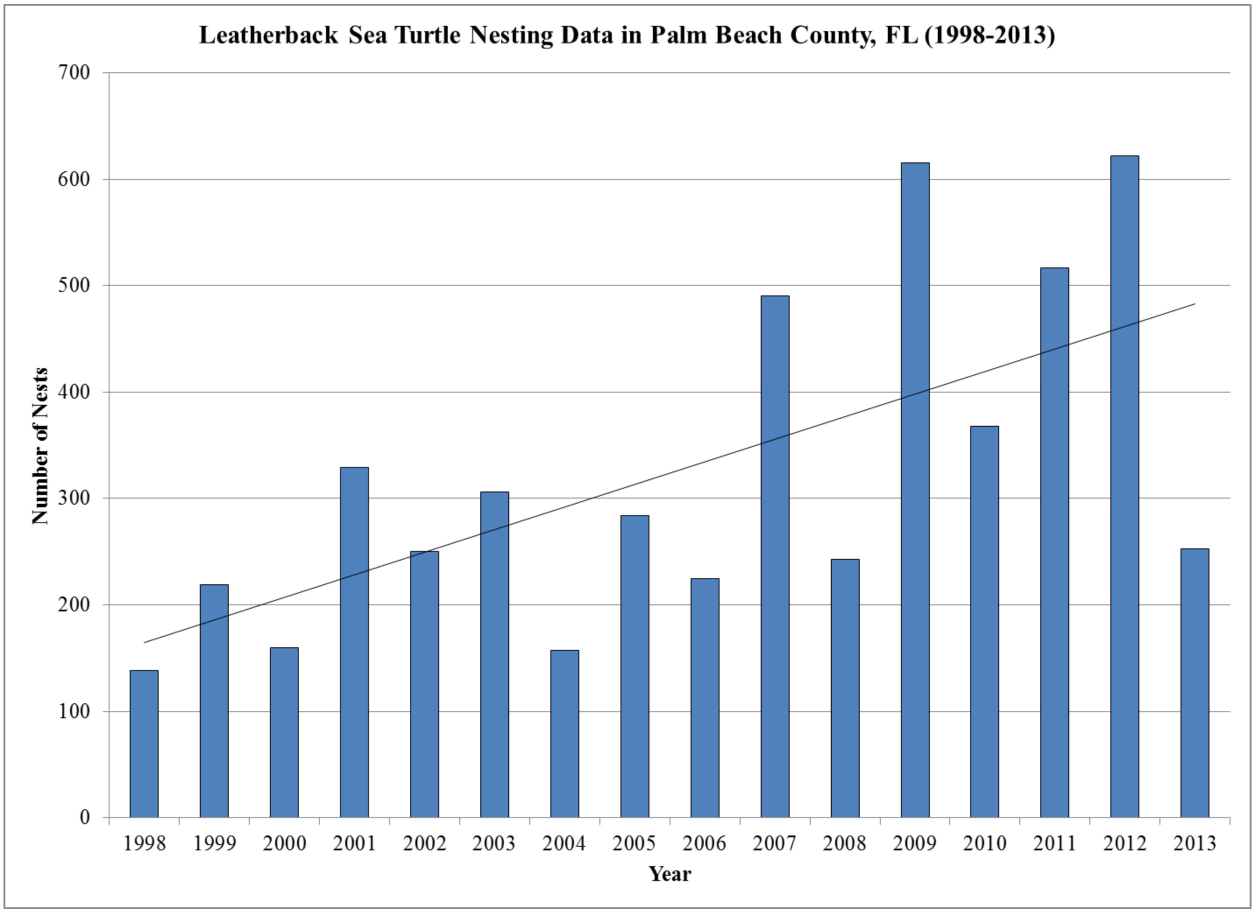


Figure 5-3. Leatherback sea turtle nesting data for Palm Beach County (1998-2013); the black line represents an increasing linear trend in the number of nests per year (PBC-ERM, 2013a).

Leatherback turtles are a pelagic species remaining in the open ocean until the females move inshore to nest. They are not found foraging in the nearshore areas of the County; however, they have been recorded to nest in the proposed Action Area. Leatherback nesting within the Action Area is summarized in Table 5-1.

5.1.4. HAWKSBILL SEA TURTLES

Although they are common inhabitants of the shallow nearshore waters of southern Florida, hawksbill sea turtles nest infrequently on County shorelines; one hawksbill nest was laid on a Boca Raton beach (south of the Action Area) in 2013 (GLNC, 2013). Hawksbill sea turtles have never been documented nesting in the Action Area and are unlikely to occur there.

5.1.5. KEMP'S RIDLEY SEA TURTLES

Kemp's ridley sea turtles have never been documented as nesting in Palm Beach County, and so are unlikely to occur in the Action Area.

5.2. SMALLTOOTH SAWFISH

Population data are few for this species, therefore reliable estimates of the current population size are not available (NMFS 2009; 2013f). However, historic records, including museum records and anecdotal fishermen observations, indicate that the smalltooth sawfish was once abundant throughout its range; historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras. Available data suggest that the distribution has been reduced by about 90%, and that the population has declined by 95% or more (NMFS, 2013f). Since April 2011, there have been three smalltooth sawfish sightings in the Atlantic Ocean offshore of the Town of Palm Beach, the closest of which was approximately 0.4 km (0.25 mi) offshore (Frick, pers. comm., 2013). Recently, a smalltooth sawfish was caught with hook and line in Palm Beach County near the Boynton Beach Inlet on May 25, 2014 (Landau, 2014). Based on these recent observations, smalltooth sawfish have the potential to occur within the Action Area.

5.3. MAMMALS

5.3.1. FLORIDA MANATEE

The most recent estimate of the Florida manatee population is 4,834 individuals, based on FWC synoptic aerial surveys of warm-water sites on the east and west coasts of Florida in 2011 (FWC, 2011). This was lower than the 2010 count of 5,077 individuals, but remains the second highest count recorded during synoptic surveys since 1991. The annual statewide manatee synoptic surveys were not performed in winter 2012 or 2013 because the warmer than average weather created unfavorable survey conditions that did not meet minimum criteria established by FWC.

In the County, manatees are common year-round residents in canals and waterways. Collection of data from past surveys suggests that in the County the most abundant populations occur during the winter season. The north section of Lake Worth Lagoon is an area of particular importance for manatee habitat. Extensive seagrass beds occur in this area serving as an attractant to manatee populations (CUESFAU and EAI, 2007). Since 1974, FWC has documented mortality statistics of the Florida manatee including the number of deaths and their cause. Data from 2012 show a total of eight manatee mortalities in the County caused by cold stress, natural causes, watercraft, other human related causes, and undetermined causes. This represents approximately 2% of the total 392 manatee mortalities documented within Florida. In 2013, there were eight manatee mortalities in the County, however statewide mortalities increased by 112% reporting 830 total mortalities (FWC, 2014a). The large increase in manatee mortality reported for 2013 is likely related to the high number of red-tide related deaths which reached 272 by September 2013. This number of red tide related deaths was anomalous as the highest number of deaths related to red tide between 1996 and 2013 was 151 (FWC, 2013e). Preliminary data from 2014 show two manatee mortalities in the County and 200 total mortalities as of June (FWC, 2014a).

5.3.2. FLORIDA PANTHER

Florida panthers inhabit large forested communities and wetlands (FNAI, 2001). They can be found in south Florida and parts of central Florida, although male panthers have been documented as far north as central Georgia. Collier, Glades, and Lee counties are the stronghold for the Florida panther, but Miami-Dade and Monroe counties are also important. Currently, FWC estimates there are between 100 and 160 adult panthers in south Florida (FWC, 2014b). The USFWS panther subteam of Multi-Species/Ecosystem Recovery Implementation Team (MERIT) developed three panther habitat zones to identify important areas for the long-term survival of the species (Figure 5-4). The Primary Zone encompasses “all lands essential for the survival of the Florida panther in the wild.” The Secondary Zone includes “lands contiguous with the Primary Zone, and areas which panthers may currently use, and where expansion of the Florida panther population is likely to occur." The Dispersal Zone is an "area needed for panthers to disperse north of the Caloosahatchee River." There are Primary, Secondary, and Dispersal Zones within Collier and Glades County, which are where potential upland mines are located, therefore the Florida panther may potentially occur in the vicinity of truck routes from upland mines (FWC, 2012).

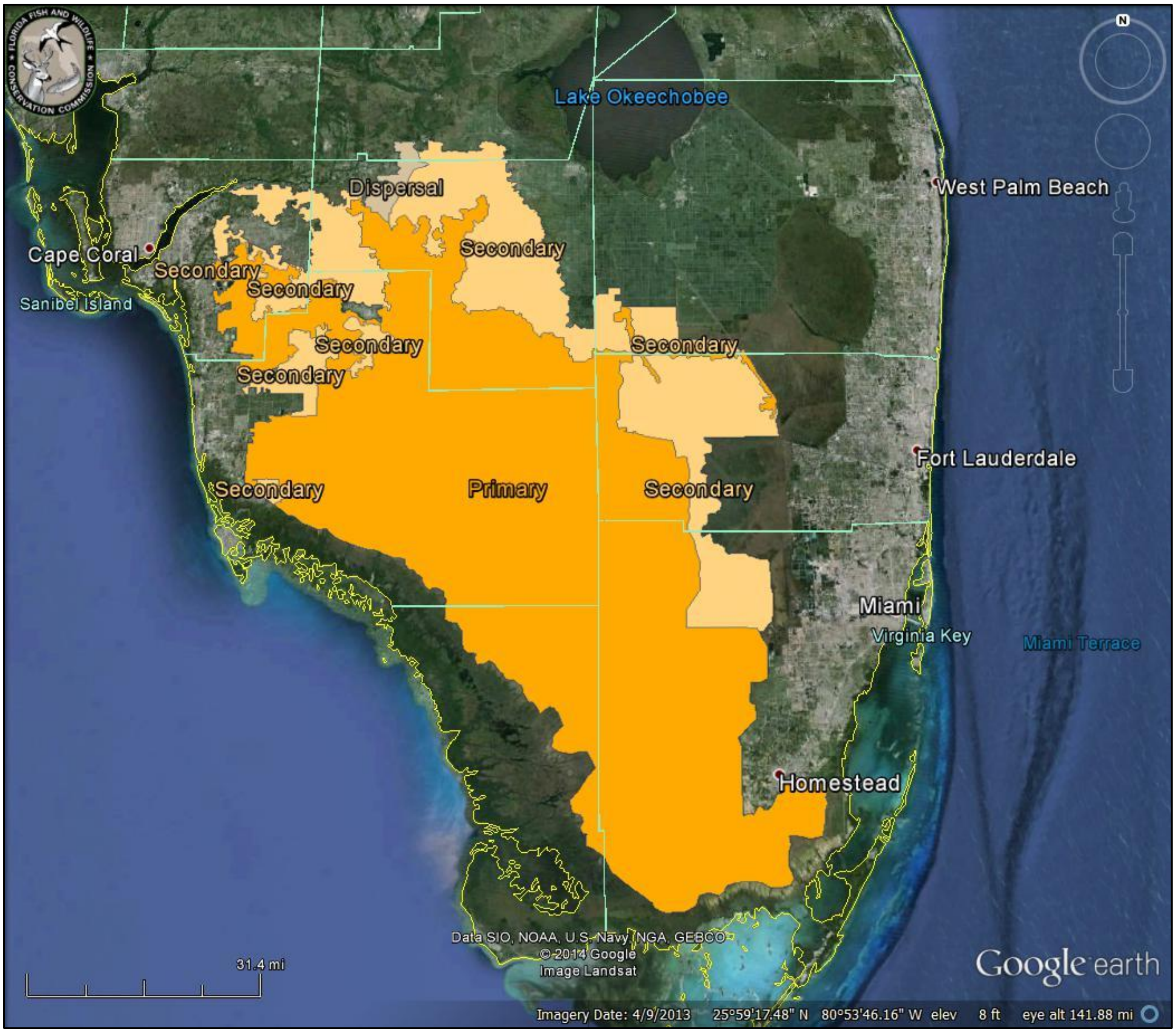


Figure 5-4. Florida panther habitat zones (FWC, 2012). Primary Zone shown in orange and Secondary Zone shown in light orange.

5.4. CORALS

5.4.1. ACROPORID CORALS

On January 6, 2009, NMFS received a petition from Palm Beach County Reef Rescue (PBCRR) to extend the northern boundary of Florida Critical Habitat area for elkhorn and staghorn corals to the Lake Worth Inlet, approximately 24.9 km (15.5 mi) north of the designated boundary at South Lake Worth Inlet. The petition provided information on the location of *A. cervicornis* colonies on an offshore reef locally known as Bath and Tennis Reef, approximately eight miles north of Boynton Beach Inlet and approximately 6.1 km (3.8 mi) north of the proposed Project Area. In September 2009, PBCRR revisited the site on Bath and Tennis Reef and reported an expansion in the number of *A. cervicornis* colonies. Based upon these reports, the Town of Palm Beach commissioned the verification, mapping and characterization study of the area by Coastal Eco-Group Inc (CEG). Staghorn coral (*A. cervicornis)* mapping and assessment activities were conducted in October 2009. The 2009 study site was located north and seaward of the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Action Area, approximately 1,710 m (5,609 ft) offshore of R-105, at an average water depth of 17 m (57 ft). During the 2009 investigation, *A. cervicornis* was the dominant coral species within the sample area with 51 colonies, contributing over 32% to the total stony coral assemblage. However, of the 51 total colonies, only 30 colonies were attached to the reef substrate (21 were detached) for a mean density of 0.43 ± 0.11 colonies/m^2 (CEG, 2009). After reviewing the data provided by CEG and PBCRR, NMFS announced their final determination on January 22, 2010 stating they would deny the petition and not extend the northern boundary of the critical habitat area to the Lake Worth Inlet. This conclusion was “based on the adequacy of the existing, recent designation to meet the corals' conservation needs, the relatively low benefit the requested revision would provide, the protections afforded to the species from the recent ESA Section 4(d) regulations, and our need to complete higher priority conservation activities for these and other coral species” (75 FR 3711).

In October 2013 Palm Beach County divers conducted an *Acropora* survey on nearshore hardbottom within the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Action Area (R-127 and R-141+586). The purpose of this survey was to perform the preliminary visual reconnaissance for locating listed species colonies per the NMFS "Recommended Survey Protocol for *Acropora* spp. in Support of Section 7 Consultation". No *Acropora* colonies were observed in the investigation area (PBC-ERM, 2013b). Nearshore hardbottom investigations were also conducted by CB&I biologists in October 2013. These surveys assessed the benthic communities in the Action Area, from the intertidal zone out to approximately 150 m offshore. No *Acropora* colonies were observed during these investigations (CB&I, 2014). There is no evidence to suggest the presence of *A. cervicornis* in water depths of less than 15 m (50 ft) north of South Lake Worth Inlet in Palm Beach County; therefore *Acropora* spp. are unlikely to be found in the Action Area.

5.4.2. RECENTLY LISTED CARIBBEAN CORAL SPECIES

Nearly all five of the Caribbean coral species recently listed as threatened (August 27, 2014, 50 CFR Part 223) may be found throughout the hardbottom communities in southeast Florida, with the exception of *M. ferox* (Banks et al., 2007). However, shallow nearshore surveys within the Action Area, including two recent nearshore hardbottom investigations conducted within the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Action Area in October 2013, have documented none of the five recently listed Caribbean coral species (CPE 2007, 2009; PBC-ERM, 2013b; CB&I, 2014).

5.5. BIRDS

5.5.1. PIPING PLOVERS

Data from the USGS 2006 International Piping Plover Census indicated that the total number of wintering Piping Plovers observed along Florida's Atlantic coast (44) was similar to the 1991 census (46) but higher than the 1996 results (15), and lower than the

2001 results (67). Data from the 2006 census reported no piping plover observations within Palm Beach County (Elliott-Smith et al., 2009).

A September 2006 shorebird survey, conducted along the shoreline between R-134 and R-141, did not document any piping plovers (CPE, 2007). However, according to e-Bird, a database launched by the Cornell Lab of Ornithology and National Audubon Society, there have been 65 piping plover sightings in Palm Beach County since 2006. Nine piping plover sightings have occurred within the Action Area between R-127 and R-129, including one near Lake Worth Pier (2010), four on Lake Worth Municipal Beach (2012) and four in Kreusler Memorial Park in 2012 (e-Bird, 2013a). Therefore, it may be expected that overwintering piping plovers may occur within the Action Area.

5.5.2. RUFA RED KNOTS

Florida is known overwintering habitat for the rufa red knot, and wintering rufa red knots are most commonly recorded on the west coast where the population was estimated at around 10,000 in the 1980s (Niles et. al, 2006; Morrison & Harrington 1992). A September 2006 shorebird survey, conducted along the shoreline between R-134 and R-141, did not document any rufa red knots (CPE, 2007). However, according to e-Bird, there have been 29 rufa red knot sightings in Palm Beach County since 2004. Closest to the Action Area for the proposed Project, three rufa red knots were observed in 2005 at Boynton Inlet Park (near R-152), just south of South Lake Worth Inlet and one was observed around Ocean Ridge in 2004 (near R-162) (e-Bird, 2013b). While no rufa red knot observations have been recorded within the Action Area, based on documented sightings along the shoreline elsewhere in Palm Beach County, it may be expected that overwintering rufa red knots may occur within the Action Area.

5.6. BEACH JACQUEMONTIA

Beach jaquemontia is endemic to the coastal barrier islands in southeast Florida from Palm Beach to Miami-Dade Counties. It was once found at several sites on Jupiter Island and Palm Beach Island, but is no longer found north of Jupiter Inlet due to habitat destruction associated with residential construction. To the south, it has been documented at Crandon Park in Miami-Dade County and at Hugh Taylor Birch State Recreational Area in Broward County (USFWS, 1999). A dune restoration project in Delray Beach, Palm Beach County, has successfully reintroduced *J. reclinata* to the site and is testing whether breeding history of plants will influence survival, reproduction and population growth (Barron, 2013). A small population of beach jacquemontia is also present in Loggerhead Park (Juno Beach, FL). Several locations in Juno Beach were identified as acceptable sites at which to plant this endangered species in order to increase the size of the population in Palm Beach County; 64 plants were planted in Juno Beach in 2006-2007. As of July 2011, 32 of the 64 plants (50%) had survived (PBC-ERM, 2011).

CB&I biologists conducted a dune vegetation survey within the Action Area of the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project in November 2013. Following an examination of aerial photography to determine specific areas of interest along the Project Area which may support dune vegetation, CB&I biologists ground-truthed the extent of vegetation using DGPS. Dominant species were identified and photographs were collected throughout the survey area. Particular effort was made to identify and document the presence of the endangered plant species beach jacquemontia. No beach jacquemontia was observed within the survey area (CB&I, 2014).

6.0. EFFECTS OF PROPOSED ACTION

This section describes how the proposed Project will affect threatened, endangered or proposed species or critical habitat that may occur in the Action Area (Figure 1-2). Components of the Project include trucking sand from stockpiles of dredged sand and from upland mines, placement of beach and dune fill, construction of seven shore-perpendicular groins, and construction of mitigative artificial reefs. The ESA requires that all effects be considered when determining if an action may affect listed species and critical habitat, including direct effects, indirect effects, interrelated or interdependent actions, and cumulative effects:

- **Direct effects** - caused by the action and occur at the same time and place as the action.
- **Indirect effects** - caused by the action at a later time, but are reasonably certain to occur.
- **Interrelated actions** - part of a larger action and depend on the larger action for their justification.
- **Interdependent actions** - have no significant independent utility apart from the action under consideration.
- **Cumulative effects** - effects of future activities which are reasonably certain to occur within the action areas of the federal actions subject to consultation. Cumulative effects are defined by ESA as those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation (50 CFR §402.02). This definition applies only to ESA Section 7 analyses and should not be confused with the broader use of this term in the National Environmental Policy Act (NEPA) or other environmental laws.

6.1. SEA TURTLES

6.1.1. NESTING SEA TURTLES AND HATCHLINGS

Although five species of sea turtle are known to occur within Florida, only three species regularly nest on the beaches of Palm Beach County: loggerhead, leatherback and green sea turtles. The proposed Project has the potential to adversely affect nesting females, nests and hatchlings within the Action Area.

Direct and/or Indirect Effects

The Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will utilize beach compatible sand and will be constructed between November 1 and April 30 in order to avoid peak sea turtle nesting season, thereby minimizing the potential for the mechanical destruction and burial of nests and encounters with construction equipment on the beach during nesting activities. The construction will only occur during daylight hours; therefore, no artificial construction-related lighting will be required.

Beach Nourishment

Even when constructed outside of nesting season, beach renourishment projects can have indirect effects on sea turtle nesting in the Action Area, such as changes to the physical and chemical beach environment. If the nourishment sand is dissimilar from the native sand, this can cause changes in sand compaction, beach moisture content, sand color, sand grain size and shape, and sand grain mineral content, all of which may alter sea turtle nesting behavior (Grain et al., 1995). Incompatibility of nourishment material with the nesting habitat can potentially affect female sea turtles' ability to nest and reproduce (Lutcavage et al., 1997). Nest site selection and digging behavior of the female can be altered or deterred, if she finds the beach unsuitable. Beach compaction can lead to reductions in nesting success (i.e., increased false crawls), which may result in increased physiological stress to the nesting females (Nelson and Dickerson, 1989). Clutch viability and hatchling emergence may also be impaired if the beach state is altered (Nelson and Dickerson, 1989; Grain et al., 1995). Steep escarpments may form along nourished beaches as they adjust from an unnatural construction profile to a more natural beach profile (Grain et al., 1995). These escarpments can impair or prevent access to nesting sites, in some cases leading to females selecting marginal or unsuitable nesting sites. Studies suggest that within the first year post-nourishment, turtle nesting decreases. Montague (1993) states that beach profiles of a newly restored beach are not conducive to nesting and hatchling success. Eventually, with local wave, tide, and wind energy, the profiles equilibrate and the beach stabilizes to resemble a natural profile of the area. While the above described impacts can occur, the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will place only beach compatible sand on the beaches and dunes to minimize indirect effects on sea turtle nesting. Permit conditions will require compaction testing and/or tilling of the beach to prevent compaction and scarp removal prior to each nesting season for three years.

The Ocean Ridge Shore Protection Project was constructed between August 1997 and April 1998 at Ocean Ridge in Palm Beach County, just south of the South Lake Worth Inlet. This project involved the removal of 11 groins, construction of eight T-head groins and beach nourishment. A sea turtle monitoring program was implemented, which allowed for comparison of data between 1997 (pre-construction) and 2001 (four years post-construction). Monitoring showed an initial decrease in nesting, nesting success and reproductive success; however, 4 years post-nourishment data suggested that the negative effects on nesting and emergence success observed during the previous years had returned to pre-construction levels. These results further supported other observations (at Jupiter and Martin County) that the negative effects of beach nourishment persist for approximately 2 years (PBC-ERM, 2001).

It has been suggested that beach nourishment may lead to more development in greater density within shorefront communities that are then left with the possible need for additional future replenishment, or even coastal armoring, in a negative feedback loop (Pilkey and Dixon, 1996). Increased development immediately adjacent to nesting beaches has often led to more coastal construction, sometimes with larger and larger structures being built to accommodate resultant increase in tourism. While the above described impacts may occur in some areas, Palm Beach Island is already highly developed, leaving little room for additional coastal development in the vicinity of the Action Area.

Increasing the elevation of the beach berm may expose sea turtles to onshore lights that were obscured prior to the beach nourishment. This could impact sea turtles by increasing the number of disorientations caused by artificial lighting (USFWS, 2011). In 1987 the County's Board of County Commissioners passed the Palm Beach County Sea Turtle Protection Ordinance and its measures are implemented by Palm Beach County's Department of Environmental Resources Management (PBC-ERM). Beachfront lighting is regulated by the Palm Beach County Unified Land Development Code (ULDC) Article 14.A, Sea Turtle Protection and Sand Ordinance. This ordinance requires that all coastal construction adhere to strict guidelines to eliminate impacts to sea turtles. Within the Project Area, Lantana and Manalapan are within the jurisdiction of the Article 14.A, ULDC and this ordinance can help minimize the effect of artificial lighting by adopting more sea turtle compatible lighting. The Town of Palm Beach and South Palm Beach have opted-out of the ordinance.

Groin Construction

Construction of the groins as part of the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will avoid peak sea turtle nesting season, thereby minimizing potential direct impacts to nesting sea turtles, nests and hatchlings. However, following construction, groins have the potential to 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 (USFWS, 2011). While there are several cases where individual turtles have interacted with groins, many nesting beaches where groins are present experience little or no decrease and in some cases show an increase, in nesting as a result of the structures (Fox, pers. comm., 2013; PBC-ERM, 2001). The 1998 Ocean Ridge Shore Protection project included the removal of 11 groins and construction of eight rock T-head groins. Sea turtle monitoring indicated that the beach in and around the groin field experienced higher nesting success in 2001 compared to 1997. However, hatchling entrapment in the rock groin structures, exacerbated by local lighting problems, led to labor intensive management options (PBC-ERM, 2001). The design of the groins which are proposed to be constructed in South Palm Beach, Lantana and Manalapan (R-134+135 to R-138+551) will reduce these potential impacts to nesting sea turtles and hatchlings, as described below.

Unlike rock groins, the groins proposed for construction as part of the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will be low profile concrete king pile and panel groins (similar to structure shown in Photograph 6-1). This type of structure is solid, and does not have spaces where turtles could become entrapped.

The groins are designed to be level with the beach berm in order to blend with the beach, which will also reduce potential obstacles to nesting or hatchling sea turtles.

Photograph 6-1. Shoreward view of a concrete king pile and panel groin.

Structures such as groins can impact hatchling sea turtles by impeding swimming behavior. It has been shown that during the first 24-36 hours after leaving the nest, hatchlings engage in a continuous swimming “frenzy” to reach less risky offshore waters (Whelan and Wyneken, 2007). Surface wave refraction is an initial cue critical to the process of normal offshore orientation of sea turtle hatchlings (Glenn, 1996). Hard structures, such as the groins, may interfere with this process causing hatchling sea turtles to temporarily be impeded on their way to the water, or during the swimming frenzy. The concrete king pile and panel groins are installed perpendicular to shore with no T-head end, thus minimizing the impact to sea turtle hatchlings.

Sharks and fin-fishes, including snappers (Lutjanidae), are significant sources of mortality for hatchling sea turtles entering the ocean from nesting beaches and during the swim-frenzy period as they migrate offshore (Vose and Shank, 2003). Although structures may only temporarily impede offshore progress of newly hatched sea turtles, a delay in the offshore migration may increase predation of sea turtle hatchlings (Glenn, 1998; Gyuris, 1994; Witherington and Salmon, 1992). Whelan and Wyneken (2007) found that most predation occurred between 38 m and 220 m from shore. During hatchling predation studies in Broward County, Florida, it was documented that predatory fish species, such as tarpon (*Megalops atlanticus*) and snappers (*Lutjanus* spp.), targeted sea turtle hatchlings and “learned” where to concentrate foraging efforts (Wyneken et al., 1998). While fish predators are likely to congregate around bottom structures, Glenn (1996) found that hatchling predation was higher over natural hardbottom than over sand or breakwater structures, while Stewart and Wyneken (2004) found that different bottom types did not affect predation rates.

Groins may indirectly impact nesting habitat downdrift of the structures. Groins are designed to trap sand that would otherwise be transported by longshore currents. In doing so, these structures lead to accretion of updrift beaches while causing accelerated erosion of downdrift beaches (USFWS, 2011; Greene, 2002). Groins, therefore, have to potential to cause degradation of sea turtle nesting habitat on shorelines downdrift of the structures. The groins proposed to be constructed between R-134+135 and R-138+551 as part of the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project have a tapered design, with the northernmost and southernmost groins shorter than the central groins, which will also work to minimize downdrift erosion. Modeling which was completed to assess the performance of the seven proposed groins proposed has shown potential downdrift impacts from the groins will be minimal. The updrift benefit of the groins would extend to roughly R-132.5. Under an average wave climate, there would be a small downdrift impact (3,100 c.y.). However, since it would be spread over a long area (R-138+551 to R-144), the effect in terms of fill density (c.y./foot) would be relatively small (CPE, 2013). The Project consists of a combination of groins and beach nourishment. The beach nourishment will result in minimizing the accretion on the updrift side and the corresponding erosion on the downdrift side.

Sea turtles may also benefit from the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project by gaining accessibility to a greater area of beach on which to nest. Sea turtles may elect not to nest on critically eroded beaches and abandon sections of beach if they determine that the nest location will not be suitable. In this instance, nesting sea turtles may return to the ocean to find another more suitable, location. This project will repair eroded sections of beach and will widen the dry beach to provide additional nesting habitat as well as additional protection from storms. A nourished beach that is designed and built to mimic the natural beach system will likely benefit nesting sea turtles more than the eroded beach it replaces.

Effects of Interrelated or Interdependent Actions

The sand source for the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project is planned to be a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the project limits along the County shoreline in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The Phipps and Mid-Town projects will be constructed outside of peak turtle nesting season; therefore, stockpiling sand and trucking the sand to the Town of Palm Beach Project Area will not directly impact nesting sea turtles, nests, or hatchlings.

Cumulative Effects

It is likely that the Phipps Project (alternating with use of a stockpile from the Mid-Town Project) will be constructed north of the Project Area concurrently with the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project. It is also reasonable to expect that nourishment and dune restoration will be continue to be periodically constructed along the Palm Beach Island in the future. All previous and future nourishment projects (discussed in Section 2) on Palm Beach Island and nearby beaches represent actions that cumulatively impact sea turtle nesting habitat. Impacts include changes to the physical and chemical beach environment. If a nourishment project results in compaction of sand, female turtles may be deterred from nesting on a particular beach (Ernest and Martin, 1999). As a result, FDEP permit conditions require compaction testing and/or tilling of the beach. Alteration of the natural profile of the beach can cause sea turtles to nest closer to the water for the first year or two after nourishment (Trindell et al., 2005). Nesting closer to the water elevates the risk of nests being washed away due to erosion or storms (USFWS, 2011). Beach nourishment can result in other chemical and physiological changes in natural beach sand qualities such as sand color and moisture content (Nelson and Dickerson, 1989; Grain et al., 1995). The color of sand plays a role in heat transfer and retention properties of the sand. Altered temperature characteristics of a nesting beach may affect the nest incubation environment, which can in turn alter the sex ratio of unborn sea turtles in the nest, as temperature plays a direct role in determining the sex of the hatchling (Yntema and Mrosovsky, 1982; Godfrey and Mrosovsky, 1999). The effects of a single nourishment on parameters such as the nesting success and sex ratio of a sea turtle population may be insignificant, but the cumulative effects over several years and several nourishment events may be detrimental to a local population of a species.

On the other hand, the cumulative effects of multiple beach nourishments which have occurred in and around the proposed Project Area may have a net positive benefit, leading to an overall increase in sea turtle nesting and hatchling success rates due to expansion of suitable nesting beaches. This is reasonable to expect, providing that fill material is compatible with native sands and the fill profile mimics the natural profile. The regular addition of suitable beach material to the shorelines provides additional nesting habitat and protects existing nesting beaches from future storm-induced erosion, given that the grain size and color, and placement profile remain similar to the native beach. The sand which will be used in the proposed Project will comply with State standards, and will be similar to existing beach sand.

Increasing the number of coastal armoring and nearshore control structures on Palm Beach Island may create potential obstacles to turtle hatchlings. However, as discussed above, the proposed groins will likely have minimal impacts, if any, to turtle hatchlings since they will be constructed of solid concrete panels and will be perpendicular to the shoreline with no T-head terminus. The groins will be buried within the beach fill immediately post-construction, and after three years they may extend 10-40 feet seaward of mean high water.

6.1.2. SWIMMING SEA TURTLES

Five sea turtle species are listed by NMFS as potentially occurring offshore of Florida in the waters of the Atlantic: loggerhead, green, leatherback, hawksbill, and Kemp's ridley. Potential impacts to these species are described below.

<u>Direct and/or Indirect Effects</u>

Beach Nourishment

The proposed Project would utilize a truck haul approach, which minimizes or eliminates the use of in-water vessels and the potential for sea turtle entanglement, entrainment or strike. However, beach restoration projects can indirectly affect sea turtles by burying nearshore foraging habitat. Studies have identified twelve genera shown to be preferred food items of *C. mydas* (Makowski et al., 2006; Wershoven and Wershoven, 1989). Five of the fourteen macroalgal genera documented on intertidal and nearshore hardbottom during the 2013 characterization survey within the proposed Project Action Area were identified as sea turtle preferred species, including *Dictyota, Dictyopteris, Bryothamnion, Dasycladus,* and *Jania* (CB&I, 2014).

Based on engineering and modeling analyses, it is anticipated that the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project may result in result in permanent impacts to 4.03 ac of hardbottom as well as temporary and secondary impacts to 8.13 ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand. It is likely that federal and state permits will require construction of mitigative artificial reefs to offset these impacts and to provide habitat similar to the nearshore hardbottom being impacted; a preliminary UMAM evaluation determined that 6.39 acres of mitigation may be required to offset anticipated impacts (Draft UMAM Analysis provided as Appendix H to EIS). During construction of the artificial reefs, there is potential for direct impacts from vessels to swimming sea turtles. However, all vessels will comply with NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS, 2006) in order to minimize direct impacts to swimming sea turtles during construction of the mitigative reef.

Groin Construction

The construction of the groins may occur from either the land or using in-water construction, or a combination of the two methods. The in water construction is unlikely due to the location of the nearshore hardbottom formations which will prevent barges from approaching the shoreline. If the groins are installed using in-water methods, direct impacts to swimming sea turtles include the possibility of vessel strike. However, all vessels will comply with NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS, 2006) in order to minimize direct impacts to swimming sea turtles during construction of the groins.

<u>Effects of Interrelated or Interdependent Actions</u>

The proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project is planned to use a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the County project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The Phipps and Mid-Town projects will utilize either a hopper or cutterhead dredge to pump beach quality sand from an offshore borrow area. Hopper dredging occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector drag heads in place, and concurrent relocation trawling (NMFS, 1997). Incidental takes of sea turtles are typically not reported from clamshell, pipeline cutterhead, or other types of dredges operating along southeastern coasts (Dickerson et al., 2004); however, two loggerhead takes by a cutterhead dredge were recently reported during a nourishment project in Manatee County, Florida (USACE, 2014) and another in Boca Raton, Palm Beach County, Florida (NMFS, 2014a). Potential impacts from dredging of offshore borrow areas which will be the sand source for the Project Area between (R-129-210 to R-134+135) will be evaluated separately in association the Phipps and Mid-Town projects.

Cumulative Effects

It is reasonable to expect that nourishment projects will continue to be periodically constructed along the Palm Beach Island in the future. The proposed Project may be constructed every 2 to 4 years, as needed. All previous and future nourishment projects (discussed in section 2) on Palm Beach Island and nearby beaches represent actions that cumulatively impact sea turtle marine habitat. Nourishment projects that involved dredging offshore borrow areas have the potential to directly impact swimming sea turtles, and equilibration of fill may indirectly impact swimming sea turtles through burial of hardbottom which provides foraging habitat.

6.1.3. LOGGERHEAD CRITICAL HABITAT

The proposed Project includes construction on the dry beach as well as nearshore, in-water construction and sediment placement. The beach nourishment project and construction of the groins, while built outside of peak nesting season, may have indirect impacts to nesting beaches in the Action Area (see Section 6.1.1), including USFWS-designated critical habitat unit LOGG-T-FL-12. The proposed Project, including construction of groins and mitigative artificial reefs, may also affect nearshore waters within the Action Area (discussed in Section 6.1.2), including NMFS-designated critical habitat unit LOGG-N-19. However, the Project is not expected to adversely modify designated loggerhead critical habitat on the beach or in the nearshore marine environment. It is expected that with construction of the Project, the affected loggerhead critical habitat, both terrestrial and marine, will continue to serve in its intended conservation role for the species. The Project is not anticipated to have a significant effect on loggerhead species persistence or the function of the NWA DPS of loggerhead critical habitat as a whole. Recently, NMFS and USFWS made similar determinations for a groin project on Longboat Key, Florida. NMFS determined that the groins would increase the nesting habitat, would not obstruct transit of turtles through the surf zone to the open water, and would not increase the likelihood of predator concentration or cause wave patterns to be modified to the extent that it would disrupt orientation nor cause excessive longshore currents (NMFS, 2014b). USFWS determined that the Longboat Key groin project “may affect” loggerhead NWA DPS critical habitat, but that with incorporation with conservation measures and Terms and Conditions in the USFWS Biological Opinion (BO), the project would “not destroy or adversely modify” loggerhead terrestrial critical habitat (USFWS, 2014).

6.2. SMALLTOOTH SAWFISH

Direct and/or Indirect Effects

Beach Nourishment

There have been three smalltooth sawfish sightings offshore the Town of Palm Beach since April of 2011, indicating the Action Area is located within the range of this species. The nearshore marine environment within the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project Action Area supports rock and reef habitats; however, increased turbidity during construction and anticipated burial of hardbottom resources are unlikely to impact sawfish, since a minimal amount of sawfish encounters have occurred over rock and reef formations (4% each) compared to observations over mud (61%) (Poulakis and Seitz, 2004). The preferred mud-bottom mangrove habitat primarily utilized by this species does not occur within the Action Area. Also, the proposed Project utilizes a truck-haul methodology for the dune restoration and beach fill activities; therefore, direct impacts to smalltooth sawfish are not anticipated. However, it is likely that artificial reefs will be required to be constructed as mitigation to offset project impacts to natural hardbottom resources. During construction of the artificial reef, there is potential for impacts from vessels to smalltooth sawfish. However, all vessels will comply with NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS, 2006) in order to minimize direct impacts to sawfish during construction of the mitigative reef.

Groin Construction

The contractor will have the option to construct the proposed groins from the land or using in-water construction, or a combination of the two methods. If the groins are installed using in-water methods, direct impacts to smalltooth sawfish include the possibility of vessel strike. However, all vessels will comply with NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS, 2006) in order to minimize direct impacts to smalltooth sawfish during construction of the groins.

<u>Effects of Interrelated or Interdependent Actions</u>

The proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project is planned to use a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the County project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The Phipps and Mid-Town projects will utilize either a hopper or cutterhead dredge to pump beach quality sand from an offshore borrow area. While utilization of an offshore borrow area increases potential for impacts with smalltooth sawfish, NMFS has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge (NMFS, 1997).

<u>Cumulative Effects</u>

In addition to being decimated by recreational and commercial fishery bycatch, smalltooth sawfish are also subject to habitat alteration and degradation (Carlson et al., 2007). Although these fish primarily utilize mangroves, seagrass and river banks as habitat, they have also been observed on coral reefs and hardbottom. These habitats are found along the southeast Florida coastline and have been impacted by numerous coastal construction activities over the years. Coastal protection efforts along Palm Beach Island have included construction of structures and beach nourishment projects, and the inlets to the north and south of the island are periodically dredged. It is therefore reasonable to expect that these actions will continue to occur, having a cumulative impact on smalltooth sawfish habitat.

6.3. MAMMALS

6.3.1. FLORIDA MANATEE

Direct and/or Indirect Effects

Beach Nourishment

Florida manatees' preferred habitat is warm freshwater, estuarine and nearshore coastal waters. Feeding areas are located in coastal and riverine systems, where shallow seagrass communities are found (USFWS, 2001). Seagrass is not located within the Action Area, but manatees may use the Action Area as a travel corridor. The proposed Project utilizes a truck-haul methodology for the dune restoration and beach fill activities, therefore direct impacts to manatees are not anticipated. However, it is likely that artificial reefs will be required to be constructed as mitigation to offset project impacts to natural hardbottom resources. During construction of the artificial reef, there is potential for impacts from vessels to manatees. However, all vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) in order to minimize direct impacts to manatees during construction of the mitigative reef.

Groin Construction

If the proposed groins are installed using in-water methods, direct impacts to manatees include the possibility of vessel strike. However, all vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) to reduce the potential for manatee impacts.

Effects of Interrelated or Interdependent Actions

The proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project is planned to use a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the County project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The Phipps and Mid-Town projects will utilize either a hopper or cutterhead dredge to pump beach quality sand from an offshore borrow area. While utilization of an offshore borrow area increases potential for impacts with manatees, all vessels will comply with *Standard Manatee Construction Conditions for In-Water Work* (FWC, 2011) to reduce the potential for manatee impacts.

Cumulative Effects

Coastal protection efforts along Palm Beach Island have included construction of structures and beach nourishment projects. It is reasonable to expect that these actions will continue to occur, though since they will not be directly impacting SAV habitat they will have a minimal cumulative impact on manatees.

6.3.2. FLORIDA PANTHER

Direct and/or Indirect Effects

The proposed Project is planned to utilize upland sand within the County project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The upland sand will be delivered from the upland mine via truck-haul to the Project Area. Three of the potential mine sites are located within the Florida panther habitat zones, therefore the increased traffic and noise disturbance may impact the Florida panther along the truck routes (FWC, 2012). Apart from potential temporary disturbances, no long-term negative effects are anticipated.

Effects of Interrelated or Interdependent Actions

The proposed Project is planned to utilize stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135). The activities associated with the Phipps and Mid-Town projects will not occur in any of the panther habitat zones; therefore no impacts to panthers are expected to occur.

Cumulative Effects

Florida panthers inhabit inland areas such as large forested and wetland areas. They do not utilize coastal and beach environments. While beach nourishment projects do not directly impact this species, as offshore sediment resources continue to be depleted, this may result in more frequent use of upland mines. Therefore, cumulative effects to Florida panthers may result from continued construction of beach nourishment projects utilizing upland sand sources.

6.4. CORALS – ACROPORID CORALS AND RECENTLY LISTED CARIBBEAN CORAL SPECIES

Direct and/or Indirect Effects

Although it is anticipated that the proposed Project may result in 4.03 ac of hardbottom as well as temporary and secondary impacts to 8.13 ac of hardbottom due to direct sand placement and subsequent spreading (equilibration) of sand, recent nearshore hardbottom surveys conducted in October 2013 supported previous nearshore hardbottom data, which have not documented any of the five recently listed coral species nor any *Acropora* colonies within the Action Area (PBC-ERM, 2013b; CB&I, 2014). Based on nearshore survey data which show no records of these species in the shallow nearshore hardbottom habitat within the Action Area, it is likely that the Project (beach nourishment and groin construction) will not cause direct or indirect impacts to these seven listed coral species.

Effects of Interdependent or Interrelated Actions

The proposed Project is planned to utilize a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The Phipps and Mid-Town projects will utilize either a hopper or cutterhead dredge to pump beach quality sand from an offshore borrow area. Utilization of an offshore borrow area increases the potential for impacts to offshore hardbottom (beyond the Action Area for the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project). These deeper areas of hardbottom may support some of the seven listed coral species; therefore, there could be potential direct impacts from pipelines or indirect impacts from turbidity and sedimentation.

Cumulative Effects

A. cervicornis and *A. palmata* populations have declined dramatically since the 1970s due primarily to bleaching and disease. The five recently listed threatened coral species have also experienced declines over the last several decades throughout their ranges. Anthropogenic influences such as physical damage (vessel groundings, anchors, divers/snorkelers), increased land-based sources of pollution, and coastal construction have exacerbated these declines resulting in a synergistic effect that greatly diminishes the survival of these corals. Additionally, while ocean acidification has not been demonstrated to have caused appreciable declines in coral populations so far, it is considered to be a significant threat to corals by 2100 (Brainard et al., 2011).

6.5. BIRDS

Direct and/or Indirect Effects

Piping plovers and rufa red knots have been observed in Palm Beach County (e-Bird, 2013a; 2013b). Heavy machinery and equipment (e.g., trucks and bulldozers operating on Project Area beaches) may adversely affect any migrating and wintering piping plovers within the Action Area by disturbance and disruption of normal activities such as roosting and feeding, and possibly forcing birds to expend additional energy reserves to seek available habitat elsewhere (i.e. north or south of the Action Area). Burial and suffocation of invertebrate species will occur during each nourishment and renourishment cycle. Research by Peterson et al. (2006) suggests that impacts to foraging habitat for shorebird species may be short-term due to the temporary depletion of the intertidal food base. Timeframes projected for benthic recruitment and re-establishment following beach nourishment are between six months and two years (Greene, 2002). Beach wrack has also been recognized as important to shorebirds, including piping plovers, for camouflage and foraging. Since piping plovers spend the majority of their overwintering time in Florida foraging along the shoreline, the wrack line provides an important foraging resource for this species. Destruction of wrack through beach nourishment eliminates this habitat. However, piping plovers may also experience some benefit from the stabilization of existing beach habitat and the increase in available roosting habitat from this Project.

Construction of dunes associated with the proposed Project can lead to stabilization of the shoreline which, while beneficial to beach infrastructure as well as wildlife that utilize the beach such as nesting sea turtles, can potentially prevent the formation of overwashes which are an important habitat utilized by piping plovers. However, the Action Area for the Southern Palm Beach Island Comprehensive Shoreline Stabilization Project contains and has historically contained dunes which have prevented the formation of overwash areas. Overwash areas do not exist in the Action Area; therefore, the proposed Project will not impact this type of habitat. Heavy construction equipment associated with dune construction and potential planting activities may also deter piping plover from utilizing the area on their migration routes, resulting in these birds selecting other suitable overwintering sites outside the Action Area.

<u>Effects of Interdependent or Interrelated Actions</u>

The proposed Project is planned to utilize a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town

Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the County project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). The construction of the Phipps Project and the stockpile of sand (alternating with use of a stockpile from the Mid-Town Project) that will be used for the proposed Southern Palm Beach Island Comprehensive Shoreline Stabilization Project will involve the use of construction machinery and equipment on the beach and within potential piping plover roosting and foraging habitat. This activity may have impacts on the beaches including depletion of intertidal and beach infauna, and temporary disruption of roosting and foraging by piping plovers. Apart from potential temporary disturbances, no long-term negative effects to these birds are anticipated.

Cumulative Effects

Piping plovers and rufa red knots overwinter along Florida's coastline and forage along the sandy beaches of the Action Area and adjacent shorelines. Although infauna recovery has been documented after beach renourishment projects, the repetitive burial of beach infauna may eventually change the abundance and composition of infaunal communities, which can in turn affect food sources for the piping plover. Additionally, large-scale removal of beach wrack associated with beach grooming programs (beach cleaning and raking) removes habitat used by piping plovers for foraging and camouflage.

6.6. BEACH JACQUEMONTIA

Direct and/or Indirect Effects

The presence of construction equipment used for beach nourishment and dune projects may mechanically damage existing plants, while sand placement, if done improperly, may bury extant plants. However, naturally occurring beach jacquemontia has become rare in Palm Beach County and, based on a recent survey, it has not been observed within the Action Area for the proposed Project (CB&I, 2014). Therefore, construction activities in the form of truck haul beach nourishment will not have any negative effects to beach jacquemontia.

<u>Effects of Interdependent or Interrelated Actions</u>

The proposed Project is planned to utilize a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). Beach jacquemontia is not found within the Action Area, therefore there is no potential for impacts to this species (FTG, 2003; CB&I, 2014).

<u>Cumulative Effects</u>

It is reasonable to expect that nourishment projects will continue to be periodically constructed along the Palm Beach Island in the future. The proposed Project may be constructed every 2 to 4 years, as needed. All previous and future nourishment projects on Palm Beach Island and nearby beaches represent actions that have the potential to cumulatively impact dune vegetation; however, beach jacquemontia is not known to occur on Palm Beach Island, so there are no cumulative impacts expected to this species (FTG, 2003; CB&I, 2014).

7.0. CONSERVATION MEASURES SUMMARY

The conservation measures that will be taken to protect federally listed species and their habitat will follow construction guidelines as set forth by state and federal agencies. The following conservation measures will be implemented during project construction and during project-related activities.

7.1. SEA TURTLE CONSERVATION MEASURES

- *Project Timing*. Construction is anticipated to occur between November 1 and April 30 in order to avoid peak sea turtle nesting season. Should construction encroach into the nesting season, construction will comply with all permit and Biological Opinion conditions. Construction will occur during daylight hours only, reducing the likelihood of interactions between machinery and nesting or hatchling sea turtles.

- *Construction Methods*. As proposed, this Project will be constructed using a truck-haul methodology, utilizing a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) and upland sand resources, thus minimizing the potential for turtle take normally associated with dredging (dredging will be permitted separately for the Phipps and Mid-Town projects). Any in water support vessels that may be used for turbidity monitoring and/or to assist with construction of the proposed groins and artificial reefs will comply with the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions.* These conditions require educating project personnel on how to monitor for the presence of sea turtles and how to respond if any are observed during water-related project activities. These conditions stipulate that if a sea turtle is observed within 100 yards of construction operations, all appropriate precautions shall be implemented to ensure its protection, including cessation of operation if the animal moves within 50 ft of any moving equipment. Any collision or injury to a sea turtle must be reported immediately to NMFS.

- *Compatibility of Sand with Native Beach Material*. All sand material placed will be similar to that already existing at the beach site in both coloration and grain size distribution and will be suitable for sea turtle nesting. The proposed Project is planned to utilize a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) within the Town of Palm Beach project limits (R-129-210 to R-134+135), and upland sand within the project limits in South Palm Beach, Lantana, and Manalapan (R-134+135 to R-138+551). All sand will meet the requirements of Florida Administrative Code, Rule 62B-41.007(2)(j), ensuring that the sand material will be compatible with the existing beach sand. Sand will also comply with County sand specifications. Beach compatible sand is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Using sediment with similar grain size, carbonate content and color to that found on the existing beach minimizes impacts to sea turtle nesting and hatchling success (Greene, 2002).

- *Monitoring and Nest Relocation.* Sea turtle monitoring, nest evaluation and protection measures shall be conducted by marine turtle permit holders during the nesting season from March 1 through October 31. If construction occurs during sea turtle nesting season, the Applicants will coordinate directly with FWC on appropriate monitoring protocol and precautionary measures to follow in order to minimize impacts to nesting sea turtles and hatchlings. FWC guidelines will be used during any sea turtle monitoring and/or nest relocation activities related to project construction. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded per the terms and conditions (A9(a)) in the Statewide Programmatic Biological Opinion (SPBO).

- *Project Lighting*. Construction will be limited to daylight hours only; therefore, there will be no project lighting required. Beachfront lighting is regulated by the Palm Beach County Unified Land Development Code (ULDC) Article 14.A, Sea Turtle Protection and Sand Ordinance and the Palm Beach County Department of Environmental Resources Management (PBC-ERM) is responsible for implementing its measures. This ordinance requires that all coastal construction adhere to strict guidelines to eliminate impacts to sea turtles. Within the Project Area, Lantana and Manalapan are within the jurisdiction of the Article 14.A, ULDC, and The Town of Palm Beach and South Palm Beach have opted-out of the ordinance. Post-construction lighting surveys will also be conducted to monitor for any increased exposure to artificial light sources.

- *Beach Maintenance*. Immediately following completion of the Project, and prior to March 1 for three subsequent years, the Town of Palm Beach and the County will conduct beach tilling along the length of the Project Area as required by permits and the Biological Opinion. This will reduce or prevent compaction of the nourished beach that could impact sea turtle nesting. During sea turtle nesting season, weekly visual surveys for escarpment formation will be conducted within the Project Area in compliance with permit requirements. These surveys will be conducted for three nesting seasons following beach nourishment. Any escarpments which exceed 46 cm (18 in) in height for a distance of 30 m (100 ft) will be reported in writing to the FDEP and mechanically leveled to the natural beach contour prior to March 1.

- *Mitigation Reefs*. In-water work for construction of mitigative artificial reefs would require implementation of the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions*. The reef construction would not be required to be restricted during the non-nesting season, and may occur during the calmer summer months to ensure proper reef construction and vessel maneuvering. Additionally, the reefs may increase the available habitat for sea turtles, in particular juvenile green turtles which may utilize the reef for shelter and foraging opportunities.

7.2. SMALLTOOTH SAWFISH CONSERVATION MEASURES

- *Construction Methods*. As proposed, this Project will be constructed using a truck-haul methodology, utilizing a combination of stockpiled dredge material from the planned Phipps Project (alternating with use of a stockpile from the Mid-Town Project) and upland sand resources, thus reducing potential impacts to smalltooth sawfish. Any in water support vessels that may be used for turbidity monitoring and/or to assist with construction of the proposed groins and artificial reefs will comply with the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions* to further reduce potential smalltooth sawfish impacts. These conditions stipulate that if a sawfish is observed within 91 m (300 ft) of construction operations, all appropriate precautions shall be implemented to ensure its protection, including cessation of operation if the animal moves within 15 m (50 ft) of any moving equipment. Any collision or injury to a sawfish must be reported immediately to NMFS.

7.3. FLORIDA MANATEE CONSERVATION MEASURES

- *Construction Methods*. As proposed, this Project will be constructed using a truck-haul methodology, thus reducing potential impacts to manatees. Any in water support vessels that may be used for turbidity monitoring and/or to assist with construction of the proposed groins and mitigative artificial reefs will comply with the FWC 2011 *Standard Manatee Construction Conditions for In-Water Work*. These conditions include protection measures that will minimize the potential for significant impacts to manatees by project-related activities. This includes: operation of vessels at 'idle speed/no wake' at all times while in the immediate area and when the draft of the vessels provides less than four feet of clearance from the bottom; immediate shutdown of all in-water operations if a manatee comes within 15 m (50 ft) of construction activities; posting of temporary signs concerning manatees prior to and during all in-water activities; use of turbidity barriers that manatees cannot become entangled in; and, reporting any collisions or injury to a manatee to FWC and USFWS.

7.4. CORAL CONSERVATION MEASURES

- *Hardbottom Surveys.* In anticipation of the proposed Project, Palm Beach County conducted an *Acropora* survey on the nearshore hardbottom within the Action Area in October 2013 (provided as Appendix C to the EIS). The survey followed the NMFS 2007 Recommended Survey Protocol for *Acropora* spp (NMFS, 2007). No *Acropora* was observed during these investigations (PBC-ERM, 2013b). CB&I also conducted a hardbottom characterization survey in the Action Area in October 2013, during which no *Acropora* spp and none of the five recently listed threatened Caribbean coral species were observed (CB&I, 2014). While no listed coral species are found within the Action Area for the proposed Project, a preliminary UMAM evaluation estimates that 6.39 acres of mitigative artificial reef would be required to offset permanent impacts to 4.03 ac of hardbottom as well as temporary and secondary impacts to 8.13 ac to intertidal and subtidal hardbottom. Mitigation and monitoring for project impacts to hardbottom habitat will be implemented in compliance with permit requirements.

7.5. SHOREBIRD CONSERVATION MEASURES

- *Shorebird Surveys and Construction Methods*. It is likely that construction of the proposed Project will be required to follow the Conservation Measures outlined in the USFWS Programmatic Piping Plover Biological Opinion (P^3BO), which addresses impacts from shore protection activities on the non-breeding piping plover (USFWS, 2013f). These measures may include: implementation of surveys for non-breeding shorebirds (including red knots), placement of equipment in areas that would not be expected to be utilized by shorebirds, and other efforts such as a designated travel corridor for driving on the beach for construction, predator-proof trash receptacles, and educational signs at public access points.

8.0. EFFECTS DETERMINATIONS

Tables 8-1 and 8-2 present the effects determinations for each listed and proposed species and critical habitat with the potential to occur in the Action Area from beach nourishment and dune restoration (Table 8-1) and from construction of seven low profile groins (Table 8-2). These May Affect, Likely to Adversely Affect; May Affect, Not Likely to Adversely Affect (MANLAA); and No Effect determinations were concluded based upon the existing information available for each species and its occurrence, as well as conservation, monitoring and mitigation measures to avoid and minimize impacts to listed species. Determinations were also made as to whether or not the Project would adversely modify critical habitat within the Action Area. These effect determinations are presented in two separate tables to differentiate effects from beach nourishment and dune restoration (Table 8-1) and from construction of seven low profile groins (Table 8-2) in order to facilitate consultation with USFWS and NMFS on the separate projects proposed by the Town of Palm Beach and the County. Note that for sea turtles, separate effects determinations were made for species during nesting (under USFWS jurisdiction) and swimming (under NMFS jurisdiction) phases.

Table 8-1. Recommended effects determinations for federally listed and proposed species and critical habitat potentially occurring in the Action Area from beach nourishment and dune restoration.

Common Name	Scientific Name	Effects Determination
SEA TURTLES		**Nesting/In-Water**
Loggerhead	*Caretta caretta*	Likely to adversely affect/No effect[1]
Green	*Chelonia mydas*	Likely to adversely affect/No effect[1]
Leatherback	*Dermochelys coriacea*	Likely to adversely affect/No effect[1]
Hawksbill	*Eretmochelys imbricata*	MANLAA/No effect[1]
Kemp's Ridley	*Lepidochelys kempii*	MANLAA/No effect[1]
FISH		
Smalltooth sawfish	*Pristis pectinata*	No effect[1]
MAMMALS		
Florida manatee	*Trichechus manatus latirostris*	MANLAA
Florida panther	*Puma concolor coryi*	MANLAA
CORALS		
Staghorn coral	*Acropora cervicornis*	No effect
Elkhorn coral	*Acropora palmata*	No effect
Boulder star coral	*Orbicella annularis*	No effect
Mountainous star coral	*Orbicella faveolata*	No effect
Star coral complex	*Orbicella franksi*	No effect
Pillar coral	*Dendrogyra cylindrus*	No effect
Rough cactus coral	*Mycetophyllia ferox*	No effect
BIRDS		
Piping plover	*Charadrius melodus*	MANLAA
Rufa red knot	*Calidris canutus rufa*	MANLAA
PLANTS		
Beach jacquemontia	*Jacquemontia reclinata*	No effect
CRITICAL HABITAT		
Acropora spp.		Will not adversely modify the Florida Unit
Loggerhead		Will not adversely modify designated terrestrial (USFWS) or marine (NMFS) critical habitat units

[1]If permits require construction of artificial reef habitat as mitigation for hardbottom impacts, then effects determination for swimming sea turtles and smalltooth sawfish is MANLAA.

Table 8-2. Recommended effects determinations for federally listed and proposed species and critical habitat potentially occurring in the Action Area from groin construction.

Common Name	Scientific Name	Effects Determination
SEA TURTLES		**Nesting/In-Water**
Loggerhead	*Caretta caretta*	Likely to adversely affect/MANLAA
Green	*Chelonia mydas*	Likely to adversely affect/MANLAA
Leatherback	*Dermochelys coriacea*	Likely to adversely affect/MANLAA
Hawksbill	*Eretmochelys imbricata*	MANLAA/MANLAA
Kemp's Ridley	*Lepidochelys kempii*	MANLAA/MANLAA
FISH		
Smalltooth sawfish	*Pristis pectinata*	MANLAA
MAMMALS		
Florida manatee	*Trichechus manatus latirostris*	MANLAA
Florida panther	*Puma concolor coryi*	MANLAA
CORALS		
Staghorn coral	*Acropora cervicornis*	No effect
Elkhorn coral	*Acropora palmata*	No effect
Boulder star coral	*Orbicella annularis*	No effect
Mountainous star coral	*Orbicella faveolata*	No effect
Star coral complex	*Orbicella franksi*	No effect
Pillar coral	*Dendrogyra cylindrus*	No effect
Rough cactus coral	*Mycetophyllia ferox*	No effect
BIRDS		
Piping plover	*Charadrius melodus*	MANLAA
Rufa red knot	*Calidris canutus rufa*	MANLAA
PLANTS		
Beach jacquemontia	*Jacquemontia reclinata*	No effect
CRITICAL HABITAT		
Acropora spp.		Will not adversely modify the Florida Unit
Loggerhead		Will not adversely modify designated terrestrial (USFWS) or marine (NMFS) critical habitat units

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