Tybee Island, Georgia
Shore Protection Project
2008 Renourishment

Biological Opinion

July 18, 2008

Prepared by:

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TABLE OF CONTENTS

CONSULTATION HISTORY………………………………………………………………..1

BIOLOGICAL OPINION……………………………………………………………………..3

DESCRIPTION OF THE PROPOSED ACTION……………………………………………..3
Action Area…………………………………………………………………………......3

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT…………………………………………10
Life history (Growth, Life Span, Survivorship, and Mortality)……………………………11
Population dynamics……………………………………………………………………...12
Status and distribution………………………………………………………………….....13
Common threats to sea turtles…………………………………………………………......15

ENVIRONMENTAL BASELINE…………………………………………………………..18
Status of the species within the action area……………………………………………....19
Factors affecting species environment within the action area…………………………....21

EFFECTS OF THE ACTION………………………………………………………………….22
Factors to be considered…………………………………………………………………22
Analyses for effects of the action……………………………………………………….....23
Species' response to a proposed action…………………………………………….......27

PIPING PLOVER

STATUS OF THE SPECIES/CRITICAL HABITAT…………………………………………27
Population dynamics……………………………………………………………………...28
Life history…………………………………………………………………………………..29
Status and distribution…………………………………………………………………….33

ENVIRONMENTAL BASELINE…………………………………………………………..37
Status of the species within the action area…………………………………………………37
Factors affecting species environment within the action area…………………………… ...37

EFFECTS OF THE ACTION………………………………………………………………….38
Factors to be considered…………………………………………………………………….38
Analysis for effects of the action…………………………………………………………....39
Species response to the proposed action……………………………………………………40

CUMULATIVE EFFECTS………………………………………………………………...41

CONCLUSION……………………………………………………………………………….41

Sea Turtles……………………………………………………………………………………..41
Piping Plover…………………………………………………………………………………..42

INCIDENTAL TAKE STATEMENT……………………………………………………………..43

AMOUNT OR EXTENT OF TAKE………………………………………………………….43
Sea Turtles…………………………………………………………………………………….43
Piping Plovers and GA-Unit 1………………………………………………………………...44

EFFECT OF THE TAKE……………………………………………………………………….45

REASONABLE AND PRUDENT MEASURES……………………………………………….45

TERMS AND CONDITIONS………………………………………………………………….46
Protection of Sea Turtles……………………………………………………………... 46
Protection of Piping Plover…………………………………………………………….50

CONSERVATION RECOMMENDATIONS…………………………………………………..50

REINITIATION NOTICE……………………………………………………………………….51

LITERATURE CITED………………………………………………………………………….53

APPENDIX 1………………………………………………………………………………

APPENDIX 2………………………………………………………………………………

APPENDIX 3………………………………………………………………………………

APPENDIX 4………………………………………………………………………………

LIST OF FIGURES

FIGURE 1. LOCATION MAP, TYBEE ISLAND, GA (SOURCE: OLSEN ASSOCIATES INC. 2008)……………………………………………………………………………….

FIGURE 2. PROPOSED FILL LIMITS FOR 2008 - 2009 TYBEE ISLAND BEACH RENOURISHMENT INCLUDING DELINEATION OF PIPING PLOVER CRITICAL HABITAT………………………………………………...

FIGURE 3. PROJECT AREA SHOWING EROSION AREAS AND MEAN HIGH WATER POST RESTORED BEACH PROJECT……………………………………………..

FIGURE 4. PROPOSED BORROW SITE EXPANSION FOR THE TYBEE ISLAND SHORE PROTECTION PROJECT (SOURCE OLSEN ASSOCIATES INC 2008)……………..

FIGURE 5. LIFE HISTORY STAGES OF A LOGGERHEAD TURTLE. THE BOXES REPRESENT LIFE STAGES AND THE CORRESPONDING ECOSYSTEMS AND DOTTED LINES ARE SPECULATIVE (BOLTEN 2003)………………………………

FIGURE 6. LOGGERHEAD NESTING ON TYBEE ISLAND, GEORGIA, 1999 - 2007. RED DOTS ARE NESTS AND GREEN DOTS ARE NON-NESTING EMERGENCES. THE DATASET INCLUDES ONE LEATHERBACK TURTLE NEST IN 2004 (COURTESY OF GADNR, NONGAME CONSERVATION SECTION)……………….

FIGURE 7. AVERAGE LOGGERHEAD SEA TURTLE NESTING IN GEORGIA BY ISLAND, 1989 - 2007 (COURTESY OF GADNR, NONGAME CONSERVATION SECTION)……………………………………………………………………………….

FIGURE 8. RANGE AND POPULATIONS OF PIPING PLOVERS……………………………

FIGURE 9. BEACH WORK LIGHTING SCHEMATIC…………………………………………

LIST OF TABLES

TABLE 1. CHRONOLOGY OF RECENT BEACH RENOURISHMENT AND EROSION CONTROL EFFORTS, TYBEE ISLAND, GEORGIA……………………………………..

TABLE 2. RESULTS OF THE 1991, 1996, 2001, AND UNOFFICIAL 2006 INTERNATIONAL PIPING PLOVER WINTERING CENSUS………………………..

TABLE 3. PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS COMPLETED FOR SEA TURTLES IN GEORGIA…………………………………….

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Attn: Ms. Ellie Covington

Re: USFWS Log #08-FA-1062

Dear Mr. Crosby:

This is the U. S. Fish and Wildlife Service's (Service) biological opinion for the Tybee Island Shore Protection Project (TISP) in Chatham County, Georgia and its effects on nesting loggerhead sea turtles (*Caretta caretta*) (loggerhead) and leatherback sea turtles (*Dermochelys coriacea*) (leatherback), non-breeding piping plovers, and designated critical habitat for the piping plover. The U. S. Army Corps of Engineers (USACE) determined that the proposed work would not likely adversely affect Florida manatees based on the inclusion of the manatee conditions in your May 21, 2008, letter (Appendix 1). We concur that the proposed action is not likely to adversely affect the Florida manatee. This opinion is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

This biological opinion is based on the permit application file, the May 2008 Environmental Assessment and Finding of No Significant Impact and Biological Assessment of Threatened and Endangered Species, the original 1994 Environmental Assessment used for the Tybee Island beach renourishment in 2000, information provided during meetings with USACE staff, information from the Georgia Department of Natural Resources (GADNR), Nongame Conservation Section species experts and from Service species experts, and information in our files. A complete administrative record of this consultation is on file in the Service's Coastal Georgia Ecological Services Suboffice (Coastal ES) in Brunswick.

CONSULTATION HISTORY

<u>January 11, 2008</u> The Service received via email a request for technical assistance and informal consultation for the Tybee Island renourishment project.

January 24, 2008	The Service requested via email information of the proposed work involved in the renourishment project and its exact location on Tybee Island.
February 20, 2008	The Service provided technical assistance via email regarding the listed species expected to be in the project area.
February 21, 2008	The Service received via email the proposed fill limits for the Tybee Island project from the USACE.
February 21, 2008	The Service received information on piping plovers on Tybee Island via email from Brad Winn, GADNR.
March 10, 2008	The Service received information on sea turtle nesting records on Tybee Island via email from Mark Dodd, GADNR.
March 15, 2008	USACE sent the Public Notice on the TISP 2008 Renourishment, Draft Environmental Assessment (EA) and Finding of No Significant Impact and Draft Biological Assessment of Threatened and Endangered Species (BATES).
March 27, 2008	We coordinated via email with the Service sea turtle coordinator and experts on having consistency on the Service sea turtle formal consultations.
April 23, 2008	The Service sent a letter to the USACE regarding the Public Notice with the EA and BATES regarding the Fish and Wildlife Coordination Report, the completion of Coastal Barrier Resources Act (CBRA) coordination and the continuation of ESA section 7 consultation.
April 29, 2008	USACE project managers met with the Service to discuss the best strategy for conducting this consultation on three very different types of listed species and the need for the USACE to get the project under contract quickly.
May 8, 2008	The Service assisted the USACE with the effects determinations for the various species involved in the Tybee Island renourishment project.
May 19, 2008	The Service made a site visit with the USACE project manager and the site operations manager and walked the entire project and discussed staging and operations.
May 21, 2008	USACE sent a letter requesting initiation of formal consultation on the loggerheads and leatherbacks including construction conditions to support their determination that manatees are not likely to be adversely affected.

June 2, 2008 The Service sent a letter acknowledging the USACE letter, initiating formal consultation, and promising to complete the consultation on an accelerated schedule to enable the USACE to finish the project before sea turtle nesting season of 2009.

July 15, 2008 The USACE sent an email clarifying the project description to include work within sea turtle nesting season if unforeseen delays occur; thereby, invoking the need for a nesting relocation program.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Tybee Island is a 3.5 mile long barrier island (Figure 1), located seventeen miles east of Savannah at the mouth of the Savannah River on the Atlantic Ocean (USACE 2008). Most of the land above high tide is occupied by the City of Tybee (City). The island is bordered on the north by the South Channel of the Savannah River, on the east by the Atlantic Ocean, and on the south and west by the Back River and other tidal creeks. Tybee Island has an average width of 0.5 miles and the ground elevation varies from 10 to 18 feet above mean low water (MLW) and slopes westward to a vast tidal marsh system. Groins have been constructed at the north and south ends of the island. A series of groins has been constructed at the southernmost tip of the island.

The USACE's Project Area and proposed fill limits for this renourishment project are shown in red on Figure 2. This encompasses most of the front beach and a small area on the Back River. Figure 3 depicts the authorized project are for Tybee Island (USACE 2008) that includes nourishment of 13,200 linear feet of beach between two terminal groins (referred to as Oceanfront Beach); construction of a groin field along 1,100 linear feet of shoreline from the southern terminal groin around the South Tip to the mouth of Tybee Creek (also known as Back River) including periodic nourishment (referred to as South Tip Beach); and construction of a groin field and nourishment of 1,800 linear feet of the eastern bank of Tybee Creek. The remaining shoreline in this area, although included in the authorizing language of WRDA 1996, is relatively stable at this time and no hurricane and storm damage protection measures have been constructed in this reach.

As proposed, the project will be constructed using a hydraulic cutterhead pipeline dredge. A submerged pipeline will extend from the borrow site to the southerly tip of Tybee Island. Shore pipe will be progressively added to two parallel pipes to pump sand along the shorefront or creekfront areas to be renourished. Pipe will be added as the renourishment progresses from the south end of the island to the north end of the island. The contractor will not impinge beach dunes during construction, as work will be conducted from the existing beach and newly placed material. Temporary toe dikes will be utilized in a shore parallel direction to control the hydraulic effluent and reduce turbidity. The sand will be placed in the form of varying design templates based upon alongshore volumetric fill requirements which reflect beach conditions at the time of construction. The proposed project is planned to commence by November 2008 and be completed by May 2009. However, construction delays may cause the project to be completed during the sea turtle nesting season.

The USACE will attempt to schedule the majority of the work between October 31 and March 1 to avoid overlap with sea turtle nesting season. GADNR has given the USACE permission to start the project on October 1, 2008. If the USACE constructs the project outside the turtle nesting season, a turtle nest monitoring program would be conducted and appropriate nest relocation procedures will be followed. Construction equipment and materials will be staged and stored in a manner that will minimize impacts to sea turtles and piping plovers to the maximum extent practicable. Also, existing beach access points will be used for vehicle and equipment beach access to the maximum extent practicable, and existing vegetated habitat at the beach access points will be protected to the maximum extent practicable. The access will be delineated by fence or other suitable material to ensure vehicles and equipment transport stay within the access corridor.

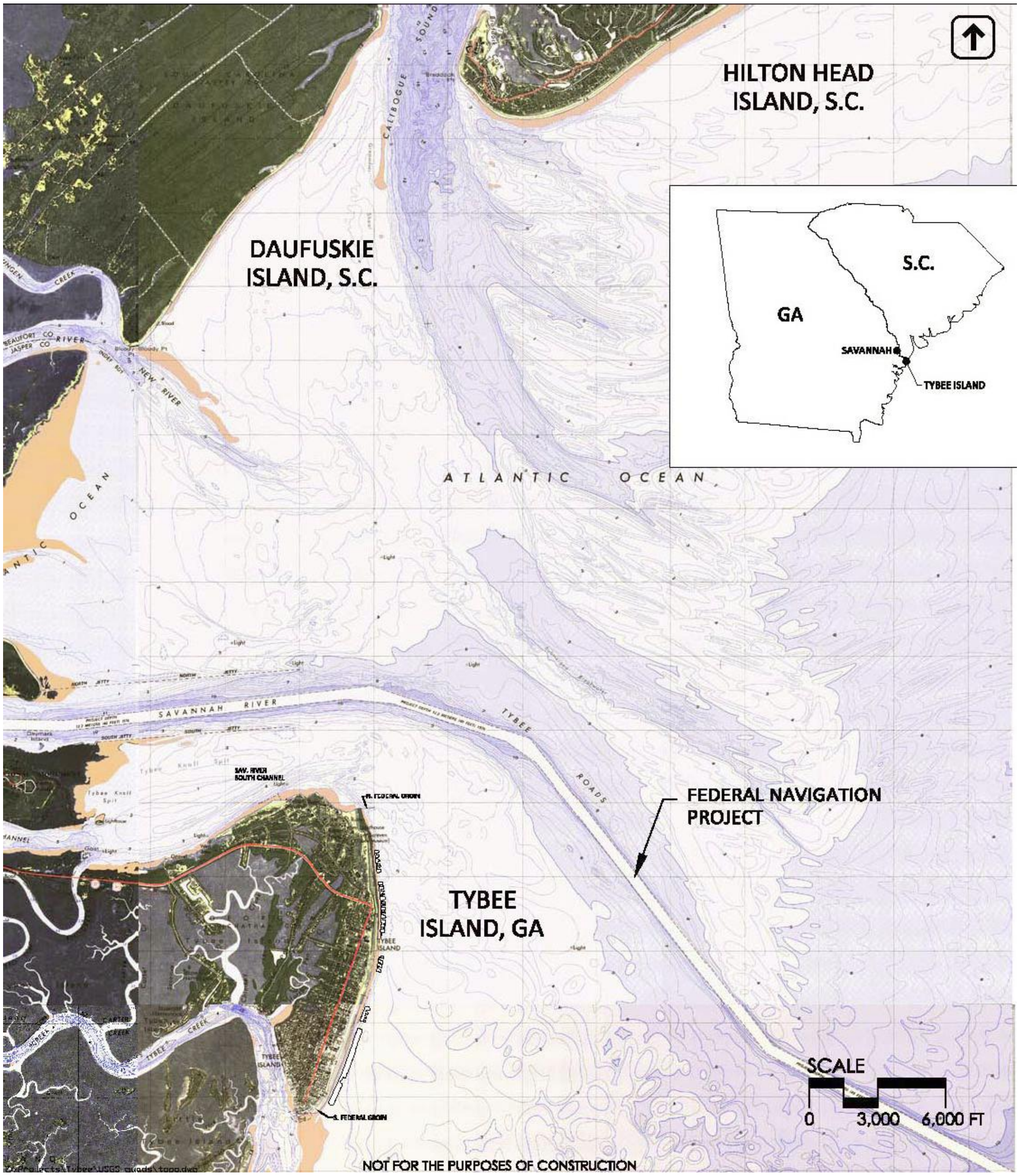
The dredged material grain sizes are expected to match existing beach sand sufficiently to avoid major compaction problems. Any escarpments in excess of 18 inches extending for more than 10 feet and exceeding 500 cone penetrometer index units (cpu) would be mechanically leveled to the natural beach contour for two consecutive turtle nesting seasons following renourishment. Only areas of compaction greater than 500 cpu and greater than 18 inches high by 100 feet long need to be mechanically leveled.

The USACE will seek coordination with GADNR and the Service for any activities that may affect sea turtle nesting. Minimization of adverse impacts will include tilling after construction, and monitoring beach profiles and compaction levels for at least 2 years after construction. The renourishment will be tilled to 36 inches and graded immediately after construction as part of the contract. All exposed derelict concrete, derelict coastal armoring, and metal debris deemed nonfunctional for erosion control will be removed.

The USACE will perform shorebird monitoring to detect piping plovers or concentrations of other shorebirds once a month for the entire beach and another time during the month on the critical habitat on the north part of the island. This will be done prior to and during the construction activities.

According to the biological assessment (USACE 2008), the project design is based on project performance and erosion rates since the last renourishment project in 2000. Beach fill will primarily be located in areas included in the previous renourishment in 2000. These areas include the Oceanfront North Beach from Gulick Street to Center Street, the Oceanfront South Beach from 12th Street to the South End Terminal (Federal) Groin, and the Back River Beach from Inlet Avenue to southernmost end of Groin G-1 in the South Tip Groin Field. Additional fill will be placed between these areas to provide a more stable beach profile and to avoid some of the excessive losses in the 2nd Street “hot spot” from project end losses and offshore losses that resulted from the side beach constructed at this location during the last renourishment.

Figure 1: Location Map, Tybee Island, GA. (Source: Olsen Associates Inc. 2008).



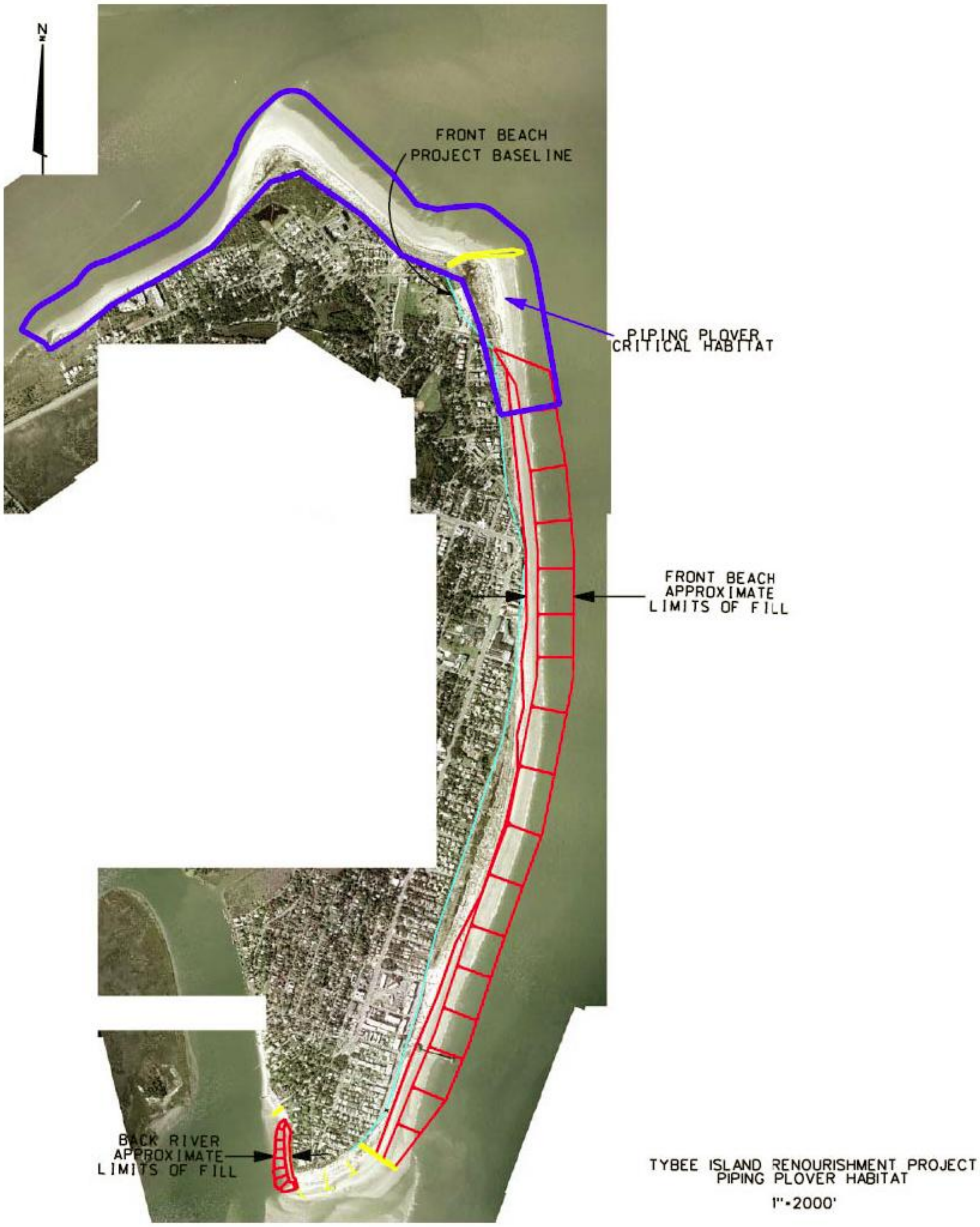


Figure 2: Proposed fill limits for 2008-2009 Tybee Island Beach Renourishment (in red) including delineation of Piping Plover Critical Habitat (in blue). Groins are shown in yellow (USACE 2008).

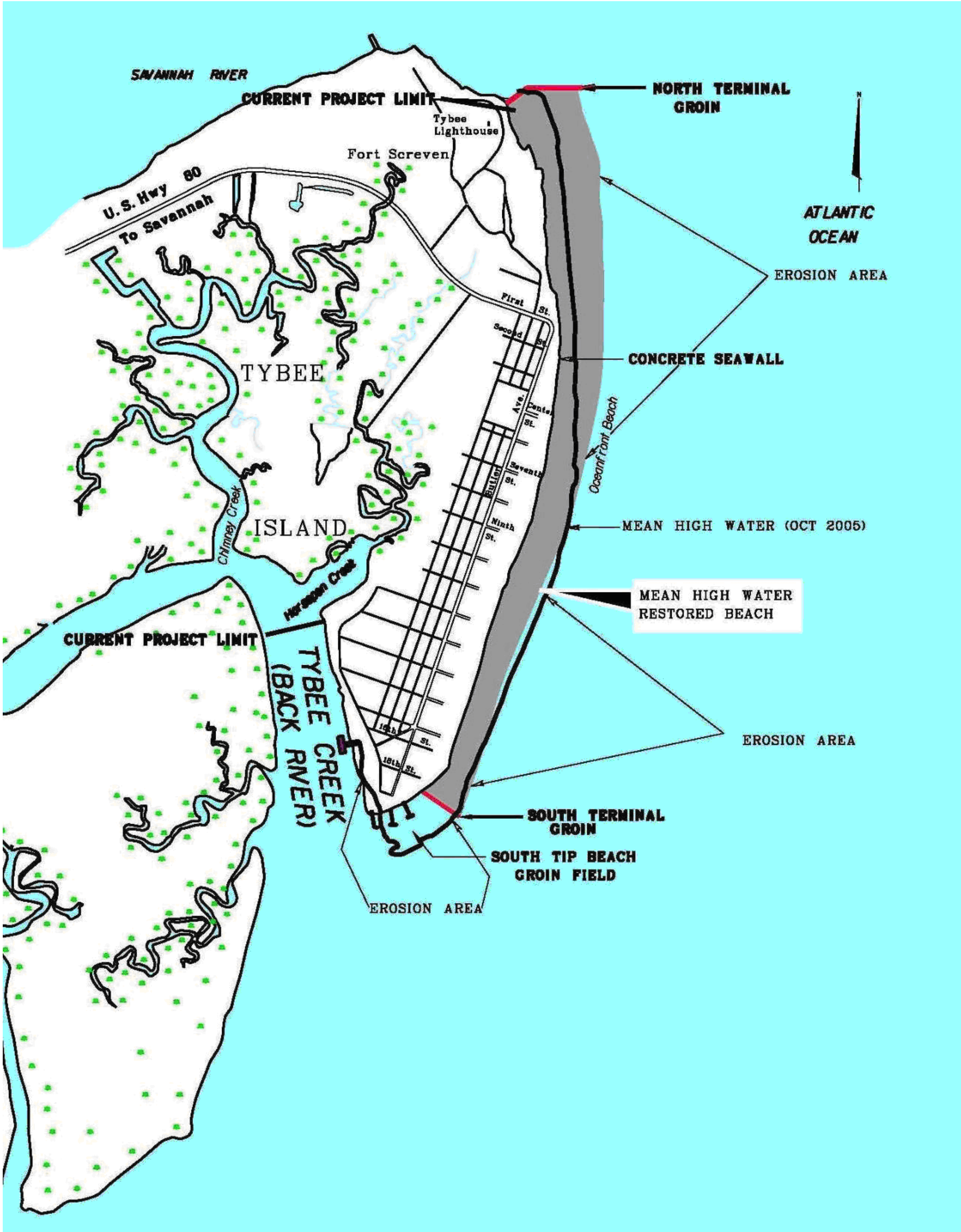


Figure 3. Project Area showing erosion areas and mean high water post project restored beach.

Based on the natural angle of repose on the existing beach, and experience with previous placement, a beach slope of 1 vertical on 25 horizontal will be required both above and below mean lower low water (MLLW) on the Front Beach. The Back River will have an 11-foot elevation MLLW and a 1V:15H slope. Proposed staging areas for equipment include Inlet Avenue, 19th Street, and North Beach Parking Lot. These are the same areas utilized during previous Tybee Island beach construction activities.

Beach fill final placement and volume of sand will be based on funds available at the time of construction. Alternative bid schedules will be used to optimize the quantity of beach fill placed for the funds available. The maximum total dredge volume would be 1,800,450 cubic yards.

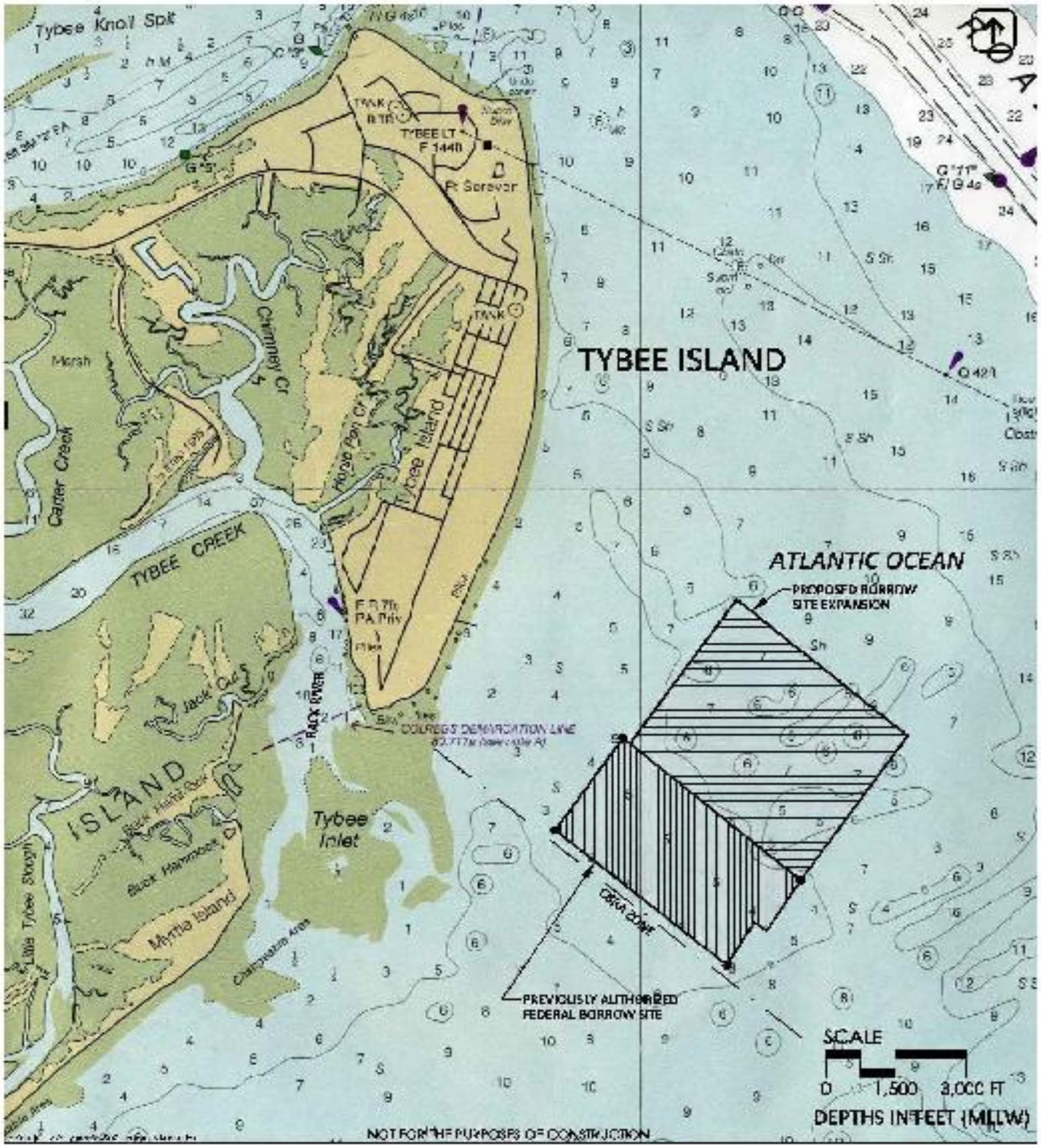
The proposed sand source for this renourishment is an expansion of the previously used Borrow Area #4. This borrow area was used by Georgia Ports Authority (GPA) for the 1994 beach nourishment. Borrow Area #4 is approximately 5,000 feet southeast of the southern tip of Tybee Island. The expanded borrow area, (Figure 4), is located approximately 7,000 feet (1.3 miles) southeast of the southernmost Federal terminal groin. All offshore dredging activities associated with this beach renourishment project will continue to be setback from CBRA Little Tybee Island Unit No. 1 to avoid impacting this protected area. This area is shown as occurring on the opposite side of the dashed line near the bottom of Figure 4.

The renourishment project is expected to last at least six months and will be performed 24 hours per day and 7 days per week.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service determines that the action area is that area of the project between the North Terminal Groin and the South Terminal Groin as shown on Figure 3.

Figure 4: Proposed borrow site expansion for the Tybee Island Shore Protection Project. Source: Olsen Associates Inc. 2008.



SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service has responsibility for implementing recovery of sea turtles when they come ashore to nest. This biological opinion addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. The National Oceanic and Atmospheric Administration Fisheries (Fisheries) has jurisdiction over sea turtles in the marine environment.

Two species of sea turtles are analyzed in this biological opinion: The threatened loggerhead sea turtles (*Caretta caretta*) (loggerhead) and the endangered leatherback sea turtles (*Dermochelys coriacea*) (leatherback).

Loggerhead Sea Turtle

The loggerhead, listed as a threatened species on July 28, 1978 (43 FR 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. The loggerhead nests within the continental United States (U. S.) from Louisiana to Virginia. Major nesting concentrations in the U. S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984).

The loggerhead grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NOAA Fisheries 2002a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals (NOAA Fisheries and Service 1991).

Major loggerhead nesting beaches are located in the Sultanate of Oman, southeastern U. S., and eastern Australia. The species is widely distributed within its range. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Nesting occurs mainly on open beaches or along narrow bays having suitable sand and often in association with other species of sea turtles (NOAA Fisheries and Service 1991).

No critical habitat has been designated for the loggerhead.

Leatherback Sea Turtle

The leatherback, listed as an endangered species on June 2, 1970, (35 FR 8491), nests on shores of the Atlantic, Pacific, and Indian Oceans. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world’s largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (NOAA Fisheries and Service 1992; National Research Council 1990a).

The leatherback regularly nests in the U. S. in Puerto Rico, the U. S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NOAA Fisheries and Service 1992). Leatherbacks have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (North Carolina Wildlife Resources Commission, South Carolina Department of Natural Resources, and GADNR statewide nesting databases). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990; FWC statewide nesting database) and in southwest Florida a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

This is the largest, deepest diving, and most migratory and wide ranging of all sea turtle species. The adult leatherback can reach 4 to 8 feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NOAA Fisheries 2002b). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed (NOAA Fisheries and Service 1992).

Leatherbacks nest on shores of the Atlantic, Pacific, and Indian Oceans. Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas (NOAA Fisheries and Service 1992).

Marine and terrestrial critical habitat for the leatherback has been designated at Sandy Point on the western end of the island of St. Croix, U. S. Virgin Islands (50 CFR 17.95).

Life History (Growth, Life Span, Survivorship, and Mortality)

Loggerhead Sea Turtle

The basic life cycle of the loggerhead turtle in the western North Atlantic consists of seven life stages (Figure 5) that are based on the size of the sea turtles at different ages (Bolten 2003; Crouse *et al.* 1987).

Loggerheads are known to nest from one to seven times within a nesting season (Talbert *et al*. 1980; Richardson and Richardson 1982; Lenarz *et al*. 1981, among others); the mean is approximately 4.1 (Murphy and Hopkins 1984). The interval between nesting events within a season varies around a mean of about fourteen days (Dodd 1988). Mean clutch size varies from about 100 to 126 eggs along the southeastern U. S. coast (NOAA Fisheries and Service 1991). Nesting migration intervals of two to three years are most common in loggerheads, but the number can vary from one to seven years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

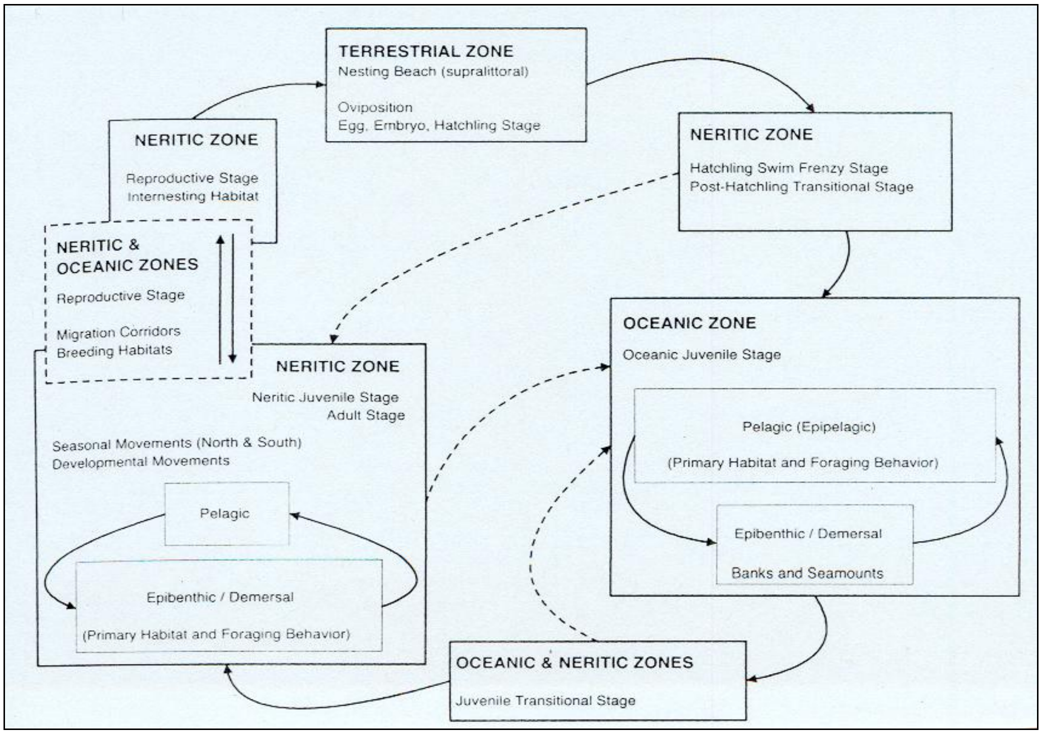


Figure 5. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems and dotted lines are speculative (Bolten 2003).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of eleven (NOAA Fisheries and Service 1992). The interval between nesting events within a season is about nine to ten days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U. S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to ten years (Zug and Parham 1996).

Population Dynamics

Loggerhead Sea Turtle

Total estimated nesting in the southeast United States is approximately 50,000 to 90,000 nests per year (FWC statewide nesting database 2004; GADNR statewide nesting database 2004; South Carolina Department of Natural Resources statewide nesting database 2004; North Carolina Wildlife Resources Commission statewide nesting database 2004). In 1998, 85,988 nests were documented in Florida alone. However, nest numbers dropped in 2001 and 2002 to below 70,000, in 2003 below 60,000, in 2004 below 70,000, and in 2005 below 50,000 nests. An analysis of nesting data from the Florida Index Nesting Beach Survey (INBS) Program from 1989 to 2005 has shown a decrease of 22.3 percent in the annual nest density. For the period from 1998 to 2005, a greater decline is observed (39.5 percent). The INBS data represent an average of 65 percent of all annual nesting by loggerhead in the State of Florida. Further, this statistically significant negative trend in loggerhead nest numbers was seen throughout the State of Florida, not just in the INBS area (McRae 2006).

From a global perspective, the southeastern United States nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982; Ehrhart 1989; NOAA Fisheries and Service 1991). The status of the Oman loggerhead nesting population (Ross 1979) is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interactions on foraging grounds and migration routes (Earl Possardt, USFWS, personal communication, 2005). The loggerhead nesting aggregations in Oman, the southeastern U. S., and Australia have been estimated to account for about 88 percent of nesting worldwide (NOAA Fisheries and Service 1991). About 80 percent of loggerhead nesting in the southeastern U. S. occurs in six Florida counties (Brevard, Indian River, Saint Lucie, Martin, Palm Beach, and Broward counties) (NOAA Fisheries and Service 1991).

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 nesting females annually. The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting/year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting/year) (Spotila *et al*. 1996). In the United States, small nesting populations occur on the Florida east coast (100 females per year) (Florida Wildlife Commission 2003), Sandy Point, U. S. Virgin Islands (50 to 190 females per year) (Alexander *et al*. 2002), and Puerto Rico (30 to 90 females per year).

Nesting Status and Distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations/nesting aggregations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29^{o} N.); (2) South Florida Subpopulation occurring from about 29^{o} N. on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida, Subpopulation, (4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and (5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994; 1995; Bowen *et al*. 1993; Encalada *et al*. 1998; Pearce 2001). These data indicate that gene flow between these five regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation.

The Northern Subpopulation has declined substantially since the early 1970s. Recent estimates of loggerhead nesting trends from standardized daily beach surveys showed significant declines ranging from 1.5 percent to 2.0 percent annually (Mark Dodd, GADNR, personal communication, 2005).

An analysis of nesting data from the Florida INBS Program from 1989 to 2002 (a period encompassing index surveys that are more consistent and more accurate than surveys in previous years), has shown no detectable trend and, more recently (1998 through 2002), has shown evidence of a declining trend (Blair Witherington, FWC, personal communication, 2003). Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

A near census of the Florida Panhandle Subpopulation undertaken from 1989 to 2002 reveals a mean of 1,028 nests per year, which equates to about 251 females nesting per year (FWC 2003). However, preliminary analysis for nine years (1997 to 2006) of INBS data for the Florida Panhandle subpopulation shows a declining trend (Blair Witherington, FWC, personal communication, 2007).

A near census of the Dry Tortugas Subpopulation undertaken from 1995 to 2001 reveals a mean of 213 nests per year, which equates to about 50 females nesting per year (FWC 2003). The trend data for the Dry Tortugas Subpopulation are from beaches that were not included in Florida's INBS program prior to 2004 but have moderately good monitoring consistency. There are seven continuous years (1995 to 2001) of data for this Subpopulation, but the time series is too short to detect a trend (Blair Witherington, FWC, personal communication, 2007).

Nesting surveys in the Yucatán Subpopulation have been too irregular to date to allow for a meaningful trend analysis (Turtle Expert Working Group 1998, 2000).

Recovery Criteria for the United States

The southeastern U. S. loggerhead population can be considered for delisting where, over a period of 25 years, the following conditions are met (NOAA Fisheries and Service 1991):

1. The adult female population in Florida is increasing and in North Carolina, South Carolina, and Georgia, it has returned to pre-listing levels (NC - 800, SC - 10,000, and GA - 2,000 nests per season). The above conditions must be met with the data from standardized surveys that would continue for at least five years after delisting.
2. At least 25 percent (348 miles) of all available nesting beaches (1,400 miles) are in public ownership, distributed over the entire nesting range and encompassing at least 50 percent of the nesting activity in each state.
3. All priority one tasks identified in the recovery plan have been successfully implemented.

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al*. (1996) estimated the number of leatherbacks nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al*. (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

Recovery Criteria for the United States

The U. S. population of leatherbacks can be considered for delisting when the following conditions are met (NOAA Fisheries and Service 1992):

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U. S. Virgin Island, and along the east coast of Florida.
2. Nesting habitat encompassing at least 75 percent of nesting activity in United States Virgin Islands, Puerto Rico, and Florida is in public ownership.
3. All priority one tasks identified in the recovery plan have been successfully implemented.
4. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto.

Common Threats to Sea Turtles

This is a summary of the past and ongoing human and natural factors leading to the current status of the species, their habitat, and ecosystem. It does not include the effects of the proposed project under review.

<u>Loggerhead Sea Turtle</u>

Anthropogenic (human) factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment, beach driving, coastal construction and fishing piers, exotic dune and beach vegetation, and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (*e.g.*, raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Loggerheads are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration and transportation, marine pollution, underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, poaching and fishery interactions. In the oceanic environment, loggerheads are exposed to a series of longline fisheries that include the U. S. Atlantic tuna and swordfish longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various fleets in the Mediterranean Sea (Aguilar *et al.* 1995; Bolten *et al.* 1994; Crouse 1999).

There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels. In the neritic environment in waters off the coastal United States, loggerheads are exposed to a suite of fisheries in Federal and State waters including trawl, purse seine, hook and line, gillnet, pound net, longline, dredge, and trap fisheries.

Leatherback Sea Turtle

The crash of the Pacific leatherback 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. Other factors threatening leatherbacks globally 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, degradation of foraging habitat, marine pollution and debris, and watercraft strikes (Spotlila *et al*. 1996).

All Sea Turtles

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in the Southeast. Beachfront development not only causes the loss of suitable nesting habitat but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach berm construction, and beach nourishment which cause changes in, additional loss or impact to the remaining sea turtle habitat.

Armoring

Responding to erosion depends on whether the erosion is continual, temporary, or permanent. In areas where erosion is continual or permanent, some artificial action to offset the erosion is usually needed where infrastructure or structures are at risk. However, activities that stop or minimize the erosion is a better long term solution for the coastal environment than coastal armoring. Such activities could include modifying navigation channel operation and maintenance, inlet sand bypassing, relocating structures, and conducting beach and dune restoration. Where erosion is temporary and the coastline is expected to recover, it is prudent to use temporary solutions that would not cause additional harm or exacerbate the existing situation on the coastline. This would allow recovery of the coastline and planning of appropriate actions to address the situation.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and disorientation of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976; Mann 1977; FWC 2007). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2006 sea turtle nesting season in Florida, over 71,000 turtle hatchlings were disoriented. Exterior lighting associated with condominiums had the greatest impact causing disorientation/misorientation of 35 percent. Other causes included sky glow and street lights (http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm).

Beach nourishment projects create a wider and higher beach. The newly created beach berm also exposes sea turtles and their nests to lights that were less visible, or not at all visible, from nesting areas before the beach nourishment. Review of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm (FWC 2007).

Predation

Depredation by a variety of predators can considerably decrease sea turtle nest hatching success. Depredation and harassment or both of nesting turtles, eggs, nests, and hatchlings by native and non-native species, such as raccoon, feral hog, cats, birds, and ghost crab, have been documented on the Atlantic and Gulf coasts of Florida (Daniel *et al*. 2002; Northwest Florida Partnership 2002; NOAA Fisheries and Service 1991). As nesting habitat dwindles, it is essential that nest production be naturally maximized so the turtles may continue to exist in the wild.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by: interrupting a female turtle approaching the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfere with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut, but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier et al. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success, and directly killing pre-emergent hatchlings (Mann 1977; Nelson and Dickerson 1987; Nelson 1988).

Godfrey *et al*. (1978) showed that the physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward, lowering the trail. Since the vehicles also inhibit plant growth and open the area to wind erosion, dunes may become unstable and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause accelerated rate of overwash and beach erosion. If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly re-establish provided the mechanical impact is removed.

Sea Turtle Strandings

The NOAA Fisheries addresses the Sea Turtle Stranding and Salvage Network (STSSN).

ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Table 1 is a chronology of the recent beach nourishments and erosion control efforts along Tybee Island beach.

Status of the species within the action area

Figure 6 shows the areas on Tybee Island beach where sea turtles have nested or attempted to nest between 1999 and 2007. Figure 7 shows the average loggerhead nesting, by barrier island, on the Georgia coast between 1989 and 2007. As discussed on page 14, the Northern Subpopulation of the loggerhead has declined substantially since the early 1970s.

Loggerhead Sea Turtle

The loggerhead nesting and hatching season for Tybee Island extends from May 1 through October 31. Incubation ranges from about 45 to 95 days. Tybee Island has an average of 6.2 sea turtle nests per year and has had as high as 14 nests in a year.

Leatherback Sea Turtle

Georgia has had ten documented leatherback nests from 1999 - 2007. Tybee Island had one nest in 2004. The nest was deposited on May 11, 2004, and hatched on July 13, 2004, in the action area. Sea turtle nesting on Tybee Island is much lower than the numbers of nests on islands that are larger or in government ownership. The islands owned by the Federal or State government are usually protected from heavy human development, alteration, and disturbance. However, considering the steady decline of the Northern Subpopulation of loggerheads, providing good nesting habitat is important on all the barrier islands along the coast. Although Tybee Island only has 2.6 miles of front beach, it has heavier use by sea turtles than most of the other developed islands or smaller islands on Georgia's coast. The numbers of sea turtle nests on the Tybee Island beach each year fluctuates, as it does on all beaches. The numbers of loggerhead nests range from a low of 0 in 1993 (before beach nourishment) to a high of 14 in 1996 (two years after beach nourishment).

Table 1. Chronology of Recent Beach Renourishment and Erosion Control Efforts
Tybee Island, Georgia (USACE 2008)

YEAR	ACTION
1975	800 foot North End Terminal Groin constructed – 10.5 tons of armor was used and 2,700 pounds of under layer stone was used.
1975-1976	Initial nourishment. – Borrow Area #3 was utilized. 2,262,100 $yard^3$ of sand placed on the beach between North End Terminal Groin and 18th Street (13,200 feet long)
1986-1987	600 foot South End Terminal Groin constructed between 18th and 19th Street Rehabilitation of North End Terminal Groin. First renourishment -1,200,000 $yard^3$ of sand placed from between the groins. 157,000 $yard^3$ of sand placed on 1,400 foot of shoreline south of South End Groin. Borrow Area #3 was utilized for all of this work.
1993	An estimated 918,000 $yard^3$ of beach material was placed on beach by USACE and Georgia Ports Authority (GPA) from Savannah Harbor deepening The source of sand was the navigation channel.
1994	South Tip Groin Field constructed by GPA with State funds.
1995	285,000 $yard^3$ of material placed between South End Groin and 13th Street by GPA 50,000 $yard^3$ of sand placed within South Tip Groin Field by GPA. Borrow Area #4, cell A was the source of sand.
2000	Back River Groin Field constructed, and initial nourishment of Back River and renourishment of South Tip and renourishment of oceanfront. Borrow Area #4 was utilized. Back River Groin renourishment quantities are: Armor Stone 4,631 tons, Underlay Stone 619 tons, & Bedding Material 1,847 tons Back River/Tybee Creek Beach 86,319 $yard^3$ Second Street Beach 1,267,738 $yard^3$ South Beach 118,654 $yard^3$ Back River/Tybee Creek/North of Seawall 7,859 $yard^3$
2001 - 2004	Monitoring North end groin/start of renourishment area 26,660 $yard^3$ accretion Second Street renourishment area 369,858 $yard^3$ erosion Middle Beach 25,954 $yard^3$ erosion South Beach (Tybrisa) renourishment area 92,620 $yard^3$ erosion South Tip Beach 33,685 $yard^3$ accretion Back River/Tybee Creek at seawall 24,428 $yard^3$ erosion Back River/Tybee Creek north of seawall 27,913 $yard^3$ accretion Average annual 142,084 $yard^3$ erosion

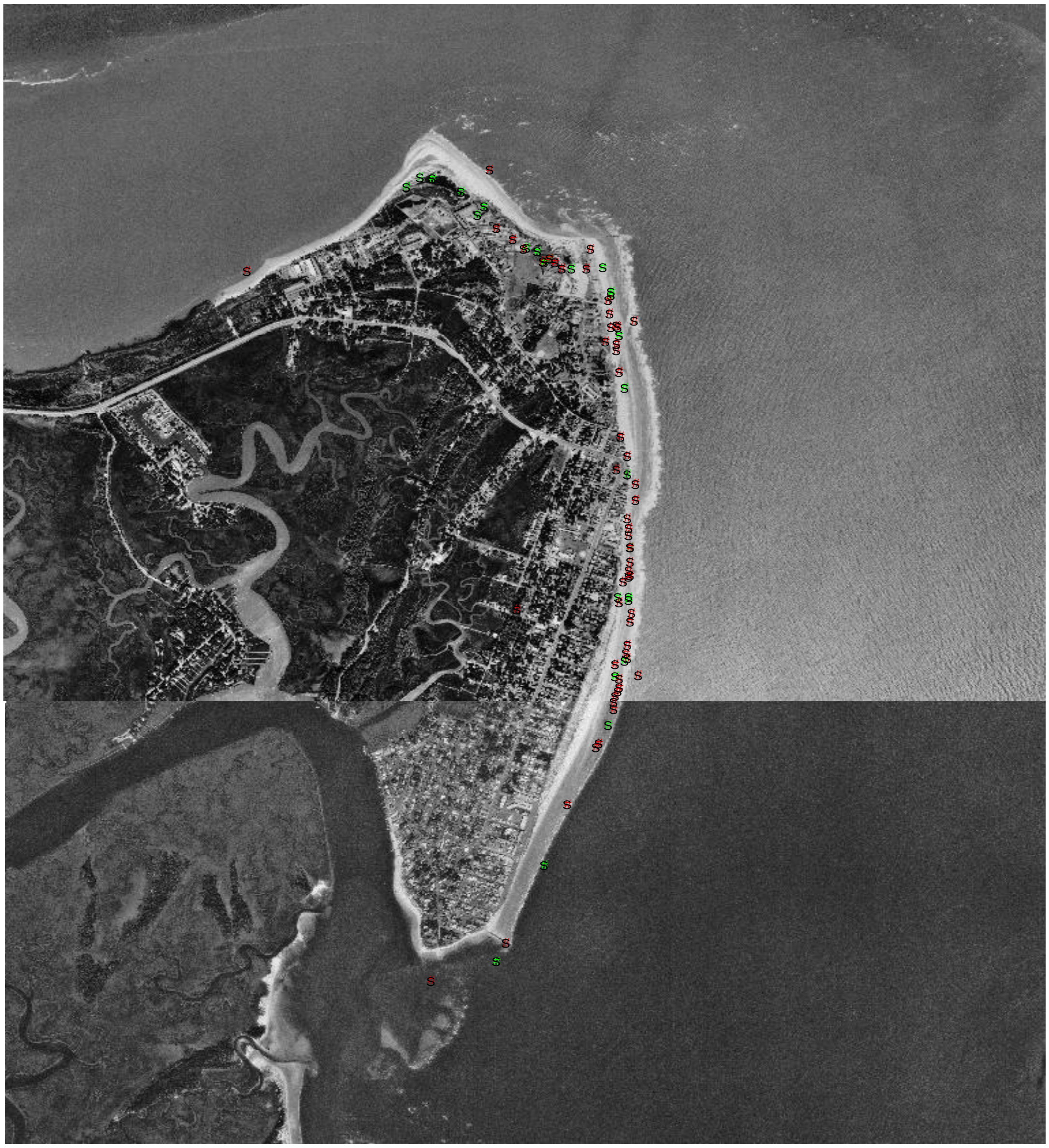


Figure 6. Loggerhead nesting on Tybee Island, Georgia 1999-2007. Red dots are nests and green dots are non-nesting emergences. The data set includes one leatherback nest in 2004. (Courtesy of GADNR, Nongame Conservation Section).

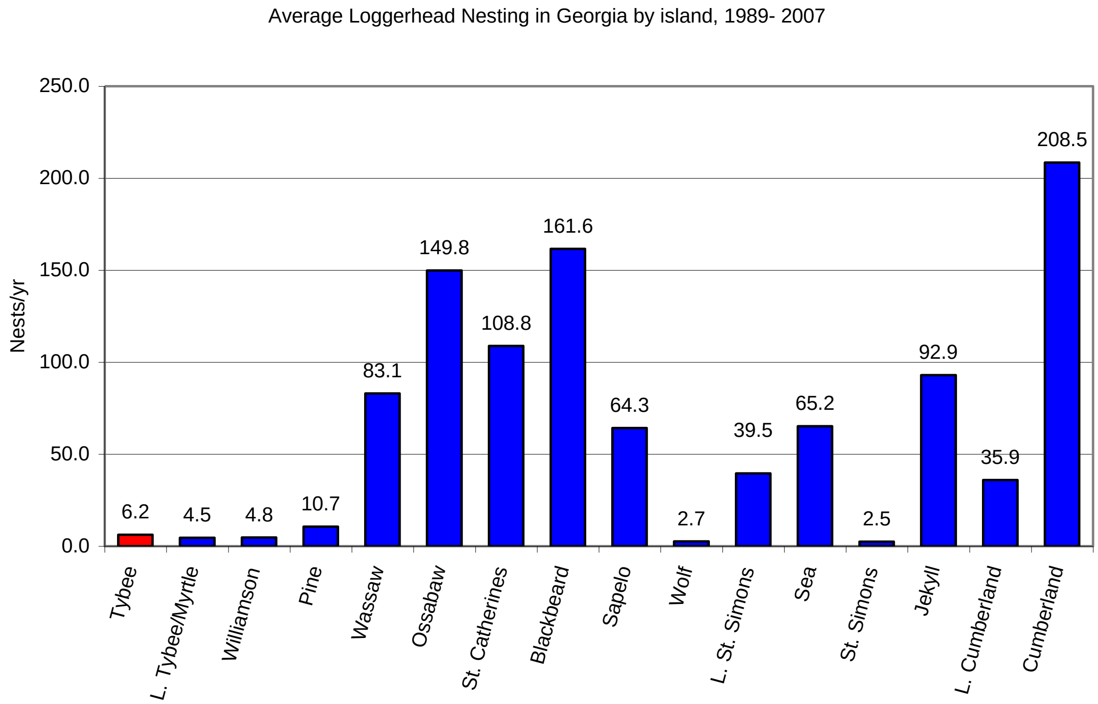


Figure 7. Average loggerhead sea turtle nesting in Georgia by island, 1989 - 2007 (Courtesy of GADNR, Nongame Conservation Section)

Factors affecting species environment within the action area

A number of ongoing anthropogenic and natural factors may affect loggerheads or leatherbacks. Many of these effects have not been evaluated with respect to biological impacts on the species. In addition, some are interrelated and the effects of one cannot be separated from others. These impacts apply to Tybee Island. Specifically, suspected factors affecting the sea turtles within the action area are discussed below.

<u>Artificial Beachfront Lighting</u>

In 1991, the City passed a sea turtle habitat protection ordinance under Title 8 – Planning and Development, Article F - Protection of the Nesting Habitat of Sea Turtles. The ordinance addresses new and existing development and publicly-owned lighting. Although there is an ordinance in place, artificial lighting continues to be an issue for sea turtles on Tybee Island, thereby implying that the ordinance is not being enforced. A lighting survey done by GADNR and Tybee Island in 2004 (Appendix 2) shows violations of the ordinance. The GADNR database shows that 16% to 100% of nests from 2002 - 2006 had disoriented sea turtle hatchlings (Mark Dodd, GADNR, personal communication, 2005)

<u>Armoring</u>

Coastal armoring in Georgia is allowed by the GADNR in efforts to protect public infrastructure and private upland structures because of exposure to high frequency storm events and extreme or critical erosion of the coastal shoreline. This erosion can be a result of normal erosional forces, upstream perturbations (inlets, navigation channels, groins, etc.), disasters, or weather events. From our site visit on May 19, 2008, it was apparent there have been several attempts by the City of Tybee to hold sand on the southern part of the front beach with various structures either made of metal or concrete. Some of these structures are still functioning. However, some of the structures do not appear to be holding sand and are instead, an impediment to female sea turtles attempting to crawl onto the upper beach to successfully nest.

Coastal Development

Service reviews of permits for development and redevelopment indicate that the City continues to grow in human population and has been experiencing a surge in development and redevelopment since the 1990's, as has the rest of the Georgia coast. This brings more human activity, construction, and disturbance to the beaches.

Beach Nourishment

Renourishment previously occurred along portions of the action area in 1993, 1994 and 1998. The natural process of dune formation has been adversely affected and washover habitats have been eliminated by human developments and hardscape. Although we have no formal reports of project effects, it appears the adverse effects of earlier nourishment were temporary as subsequent tilling of the new beach offset sand compaction concerns. Loggerhead turtle nesting in 1996, 2 years after beach nourishment was a high of 14 nests.

EFFECTS OF THE ACTION

The proposed project will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term impacts from the dredging could include a change in the nest incubation environment from the restoration/nourishment material. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the active nesting or hatching period, changes in the physical characteristics of the beach from the placement of the beach restoration/nourishment material and changes in the nest incubation environment from the material.

Factors to be considered

Proximity of action: The beach restoration activities would occur directly on nesting habitat for sea turtles. Specifically, the project would potentially impact nesting and hatchling loggerheads and leatherbacks.

Distribution: The beach restoration activities that may impact nesting and hatchling sea turtles would occur in Chatham County along 2.6 miles of Atlantic coastline between the north and south Federal groins and an additional 0.36 miles of shoreline on the southwest end of Tybee Island where the locally-constructed groin field is located.

Timing: The sea turtle nesting season for Tybee Island is considered to extend between May 1 and October 31. The timing of the beach restoration activities could directly and indirectly impact nesting and hatchling sea turtles when conducted between these times.

Nature of the effect: The effects of the beach restoration activities may change the nesting behavior of adult female sea turtles or diminish the nesting success, change the behavior of hatchling sea turtles, and result in nests or hatching events being missed during the daily survey of the subject action area. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the western North Atlantic subpopulation of loggerheads. NOAA Fisheries, who has the lead for sea turtles, is currently responding to a petition to reclassify loggerheads in this subpopulation as a Distinct Population Segment with endangered status under the Act.

Duration: The beach renourishment project on Tybee Island is a one-time activity and will take approximately six months to complete. However, USACE is authorized to renourish Tybee Island beach approximately every seven years. The maximum amount of beach that will be renourished is shown in Figure 2. Tentative plans are to begin the project on October 1, 2008. Completion is tentatively scheduled by April 30, 2009. However, any delays experienced by the contractor could push the completion of the project into the sea turtle nesting season. The direct effects from the beach renourishment for the 2009 sea turtle nesting season would be expected to be short-term in duration. Indirect effects from changes in the beach sand and compaction may continue to impact nesting and hatchling sea turtles in subsequent nesting seasons.

Disturbance intensity and severity: For loggerheads, extirpation of the Tybee Island nesting population may be able to be replenished by regional dispersal from other barrier islands. Currently, only one leatherback nest has been documented on Tybee Island.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally-occurring beach sediments in the area, and because compaction and escarpment remediation measures are incorporated into the project. Core samples from the proposed borrow area prompted a USACE determination that the sand is appropriate for Tybee Island beach. A nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces, thereby benefiting sea turtles. The USACE cannot guarantee color shape and grain size to mimic a natural beach system.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach may not provide suitable nesting habitat for sea turtles. Although beach nourishment may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not implemented during project construction. Nourishment during the nesting season can cause increased loss of eggs and hatchlings beyond such typical losses, as predation or flooding. Renourishment could disrupt adult nesting activity and bury or crush nests or hatchlings. A nest monitoring and egg relocation program would reduce these impacts, but nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed the next morning at daylight. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

1. *Nest relocation*
Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within

twelve hours of deposition (Limpus *et al*. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al*. 1979; Ackerman 1980; Parmenter 1980; Spotila *et al*., 1983; McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al*. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al*. 1985), hatchling size (Packard *et al*. 1981; McGehee 1990), energy reserves in the yolk at hatching (Packard *et al*. 1988), and locomotory ability of hatchlings (Miller *et al*. 1987).

In a 1994 Florida study comparing loggerhead hatching and emergence success of relocated nests with *in situ* nests, Moody (1998) found that hatching success was lower in relocated nests at 9 of 12 beaches evaluated. In addition, emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994.

2. *Equipment*

The construction pipelines and heavy machinery located between the ocean and the turtle nesting area may have adverse effects on sea turtles. These materials can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

3. *Artificial lighting*

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976; Mann 1977; FWC sea turtle disorientation database). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low-pressure sodium lighting during project construction (Witherington 1999).

Beach nourishment projects create a wider and higher beach which can expose sea turtles and their nests to lights that were less visible, or not at all visible, from nesting areas before the beach nourishment. Review of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm (FWC 2007). Following a beach nourishment project in Brevard County, Florida, completed in 2002, an increase of 130 percent in disorientations was documented in the nourished area. Disorientations on beaches in the county that were not nourished remained constant (FWC 2007). This same result was also documented in 2003 when another beach in the County was nourished and the disorientations increased by 480 percent (FWC 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on a nourished beach. Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting and enforcing appropriate regulations.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Many of the direct effects of beach nourishment may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, and sand migration.

1. *Increased susceptibility to catastrophic events*
If project delays cause the project to last into sea turtle nesting season, nest relocation may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998; Wyneken *et al*. 1998).

2. *Increased beachfront development*
Pilkey and Dixon (1996) state that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also notes that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger ones that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development, which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as raccoons, than undeveloped areas (National Research Council 1990a) and can also result in greater adverse effects due to artificial lighting.

From our site visit on May 19, 2008, it is obvious that Tybee Island is experiencing a surge of growth and redevelopment. In our review of the State's Shore Protection Act permits, we see structures are going in are larger, taller, and more densely-spaced than those that were previously near the beach. Lighting, disturbance, and mammalian predation will increase and compromise sea turtle habitat. For example, a May 30, 2008, GADNR Shore Protection Act permit calls for a beachfront lot to be divided in two. One of the lots will be 12,260 square feet, of which approximately 9,827 square feet is within the State's jurisdiction (in the dune area). The new residence will be 10 feet seaward of the toe of the most landward dune on the western side of the property and 35 feet seaward of the toe of the most landward dune on the eastern side of the property. Approximately 905 square feet of the proposed residence will encroach into the dunes.

It is unusual for GADNR permits to be denied. This trend is expected to continue and may increase with the addition of more sand on the beaches.

3. *Changes in the physical environment*
Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987; Nelson 1988).

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

These impacts can be minimized by using suitable sand and by tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled, nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, thus altering natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

4. *Escarpment formation*
On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984; Nelson *et al*., 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (*e.g*., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Species' response to the proposed action

The following summary (Ernest and Martin 1999; Crain *et al.* 1995; Trindell *et al*. 2000) illustrates sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or pre-nourished beaches. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (*e.g.*, beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural and background conditions. However, tilling is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to background levels.

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. As the width of nourished beaches decreased during the second year, nest placement diminishes. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower, steeply-sloped beaches of a natural beach. This phenomenon may persist through the second post-construction year monitoring and results from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occurred as the beach equilibrated to a more natural contour (Crain *et al.* 1995).

The principal effect of nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicate that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

PIPING PLOVER

STATUS OF THE SPECIES/CRITICAL HABITAT

The proposed action will affect the piping plover (*Charadrius melodus*) within all ocean-side (e.g., intertidal areas, wrack lines, and the upper sandy beach with sparse or no vegetation) and inland-side (e.g., sand and mud flats) habitat. The action area also includes the southeastern part of the CBRS Unit GA-1 of critical habitat for the piping plover below the northern groin.

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (USFWS 1985).

Population Dynamics

Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide. Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened) (Figure 8). The piping plover winters in coastal areas of the United States from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a degree.

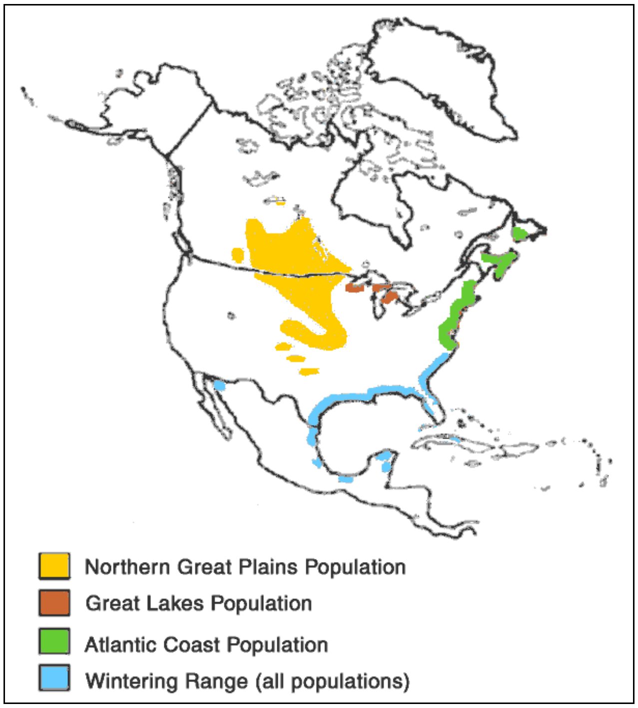


Figure 8. Range and populations of Piping Plovers (USFWS 1996).

Critical Habitat Description

The Service designated critical habitat for the piping plover on three occasions. Two of these designations protected different breeding populations of the piping plover. Critical habitat for the Great Lakes breeding population was designated May 7, 2001, (USFWS 2001), and critical habitat for the northern Great Plains breeding population was designated September 11, 2002, (USFWS 2002). The Service designated critical habitat for wintering piping plovers on July 10, 2001 (USFWS 2001a). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic coast. The three separate designations of piping plover critical habitat demonstrate diversity of constituent elements between the two breeding populations as well as diversity of constituent elements between breeding and wintering populations.

Designated wintering piping plover critical habitat originally included 142 areas [the rule states 137 units; this is in error] encompassing about 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (USFWS 2001a).

The primary constituent elements for piping plover wintering habitat are those biological and physical features that are essential to the conservation of the species. The primary constituent elements are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. These areas typically include coastal areas that support intertidal beaches and flats and associated dune systems and flats above annual high tide (USFWS 2001a). Primary constituent elements of wintering piping plover critical habitat include sand or mud flats or both with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (USFWS 2001a). Important components of the beach/dune ecosystem include surf-cast algae, sparsely-vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as critical habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (USFWS 2001a).

Since the designation of wintering critical habitat, 19 units (TX- 3,4,7-10, 14-19, 22, 23, 27,28, and 31-33) in Texas have been vacated and remanded back to the Service for reconsideration by Court order (Texas General Land Office v. U. S. Department of Interior (Case No. V-06-CV-00032). Four units in North Carolina have been vacated and remanded back to the Service for reconsideration by Court order (Cape Hatteras Access Preservation Alliance v. U. S. Department of Interior (344 F. Supp. 2d 108 (D.D.C. 2004)). The four critical habitat units vacated were NC-1, 2, 4, and 5. On June 12, 2006, and revised on May 15, 2008, the Service proposed to amend and re-designate these four units as critical habitat for wintering piping plover. These actions have not been finalized (USFWS 2006; David Rabon, USFWS, personal communication, 2008). Currently, a total of 119 critical habitat units are designated.

Life History

Breeding/lifespan: Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu *et al*. 1990; Cross 1990; Goldin 1990; MacIvor 1990; Hake 1993). Plovers are known to begin breeding as early as one year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plovers generally fledge only a single brood per season, but may renest several times if previous nests are lost. Piping plovers live an average of five years, although studies have documented birds as old as eleven years (Wilcox 1959).

Natural protection: Cryptic coloration is a primary defense mechanism for this species; nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (pedestrian, avian and mammalian) in their sites usually by squatting, running, and flushing (flying) (USFWS 1996).

Foraging/food: Behavioral observation of piping plovers on the wintering grounds suggests that they spend the majority of their time foraging (Nicholls and Baldassarre 1990; Drake 1999, Drake 1999a). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996). They peck these invertebrates on top or just beneath the surface.

Feeding areas: Important feeding areas include intertidal portions of ocean beaches, washover areas, mudflats, sand flats, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, or salt marshes (Gibbs 1986; Zivojnovich 1987; Nichols 1989; Nicholls and Baldassarre 1990a; Coutu *et al*. 1990; Hoopes et al. 1992; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Zonick 1997). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993). Cohen et al. (2006) documented more abundant prey items and biomass in Sound Island and sound beaches than the ocean beach.

Migration: Plovers depart their breeding grounds for their wintering grounds from July through late August, but southward migration extends through November. Piping plovers use habitats on the Georgia coast from July 15 through May 15. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (USFWS 1996). Some mid-continent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006); use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. Therefore, the source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked.

While piping plover migration patterns and needs remain poorly understood and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle. The possibility of lower survival rates for Atlantic Coast piping plovers breeding at higher latitudes (based on relationships between population trends and productivity) suggest that migration stress may substantially affect survival rates of this species (Hecht 2006). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to one month during their migrations (Noel et al. 2005; Stucker and Cuthbert 2006). In addition, this species exhibits a high degree of both intra- and inter-annual wintering site fidelity (Nicholls and Baldassarre 1990; Drake *et al*. 2001; Noel *et al*. 2005; Stucker and Cuthbert 2006).

Habitat: Wintering piping plovers appear to prefer coastal habitat that include sand flats adjacent to inlets or passes, sandy mud flats along prograding spits (areas where the land rises with respect to the water level), ephemeral pools, and overwash areas as foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2006). Plovers forage on moist substrate features such as intertidal flats, algal flats, and ephemeral pools (USFWS 2001a; Nicholls and Baldassarre 1990; Wilkinson and Spinks 1994). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990). Wintering plovers use the marsh wrack line on the upper beach in Georgia for feeding and for shelter during high winds and storms (Brad Winn, GADNR, personal communication, 2008). Drake (1999a) monitored the movement of 48 piping plovers in south Texas, for one season. She found, using 95 percent of the documented locations, that these birds had a mean home range of 3,117 acres. Drake (1999a) also noted that the mean linear distance moved per individual bird was two miles for the fall through the spring of 1997 - 1998. Observations suggest that this species exhibits a high degree of wintering site fidelity (Drake *et al*. 2001; Stucker and Cuthbert 2006).

Threats

Predation: Predation has been identified as a major factor limiting piping plover reproductive success but the impact predation has on piping plovers while on migration or wintering grounds is unknown. Substantial evidence exists that human activities are affecting types, numbers, and activity patterns of predators, thereby exacerbating natural predation (USFWS 2002). Non-native species such as feral cats are considered significant predators on some sites (Goldin *et al*. 1990; Post 1991). Humans have also indirectly influenced predator populations; for instance, human activities abetted the expansions in the populations and/or range of other species such as gulls (Drury 1973; Erwin 1979). Predatory birds also are relatively common during their fall and spring migration along the Atlantic Ocean coastline, and there is a possibility they may occasionally take piping plovers.

Weather: Piping plover habitats (breeding and non-breeding) are dependent on natural forces although storms and severe cold weather are believed to take their toll on piping plovers. After an intense snowstorm swept the entire North Carolina coast in late December 1989, high mortality of many coastal bird species was noted (Fussell 1990). Piping plover numbers decreased significantly from about 30 to 40 birds down to 15 birds. While no dead piping plovers were found, circumstantial evidence suggests that much of the decrease was mortality (Fussell 1990). Hurricanes may also result in direct mortality or habitat loss, and if piping plover numbers are low enough or if total remaining habitat is very sparse relative to historical levels, population responses may be impaired even through short-term habitat losses. Wilkinson and Spinks (1994) suggest that, in addition to the unusually harsh December 1989 weather, low plover numbers seen in South Carolina in January 1990 (11 birds, compared with more than 50 during the same time period in 1991 to 1993) may have been influenced by effects on habitat and food availability caused by Hurricane Hugo which came ashore there in September 1989. Hurricane Elena struck the Alabama Coast in September 1985 and subsequent surveys noted a reduction of foraging intertidal habitat on Dauphin and Little Dauphin Islands (Johnson and Baldassarre 1988). Birds were observed foraging at Sand Island, a site that was used little prior to the hurricane.

Vehicles: Vehicles significantly degrade piping plover habitat or disrupt normal behavior patterns. Vehicular and/or pedestrian disturbance that reduces plover use and/or impairs their foraging efficiency on soundside tidal flats is particularly injurious. Multiple studies have shown that bay tidal flats have relatively high indices of arthropod abundance compared with other microhabitats, and that piping plovers select these habitats in greater proportion than their availability (Loegering and Fraser 1995; Cross and Terwilliger 2000; Elias *et al*. 2000; Houghton *et al*. 2005). Zonick

(2000) found that off road vehicle (ORV) density negatively correlated with abundance of roosting plovers on the ocean beach. Studies elsewhere (Wheeler 1979) demonstrate adverse effects of ORV driving on soundside beaches on the abundance of infauna essential to piping plover foraging requirements.

Recreational Activities: Pedestrian and non-motorized recreational activities can be a source of both direct mortality and harassment of piping plovers. There are a number of potential sources for pedestrians on the beach, including those individuals driving and subsequently parking on the beach, those originating from off-beach parking areas (hotels, motels, commercial facilities, beachside parks, etc.), and those from beachfront and nearby residences. Essentially, the magnitude of threats to coastal species is particularly significant because vehicles extend impacts to remote stretches of beach where human disturbance would be very slight if access were limited to pedestrians only. Human recreation on coastal habitats can cause adverse impacts on dune formation, vegetation, and the invertebrate and vertebrate fauna (USFWS 1996).

Elliott and Teas (1996) found a significant difference in actions between piping plovers encountering pedestrians and those not encountering pedestrians. Piping plover not encountering pedestrians spend proportionately less time in active non-foraging behavior. This study suggests that interactions with pedestrians on beaches cause birds to shift their activities from calorie acquisition to calorie expenditure. In winter and migration sites, human disturbance continues to decrease the amount of undisturbed habitat and appears to limit local piping plover abundance (Zonick and Ryan 1996). The disturbance distance for wintering and migrating western snowy plovers in a California study was 98.4 feet for pedestrians and pets, but a higher proportion of pets than pedestrians disturbed plovers (Lafferty 2001).

During spring, summer and fall months in the south, recreational boaters find barrier island washover areas and peninsular tips attractive landing spots to spend the day, which may prove an increasing issue for piping plovers especially during migration months. This is particularly true on weekends and holiday weekends. Fireworks are highly disturbing to piping plovers (Howard *et al*. 1993).

Dogs: The presence of pets increases disturbance to wintering and migrating piping plovers. Pedestrians have been observed walking their dogs through congregations of feeding shorebirds and encouraging their dogs to chase the birds (USFWS 1996). Noncompliant pet owners who allow their dogs off leash have the potential to flush piping plovers and these flushing events may be more prolonged than those associated with pedestrians or pedestrians with dogs on leash. A study conducted on Cape Cod, Massachusetts found that the average distance at which piping plovers were disturbed by pets was 150 feet, compared with 75 feet for pedestrians. Furthermore, the birds reacted to the pets by moving an average of 187 feet, compared with 82 feet when the birds were reacting to a pedestrian, and the duration of the disturbance behavior stimulated by pets was significantly greater than that caused by pedestrians (Hoopes 1993). Disturbance also reduces the time migrating shorebirds spend foraging (Burger 1991) and has been implicated as a factor in the long-term decline of migrating shorebirds at staging areas (Pfister *et al*. 1992).

Viruses: Preliminary reports of West Nile virus were thought a potential threat on the northern Great Plains population in 2003 or 2004, but a case has yet to be confirmed (Dingledine 2006). Shorebird testing throughout the U. S. for avian flu is ongoing.

Oil Spills: Oil spills pose a threat to piping plovers throughout their life cycle. One example of oiled plovers was reported from Matagorda Island National Wildlife Refuge, Texas (USFWS 1996).

Habitat Loss/Degradation: Important components of ecologically sound barrier beach management include perpetuation of natural dynamic coastal formation processes. Man-made structures along the shoreline or manipulation of natural inlets upset the dynamic processes and result in habitat loss or degradation (Melvin *et al*. 1991). Throughout the range of migrating and wintering piping plovers, inlet and shoreline stabilization, inlet dredging, and beach maintenance and renourishment activities continue to constrict natural coastal processes. Dredging of inlets can affect spit formation adjacent to inlets, while jetties can cause widening of islands and subsequent growth of vegetation on inlet shores. Over time, both result in loss of plover habitat. Additional investigation is warranted to determine the extent to which these disturbance factors affect wintering plovers on a cumulative nature (Melvin *et al.* 1991).

Survivorship: Demographic models for piping plovers indicate that even small declines in adult and juvenile survival rates will cause very substantial increases in extinction risk (Melvin and Gibbs 1994; Amirault *et al*. 2005). Furthermore, insufficient protection of non-breeding piping plovers and their habitat has the potential to quickly undermine the progress toward recovery achieved at other sites. For example, a banding study conducted between 1998 and 2004 in Atlantic Canada found lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1996, cited in Appendix E, USFWS 1996), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase abundance despite very high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U. S. over the last 15 plus years (Amirault *et al.* 2005). Simply stated, this suggests that maximizing productivity does not ensure population increases; management must focus simultaneously on all sources of stress on the population within management control (predators, ORVs, etc.). Drake *et al*. (2001) evaluated winter piping plover habitat use in Texas and determined they have relatively small home-ranges and high survivorship from arrival in fall through spring departure. Cohen *et al*. (2006) experienced 100 percent winter survival of radio-tagged birds in a study conducted in North Carolina from December 2005 to March 2006. They speculate their high survival rate was attributed to plovers food availability much of the day as well as the low occurrence of days below freezing and infrequent wet weather.

Status and Distribution

Northern Great Plains Population

The northern Great Plains plover breeds from Alberta to Manitoba, Canada and south to Nebraska; although some nesting has recently occurred in Oklahoma. Currently the most westerly breeding piping plovers in the United States occur in Montana and Colorado. The northern Great Plains is the largest of the three breeding populations, 2006 data report 4,698 breeding pairs including the 2,962 pairs in the U. S. (Ryba 2007). The 2006 International Census reported a substantial increase since 2001 in both the U. S. and Canadian portion of the northern Great Plains breeding population.

Recovery criteria (USFWS 1994)

1. Increase the number of birds in the U. S. northern Great Plains states to 2,300 pairs.
2. Attain recovery objective of 813 pairs amongst four Provinces for Prairie Canada (Goossen *et al.* 2002).
3. Secure long term protection of essential breeding and wintering habitat.

<u>Great Lakes Population</u>

The Great Lakes plovers once nested on Great Lakes beaches in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario, Canada. Russell (1983) reviewed historical records to estimate the pre-settlement populations of the plover throughout this range. Total population estimates ranged from 492 to 682 breeding pairs in the Great Lakes region; Michigan alone may have had the most with as many as 215 pairs.

The endangered Great Lakes population is at a perilously low level. From an all-time low of 12 nesting pairs in 1990, the population increased to 32 nesting pairs in 1999, 58 nesting pairs in 2005, and 53 pairs in 2006 (Roche 2006). Although the increase from 12 pairs to a high of 58 pairs is very important, this population remains extremely vulnerable at these low numbers.

Sightings of banded birds in the Great Lakes during the 2005 breeding season indicate that adult mortality during winter 2004 - 2005 and spring migration 2005 was higher than normal, and this data is supported by a smaller population increase than was expected based on productivity in 2003 and 2004 (Stucker and Cuthbert 2006). Future-year detection of individuals presumed lost may determine that this survival estimate is low, but the apparent increase in mortality has potentially grave implications for survival and recovery of this imperiled population.

Recovery criteria (USFWS 2002a)

1. At least 150 pairs (300 individuals), for at least five consecutive years, with at least 100 breeding pairs (200 individuals) in Michigan and 50 breeding pairs (100 individuals) distributed among sites in other Great Lakes states.
2. Five year average fecundity within the range of 1.5 - 2.0 fledglings per pair, per year, across the breeding distribution, and ten year population projections indicate the population is stable or continuing to grow above the recovery goal.
3. Protection and long-term maintenance of essential breeding and wintering habitat is ensured, sufficient in quantity, quality, and distribution to support the recovery goal of 150 pairs (300 individuals).
4. Genetic diversity within the population is deemed adequate for population persistence and can be maintained over the long-term.
5. Agreements and funding mechanisms are in place for long-term protection and management activities in essential breeding and wintering habitat.

<u>Atlantic Coast Population</u>

The Atlantic Coast piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec, Canada to North Carolina. The Atlantic Coast population has increased from 790 pairs since listing to a preliminary estimation of 1,632 pairs in 2005 (USFWS 2006a). However, it is important to note that the increase is unevenly distributed, with most pairs occurring in New England (USFWS 1996).

Recovery criteria (USFWS 1996)

Increase and maintain for five years a total of 2,000 breeding pairs, distributed among four recovery units.

1. Verify the adequacy of a 2,000 pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term.
2. Achieve a five year average productivity of 1.5 fledged chicks per pair in each of the four recovery units described in criterion 1, based on data from sites that collectively support at least 90 percent of the recovery unit's population.
3. Institute long-term agreements to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit.
4. Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000 pair population.

<u>Non-breeding (migrating and wintering)</u>

Piping plovers winter in coastal areas of the U. S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Birds from the three breeding populations overlap in their use of migration and winter habitat. On the Georgia coast, the majority of wintering birds are likely to be from the Great Lakes and Atlantic populations. Of the Great Lakes piping plover population sighted on the wintering ground between 1993 and spring of 2000, 67 percent were in South Carolina, Georgia, or the Atlantic Coast of Florida. (Wemmer 2000) Repeated sightings for over eight years of banded Great Lakes birds have been documented off the coast of the Carolinas, Georgia (Noel *et al*. 2005), and Alabama (Stucker and Cuthbert 2006). Nichols and Baldassarre (1990) found that Georgia had the highest number (105 of 222 piping plovers observed), frequency (69.2% of sites surveys in Georgia), and density per km surveyed (0.77) on wintering piping plovers. Stucker and Cuthbert (2006) also identified Georgia's coastline as a priority area for protection for migrating and wintering piping plovers.

During a 2001 winter census, 2,389 piping plovers were observed. This accounted for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U. S. do so along the Gulf Coast, while 8 percent winter along the Atlantic coast. Four range-wide population surveys have been conducted for the piping plover; the 1991 (Haig and Plissner 1992), the 1996 (Plissner and Haig 1997), the 2001 (Ferland and Haig 2002) and the 2006 (Maddock 2006). These four surveys were completed to help determine the species distribution and to monitor progress towards recovery. Table 2 summarizes the results of the wintering census, respectively. Total numbers have fluctuated over time with some areas experiencing increases and others decreases. Fluctuations are predominately due to the location, quality, and extent of suitable non-breeding habitat that may vary over time due to regional rainfall and anthropogenic hydrologic manipulation and disturbance. Fluctuations could also represent unequal survey efforts or localized conditions during surveys. The increased numbers of birds counted in Texas in 2006 may reflect a shift of birds away from areas such as the Chandeleur Islands in Louisiana that were negatively impacted by Hurricane Katrina in 2005 (Cobbs 2006). The increase in the 2006 numbers from the Caribbean is due to increased survey efforts (Maddock 2006).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of critical habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat (USFWS 1996).

Table 2. Results of the 1991, 1996, 2001, and unofficial 2006 International Piping Plover Wintering Census.

Location	**1991**	**1996**	**2001**	**2006**
North Carolina	20	50	87	84
South Carolina	51	78	78	82
Georgia	37	124	111	212
Florida	551	375	416	414
Atlantic	*70*	*31*	*111*	*unk*
Gulf	*481*	*344*	*305*	*unk*
Alabama	12	31	30	29
Mississippi	59	27	18	78
Louisiana	750	398	511	224
Texas	1,904	1,333	1,042	2,158
Puerto Rico	0	0	6	?
U. S. Total	**3,935**	**2,416**	**2,299**	**3,281**
Mexico	27	16	Not surveyed	76
Caribbean	40	83	90	378
Grand Total	**3,451**	**2,515**	**2,389**	**3,735**
% of Breeding Census	62.9%	42.4%	40.2%	unknown

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. On the flip side, hard shoreline structures are put into place to prevent such shoreline migration. The Chandeleur Islands, a north-south oriented chain of low-lying islands, located approximately 62 miles east of the city of New Orleans, Louisiana, were impacted by hurricanes Lili (2002), Ivan (2004), Dennis (2005) and Katrina (2005, the strongest and closest in proximity to the Chandeleurs) (USGS 2005). Early estimates are that Hurricane Katrina removed about 85 percent of the sand from the beach and dunes of the Chandeleur Islands. It is unknown how much sand is likely to return under natural conditions to rebuild these barrier islands (Williams 2006). The Chandeleur Island Chain was used consistently by piping plovers and was designated critical habitat in 2001.

We are aware of the following site-specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including critical habitat units. In Texas, one critical habitat unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were prohibited from a portion of the beach decreasing the likelihood of their disturbance to plovers. In Florida, land acquisition has been initiated within portions of one critical habitat unit in the panhandle. The Service remains in a contractual agreement with the USDA for predator control within limited coastal areas in the panhandle, including portions of some critical habitat units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one critical habitat unit obtained greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of the nearby inlet channel (USFWS 2001a).

Emergency consultation for beach nourishment at Navarre Beach, Florida resulted in supplying the permittee with avoidance and minimization measures to lessen the impacts to optimal piping plover habitat that may have been created by the hurricane. Emergency consultations with the Federal Emergency Management Agency for berm placement post Hurricane Ivan, resulted in similar guidance.

ENVIRONMENTAL BASELINE

Tybee Island is part of a complex and dynamic coastal system that is continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport, and depletion, fluctuations in sea level, and weather events. The location and shape of barrier lands perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Along portions of the Tybee Island beach there are foredunes, primary and secondary dunes, and interdunal swales. If Tybee Island was managed as a natural barrier island, overwash of the island during storm events would be a common occurrence and could breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of the island, increasing island elevation and accreting the sound shoreline. If hardening efforts were minimized, breaches could result in new inlets through the island. However, the protection or persistence of these important natural land forms, processes, and wildlife resources is often in conflict with long-term, large-scale beach stabilization projects and their indirect effects, i.e., increases in residential development, infrastructure, and public recreational uses, and preclusion of overwash and creation of inlet formations.

Status of the species within the action area

GADNR conducts annual Waterbird Surveys in the winter that have evolved from the International Piping Plover Census. From reviewing the survey results back to 1997, piping plovers were seen on Tybee Island on January 22, 1999 (4 birds), January 26, 2004 (3 birds), January 14, 2005 (7 birds). There is a reliable record of 17 piping plovers on Tybee Island on January 15, 1996. (Brad Winn, GADNR, personal communication, 2008). From discussions with birders who regularly bird Tybee Island, most piping plovers are seen on the north end of the island north of the groin in Critical Habitat Unit GA-1. The birds can be found using different parts of the beach for foraging and roosting, which are weather and tide-dependent (Brad Winn, GADNR, personal communication, 2008).

Factors affecting species environment within the action area

A number of ongoing anthropogenic and natural factors may affect piping plovers. Known or suspected factors affecting piping plovers are discussed below.

Dogs are not allowed on Tybee Island beach, but because dogs are seen on the beach, this may not be enforced. The City is considering allowing dogs on certain areas of the beach. Other potential disturbances to piping plovers roosting or feeding along the beach are people walking through congregations of shorebirds and surf-cast fishermen causing the birds to flush and preventing them from feeding. Certain vehicles are allowed to drive on the beach for maintenance or emergency situations.

Tybee Island has a feral cat population that appears to be growing to the point that citizens are beginning to take action. A Savannah newspaper reported on April 2, 2008, that a feral cat rescue organization in Savannah, The Milton Project, is teaming up with Atlanta's Project CatSnip to spay and neuter outdoor feral cats on the Tybee Island. Organizers say the feral cat population has grown out of control due to the animals' reproductive capacity and the relative isolation of the island, http://savannahnow.com/node/473017.

The status of the critical habitat within the action area is experiencing some erosion; however, there is currently ample beach, a good dune system, and fewer disturbances on the north end of Tybee Island beach compared to other sections of the front beach.

EFFECTS OF THE ACTION

Factors to be considered

The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from possibly all three populations within the proposed Project Area. Georgia has 16 designated critical habitat units, comprising 83.5 miles of its coastline. Critical Habitat Unit GA-1 Tybee Island is about 91 acres in size and 11,000 feet in length. The majority of the unit is privately-owned. The unit extends along the northern tip of Tybee Island starting from 0.5 mile northeast from the intersection of Crab Creek and Highway 80 to 0.41 mile northeast from the intersection of Highway 80 and Horse Pen Creek. The unit includes MLLW on Savannah River and Atlantic Ocean to where densely vegetated habitat or developed structures begin, areas which are not used by the piping plover. Approximately 1000 feet of Unit GA-1 is within the Project Area or approximately 9% of the linear distance of the unit. The indirect effects of the action, alterations in the natural processes of the barrier island, are expected to occur throughout the 2.6 miles of front beach.

The purpose of the project is to renourish or add sand to the Tybee Island beach to protect residential housing and hotels that are present along this eroding shoreline. The project will occur predominantly south of the part of the island that is currently used by wintering piping plovers. The construction is expected to begin by October 1, 2008 and be completed by April 30, 2009. This coincides with the piping plovers migration and wintering period (July 15 through May 15), which is the only time this species occurs in Georgia. Short-term and temporary impacts to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The intertidal food base will be temporarily depleted and the roosting areas may be disturbed by the staging, storage, and transportation of equipment, materials, supplies, and workers on the beach. The actual nourishment activities should not reach the critical habitat of the piping plover on Tybee Island until the end of the wintering period for the piping plovers in Georgia. The tilling to loosen compaction of the sand required to minimize sea turtle impacts will affect any wrack that has accumulated on the "new" beach. This will impact feeding and roosting habitat, both of which are often used by piping plovers. The renourished beach will impede overwash to the inland side flats as is the project purpose, thereby causing successional advances in the habitat that will preclude its use by piping plovers.

The activities associated with the manufactured beach for the current project are expected to be a one-time occurrence and should be completed by spring 2009. Alteration of the natural barrier island processes are expected to be long term, if not permanent. The applicant expects that the life span of this beach will be seven to eight years before needing more sand to replace that which will be lost through sand transport and episodic storm events.

Analysis for Effects of the Action

Beneficial effects

The increase in beach width from the renourishment activities should provide more roosting habitat for piping plovers and eventually more feeding habitat after invertebrates recolonize the area. The beneficial effects could last as long as seven to eight years.

Direct effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. The construction window (i.e., disposal of sand) will extend through approximately one piping plover migration and winter season. Piping plovers have proven site fidelity. There will be a minimal amount of equipment staging on the beach in the form of sections of pipe to be added as nourishment is completed from the southern to the northern end of the island. This staging and heavy machinery and equipment (e.g., trucks and bulldozers operating on the beach, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and feeding, and forcing birds to expend valuable energy reserves to seek available habitat elsewhere.

Burial and suffocation of invertebrate species will occur along the entire 2.6 miles of beach. Timeframes projected for benthic recruitment and re-establishment following beach nourishment are between six months to two years (Brad Winn, GADNR, personal communication, 2008), but there is currently no available data on abundance and biomass to determine whether these recovery rates are applicable to Georgia coastal areas. Depending on actual recovery rates, impacts will occur even if renourishment activities occur outside the plover migration and wintering seasons.

Indirect effects

The Tybee Island beach is being renourished along 2.6 miles of front beach as a protective element against shoreline erosion to protect man-made infrastructure. While direct impacts described above pose threats to the survival of the piping plover, indirect effects of reducing potential for the formation of optimal habitats pose a concern for piping plovers with respect to survival and recovery.

Once the inter-tidal zone is re-established, feeding habitat will be available but these feeding areas are considered substantially inferior to natural overwash habitat. The proposed project will perpetuate and contribute to the widespread activities that prevent the formation of these preferred early successional overwash habitats and reduce the likelihood of survival and recovery of the species. Additional investigation is warranted to determine the extent to which these disturbance factors affect wintering plovers on a cumulative nature.

At the same time that the proposed project will limit the creation of optimal foraging and roosting habitat, it will increase the attractiveness of these beaches for human recreation. The increased recreational use of artificially-widened beaches is often cited by the USACE and others as a benefit of beach nourishment. Activities that may potentially adversely affect plovers include the presence of unleashed pets and the routine removal of marsh wrack (used by piping plovers for habitat) to “clean up” the beach for tourists.

The project life and expected future renourishment activities increase the likelihood that landowners or local governments will initiate construction of new infrastructure or upgrade existing facilities, such as roads, buildings, or parking areas adjacent to the nourished beach. Short-term adverse effects may include disturbance to nearby plovers due to construction activities, while longer-term impacts could include a decrease in use of nearby habitat due to increased disturbance levels, and preclusion of the creation of additional recovery habitat.

Critical Habitat

Critical Habitat Unit GA-1 should experience temporary impacts during one wintering season due to disturbance issues from construction. The primary constituent elements that are present include the intertidal beach, flats and/or associated dunes, extending down to the lowest low-tide mark. The intertidal beach will be the element that will be affected. Because of the long history of renourishment of Tybee Island beach, the natural process of dune formation has been adversely affected for decades and washover habitats have been eliminated by human developments and hardscape.

Most of the construction activity in the critical habitat should be toward the end of the winter season of the piping plovers prior to migration north to the nesting grounds in May. A minor amount of renourishment activity may take place on the southernmost 1000 feet of the unit, primarily on the upper part of the beach near the dunes. If this area becomes hardened from the nourishment and is not tilled, there may be a permanent impact to some of the foraging habitat for the piping plover within Unit GA-1. Staging of equipment will also occur in the lower 1000 feet of Unit GA-1 on the upper part of the beach. Foraging habitat may be decreased for up to two years on the portion of Unit GA-1 impacted by the construction.

Species response to the proposed action

This biological opinion is based on direct and indirect effects that are anticipated to piping plovers (wintering and migrating) as a result of construction disturbance, creating berms and sloped beach, and preventing the formation of natural habitat that is considered optimal for foraging and roosting. In the context of migrating and wintering piping plovers, it is anticipated that 2.6 miles of Tybee Island shoreline and an unknown number of piping plovers could be impacted by habitat loss due to construction disturbance and an associated increase in recreational disturbance. The area of the critical habitat being directly affected by the construction is currently used sparingly by piping plovers. In recent years, piping plovers favor the area of Unit GA-1 found on the north end of Tybee Island beyond the north groin.

Disturbance from the construction activity on the 2.6 miles of front beach may disturb wintering piping plovers from foraging in the intertidal zone or roosting and loafing areas on the dry part of the beach. Such disturbance can result in unnecessary expenditure of energy, and force birds to seek other, less suitable areas, and may expose piping plovers to increased predation. Foraging on suboptimal habitat on the non-breeding grounds by migrating and wintering piping plovers may reduce the fitness of individuals for successful migration and reproduction.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The City has applied for a permit under the Georgia Shore Protection Act to level the seaward-most dunes on the beach to create a 20-foot-wide flattened area just above the high water mark along the 2.6-mile project area to allow emergency, and possibly maintenance vehicles, to move up and down the beach. The dunes will be leveled with a bull dozer making multiple along-shore passes. The removed sand will be spread along the shore above the high water mark which could smother the invertebrates used by the piping plovers for food. Maintaining the access way would require the periodic use of heavy equipment to re-shape the road and “clean up” the marsh wrack. The marsh wrack is an important feeding area for many shorebirds, including piping plovers. Piping plovers take refuge behind the wrack line during inclement weather for roosting. The actions proposed by the City will lead to degradation of the remaining natural barrier island beach and dune building processes and degrade piping plover habitat on the entire front beach of Tybee Island.

Regarding sea turtles, leveling the dunes could have the effect of increasing light pollution on the beach. Increased light would increase the disorientation and misorientation of sea turtle hatchlings trying to find their way to the ocean after emerging from the nest.

It is reasonably certain to expect that coastal development, human occupancy, and recreational use along the Southeastern United States will increase in the future. For example, re-development, along with new developments, is rapidly occurring on Tybee Island and the other easily-accessible Georgia barrier islands, as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead and the leatherback, the environmental baseline for the action area, the effects of the proposed beach nourishment, and the cumulative effects, it is the Service's biological opinion that the Tybee Island beach nourishment project, as proposed, is not likely to jeopardize the continued existence of the loggerhead and the leatherback.

No critical habitat has been designated for the loggerhead or the leatherback in the continental United States; therefore, none will be affected.

Table 3 shows the previous formal consultations that have been done in Georgia, in which incidental take was given to the Federal agency. Three of these have been prior beach nourishments for Tybee Island.

Table 3. Previous formal consultations/biological opinions completed for sea turtles in Georgia

PROJECT/ACTIVITY	COUNTY /STATE	YEAR	TAKE (Critical habitat/individuals)
Tybee Island Beach Erosion Control Project	Chatham Georgia	1993	All sea turtle nests overlooked by monitoring One loggerhead nest from disorientation from lighting in compliance
Tybee Island Beach Restoration	Chatham Georgia	1994	All sea turtle nests overlooked by monitoring One loggerhead nest from disorientation from lighting in compliance
Tybee Island Oceanfront Beach Second Street Study	Chatham Georgia	1998	All sea turtle nests missed by a nest survey and all nests deposited when surveys are not required. One loggerhead nest from disorientation from lighting in compliance
Sea Island Beach Nourishment and Construction of Terminal Groins	Glynn Georgia	1989	One loggerhead nest missed by a nest survey and relocation for the first nesting season following project completion
Beach Nourishment for Saint Simons Island, Sea Island, and Jekyll Island	Glynn Georgia	1991	All sea turtle nests missed by a nest relocation program One loggerhead nest per island to reflect implementation of the lighting ordinance
Sea Island Company	Glynn Georgia	1995	Four nests due to the project activities

The proposed project will affect 2.6 miles of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern United States. Research has shown that the principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Piping Plover

After reviewing the current status of the wintering populations of the northern Great Plains, the Great Lakes, and the Atlantic Coast piping plover, the environmental baseline for the renourished beach, the effects of the activities, and the cumulative effects, it is the Service's biological opinion that implementation of the project, as proposed, is not likely to jeopardize the continued existence of the species. This conclusion is based on the temporary nature of the direct effects, the expected low probability of significant indirect effects, and availability of other foraging, roosting, and loafing habitat within Critical Habitat Unit GA-1. Additionally, the project is not likely to result in adverse modification of Critical Habitat Unit GA-1.

INCIDENTAL TAKE STATEMENT

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

The measures described below are non-discretionary, and must be implemented by the USACE so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE (1) fails to assume and implement the terms and conditions or (2) fails to require the contractor to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contract, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USACE must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Sea Turtles

Incidental take of nesting and hatchling sea turtles is anticipated to occur if, due to unforeseen construction delays, the project is extended beyond April 30 which will be sea turtle nesting season. If the proposed work occurs within the nesting season, the USACE will implement a nest survey and egg relocation programs. This program, though necessary to minimize impacts to turtles, may also cause adverse impacts. Take could occur anywhere within the 2.6 miles of beach where renourishment material will be placed. However, incidental take of sea turtles will be difficult to detect for the following reasons:

(1) turtles nest primarily at night and all nests are not located because
 [a] natural factors, such as rainfall, wind, and tides may obscure crawls
 [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls;
(2) the total number of hatchlings per nest is unknown;
(3) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;
(4) lights may misdirect an unknown number of hatchlings and cause death and
(5) escarpments may form and keep an unknown number of females from accessing a suitable nesting site.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited after April 30, 2009, and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project (i.e., early nests); (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season.

The average number of sea turtle nests per year on Tybee Island is 6.2. According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests on Tybee Island may be misidentified as false crawls and missed. We anticipate, therefore, an average of 5.8 to 6.6 nests will be incidentally taken by the proposed action.

Piping Plovers and GA-Unit 1

The Service anticipates that 1000 feet of foraging, roosting, and loafing habitat within the piping plover Critical Habitat Unit GA-1 could be affected as a result of this proposed action, as well as, an indeterminate number of piping plovers within the 2.6 mile section of affected shoreline. The habitat impacts are likely to affect an undeterminable (maximum of seven seen during a census) number of piping plovers that could be harassed during the non-breeding season.

Incidental take of non-breeding piping plovers will be particularly difficult to detect because: (1) migrating and wintering plovers are not easy to identify because they lose some of the markings associated with their breeding plumage and often congregate with other similar looking shorebirds; (2) the effects of intraspecific competition are difficult to measure on the wintering grounds; and (3) reduction in reproductive success on the breeding grounds will be difficult to measure if the plover on the wintering grounds has no leg band to show its population of origin.

Based on the review of biological information and other information relevant to this action, incidental take is anticipated to be in the form of: (1) harassing, disturbing, or interfering with piping plovers attempting to forage or roost within the action area; (2) behavior modification of piping plovers during the migrating and wintering seasons due to disturbances associated with construction and subsequent loss of habitat within the action area, resulting in excessive energy expenditures, displacement of individual birds, increased foraging behavior, or situations where they choose marginal or unsuitable resting or foraging areas; and, (3) decreased survivorship of migrating and wintering piping plovers due to diminished quantity and quality of remaining habitats, compared with the existing habitat. This would include direct effects of the action on the birds on the wintering ground and the indirect effects of the success of those piping plovers in migrating and successfully reproducing on the breeding grounds. No lethal take is anticipated. The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 USC § 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the sea turtles and the piping plover.

REASONABLE AND PRUDENT MEASURES

The USACE included in their proposed action conservation measures to minimize the effects of this action on sea turtles and piping plovers:

1. Construction equipment and materials will be staged and stored in a manner that will minimize impacts to sea turtles and piping plovers to the maximum extent practicable.

2. Existing beach access points will be used for vehicle and equipment beach access to the maximum extent practicable. Existing vegetated habitat at the beach access points must be protected to the maximum extent practicable. The access must be delineated by fence or other suitable material to ensure vehicles and equipment transport stay within the access corridor.

3. Shorebird monitoring will be performed to detect piping plovers or concentrations of other shorebirds once a month for the entire beach and another time during the month on the critical habitat on the north part of the island. This will be done prior to and during the construction activities.

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of nesting and hatchling loggerheads and leatherbacks and non-breeding piping plovers in the proposed areas of dredged material placement and associated activities in the action area.

1. If the beach renourishment project extends into the sea turtle nesting season (beyond April 30), surveys for nesting sea turtles must be conducted daily before work is begun. If nests are constructed in the area of beach renourishment, the eggs must be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

2. Immediately after completion of the beach renourishment project and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required to reduce the likelihood of impacting sea turtle nesting and hatching activities, and

foraging, roosting and loafing piping plovers. (If tilling is needed, it must only occur above the primary wrack line.)

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

4. Disturbance to piping plover Critical Habitat GA-1 by the USACE beach nourishment project will be minimized. Surveys for piping plovers must be done within the action area to document the continued use of the Critical Habitat GA-1, as well as, the remaining action area. The amount of pedestrian traffic and unleashed pet occurrences should also be recorded.

5. Lighting associated with the project night work must be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles and piping plover roosting activities.

6. A survey of all lighting visible from the renourished beach shall be completed using standard techniques for such a survey.

7. The USACE shall ensure that contractors conducting the beach nourishment work fully understand the sea turtle and piping plover protection measures detailed in this incidental take statement.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the USACE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Protection of Sea Turtles

1. (RPM #1) Nesting surveys must be initiated 70 days prior to nourishment activities or by May 1, whichever is later, and continue through the end of the project. If nests are constructed in areas where they may be affected by beach nourishment activities, eggs must be relocated per the following requirements. These requirements shall only be required if the renourishment project occurs before October 1, 2008, (Mark Dodd, GADNR, personal communication, 2008) or extends past April 30, 2009.

    a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures, and who are duly authorized to conduct such activities through a valid permit issued by GADNR. Nesting surveys shall be conducted daily between sunrise and 9 a.m. During sea turtle nesting season, the contractor shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in a new work area or the contractor does not expand the work site prior to completion of the necessary sea turtle protection measures.

b. All nests that may be affected by construction activities will be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings; relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project shall be notified so the eggs can be moved to a suitable relocation site.

c. Nests deposited within areas where construction activities have ceased or will not occur for 70 days shall be marked and left *in situ* unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and/or a secondary marker at a point landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10 foot radius around the nest. No activity will occur within this area resulting in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the restoration activity.

3. (RPM #1) During the sea turtle nesting season, the contractor must not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. (See a. above.) Once the beach has been cleared and the necessary nest relocations have been completed, the contractor is allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500 foot length limitation shall apply.

4. (RPM #2) Immediately after completion of the project and prior to April 15 for three subsequent years, sand compaction shall be monitored in the area of restoration in accordance with a protocol agreed to by Coastal ES, GADNR, and the USACE and/or local sponsor. At a minimum, the protocol provided below shall be followed. If tilling is required, the area shall be tilled to a depth of 36 inches. All tilling activity shall be completed prior to the sea turtle nesting season which starts May 1.

   Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. If the project is completed during the sea turtle nesting season, tilling will not be performed in areas where sea turtle nests have been left in place or relocated. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.) A report on the results of the compaction monitoring shall be submitted to our Coastal ES prior to any tilling actions being taken.

a. Compaction sampling stations shall be located at 500 foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area) and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final 6 averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the start of sea turtle nesting season (May 1).

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas three square feet or greater with a 3-square-foot buffer around the vegetated areas.

4. (RPM #3) Visual surveys for escarpments along the project area shall be made immediately after completion of the project and prior to April 15 for 3 subsequent years. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the beginning of sea turtle nesting season on May 1.

   If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. Surveys for escarpments shall be conducted weekly. Results of the surveys shall be submitted within one month to our Coastal ES prior to any action being taken during the nesting season. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted to our Coastal ES. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the beach).

5. (USACE #1) From May 1 through October 31, nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes shall be off the beach to the maximum extent possible. Temporary storage of pipes on the beach shall be in such a manner so as to impact the least amount of nesting habitat and shall not compromise the integrity of the dune systems. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

6. (RPM #5) Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area and shall comply with safety requirements. From May 1, 2009, to completion of the project, lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the waters surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and Occupational Health and Safety Administration (OSHA) requirements. Light intensity of lighting plants shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 9).

7. (RPM #1 and #7) The USACE must arrange a meeting between representatives of the contractor, the Service, the GADNR, and the permitted person(s) responsible for sea turtle egg relocation at least 30 days prior to April 30, 2009. At least ten days advance notice must be provided prior to conducting this meeting. This will provide for explanation and/or clarification of the sea turtle protection measures.

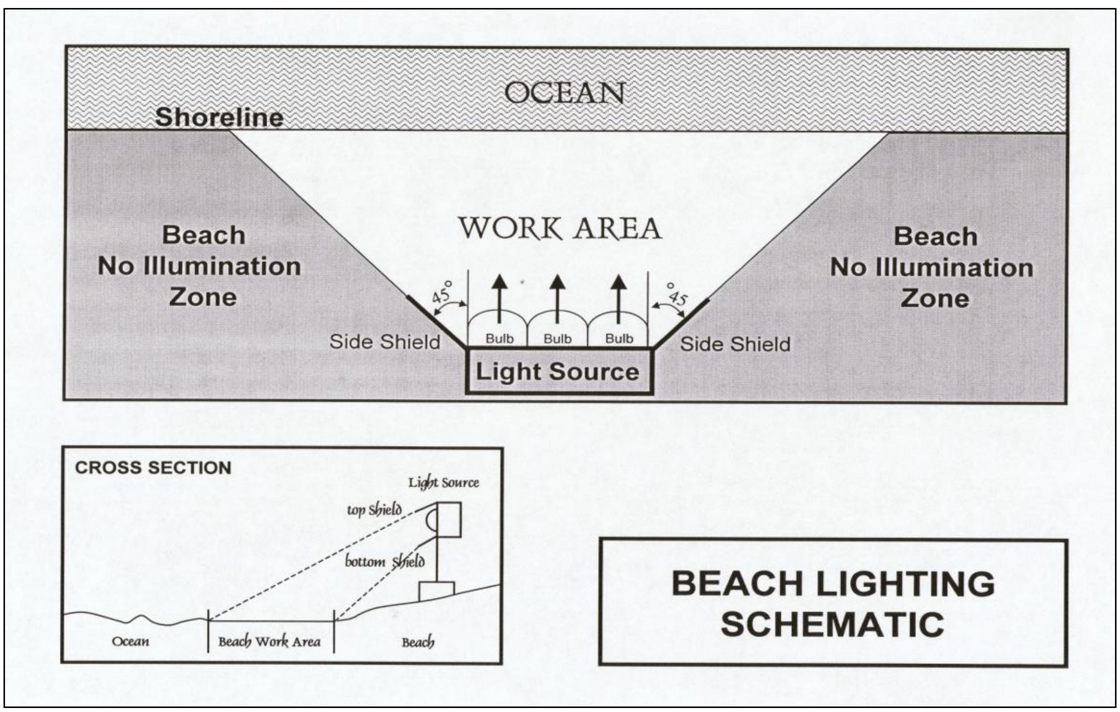


Figure 9. Beach work lighting schematic.

Protection of Piping Plover

(USACE#3) To assist in increasing our understanding of the scope of impacts of beach nourishment on piping plovers, shorebird monitoring will be conducted prior to and during construction activities in the vicinity of Critical Habitat Unit GA-1 as outlined in the USACE Biological Assessment prior to commencement of construction and be conducted once every two weeks through April 30 or the end of construction, whichever comes first with the following modifications: One of the two surveys per month should be done of the entire Unit GA-1 one hour before high tide and one hour after high tide. The other survey of the month should be done when the birds are feeding, either at low tide or on a falling tide of the entire beach, providing that the feeding areas are not completely covered. Avoid doing surveys during poor weather conditions (e.g., high winds, rain) and preferably do the surveys on foot. Monitoring should be conducted from September 15 through May 15.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The level of incidental take for sea turtles on the 2.6 miles of nesting beach habitat will be difficult to detect; however, we anticipate an average of 5.8 to 6.6 nests will be incidentally taken. Based on recent surveys of Tybee Island during the winter, a range of 1 to 7 piping plovers could be harassed during the project. If, during the course of the action, th level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation. The USACE must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reporting

1. A report describing the actions taken to implement the terms and conditions of this incidental take statement shall be submitted to our Coastal ES within 60 days of completion of the proposed work when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities and descriptions and locations of self-release beach sites. This report will also include all survey data for piping plovers and shorebirds.

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

1. The USACE and the Service designee shall be immediately notified by the project contractors upon locating an injured or dead sea turtle or piping plover. The permittee or its designee shall be responsible for notifying GADNR at 912-264-7218 and our Coastal ES at 912-265-9336. Care should be taken in handling dead specimens to preserve biological materials in the best possible state for later analysis.

CONSERVATION RECOMMENDATIONS

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

1. Surveys for nesting success of sea turtles should be continued for a minimum of three years following beach nourishment to determine whether sea turtle nesting success has been affected.

2. During surveys for piping plovers and other shorebirds, negative survey data and the amount and type of human and unleashed pet recreational pressures should also be documented. When piping plovers are seen, the habitat type (intertidal area, mid-beach, etc.) and behavior (foraging, roosting, etc.) should also be recorded in the database.

3. Because piping plovers and other shorebirds rely on the swash zone along the beach front for foraging, the USACE should study the impacts of macro benthic invertebrate recovery rates and assemblages at a minimum from First Street north to the northern groin. These data could show the difference between nourished and non-nourished beach sections.

4. To preserve piping plover feeding and roosting habitat, the mechanical removal of natural organic material (wrack or dead marsh grass) should be prohibited year-around along the shoreline and upper beach in the Critical Habitat Unit GA-1.

5. Artificial beachfront lighting in the beach nourished or dredged material placement area shall be managed by the City. The City Lighting Code Sea Turtle Nesting Season 1 May through 31 October Sec. 3-230 shall be enforced on Tybee Island. For each light no in compliance, the City shall provide documentation that the property owner(s) has been notified of the problem light(s) with recommendations for correcting the light. The City shall complete a survey of all lighting visible from the nourished beach by May 15 following nourishment work, using standard techniques for such a survey (Appendix 3). A summary report of the survey and documentation of property owner notification shall be submitted to the Service, the USACE, and GADNR by June 1 of that nesting season. Additional lighting surveys shall be conducted by June 15, July 15, August 15, September 15, and October 15 of that nesting season. A summary report of each survey including documentation of property owner notification shall be submitted to our Service Coastal ES office by the first of the following month; and a final summary report provided by December 15 of that year.

6. The City shall install predator proof trash receptacles at all main public beach access points to minimize the potential for attracting predators of sea turtles and piping plovers.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitat, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the May 21, 2008, request for the initiation of formal consultation on the Tybee Island renourishment project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary USACE involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the USACE action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The above findings and recommendations constitute the report of the U. S. Department of the Interior. Contact Kathy Chapman, fish and wildlife biologist, at 912-265-9336 if you require additional information

Sincerely,

Sandra S. Tucker

Sandra S. Tucker
Field Supervisor

cc: file
FWS-RO, Atlanta Attn: Kenneth Graham
GADNR-CRD, Brunswick
FWS, Jacksonville, Florida Attn: Sandy MacPherson

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Appendix 1. USACE Letter with Manatee Conditions.

DEPARTMENT OF THE ARMY
SAVANNAH DISTRICT, CORPS OF ENGINEERS
100 W. OGLETHORPE AVENUE
SAVANNAH, GEORGIA 31401-3640

May 21, 2008

Ms. Kathy Chapman
US Fish and Wildlife Service
Ecological Services
4270 Norwich Street
Brunswick, GA 31520

Dear Ms. Chapman,

In accordance with Section 7 of the Endangered Species Act, I am requesting initiation of Formal Consultation on the effects of the Tybee Island Shore Protection Project Renourishment on piping plover, critical habitat unit GA-1, loggerhead and leatherback sea turtles. In the Biological Assessment of Threatened and Endangered Species that we provided your office in March 2008, we determined that implementation of this beach restoration may affect piping plover and designated critical habitat unit GA-1. In addition, we have determined if the renourishment extends past April 30 loggerhead and leatherback sea turtles are likely to be adversely affected. We feel that the project, with special conditions listed below, will not be likely to adversely affect the other listed species in the area, including the Florida manatee. Other listed species potentially occurring in the general project area are listed in the table below.

Federal Threatened and Endangered Species

Common Name	Scientific Name	Status
Florida manatee	Trichechus manatus latirostris	Endangered
Right whale	Balaena glaciali	Endangered
Sei whale	Balenoptera borealis	Endangered
Blue whale	Balaena musculus	Endangered
Sperm whale	Physeter macrocephalus	Endangered
Finback whale	Balaenoptera physalus	Endangered
Humpback whale	Megaptera novaeangliae	Endangered
Piping plover	Charadrius melodus	Threatened
Wood stork	Mycteria americana	Endangered
Bachman’s warbler	Vermivora bachmanii	Endangered
Kirtland’s warbler	Dendroica kirtlandii	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
Eastern Indigo snake	Drymarshon corais couperi	Threatened
Loggerhead turtle	Caretta caretta	Threatened
Leatherback turtle	Dermochelys coriacea	Endangered
Hawksbill turtle	Eretmochelys imbricata	Endangered
Green turtle	Chelonia mydas	Threatened
Kemp’s Ridley turtle	Lepidochelys kempii	Endangered

Shortnose sturgeon	Acipenser brevirostrum	Endangered

Flatwoods salamander	Ambystoma cingulatum	Threatened
Pondberry	Lindera melissifolia	Endangered

NOTE: List developed by the Southeast Region, U.S. Fish and Wildlife Service, February 2008

The following conditions will be added to any contract issued for work. We feel with the addition of these conditions the project may affect, but is not likely to adversely affect Florida manatees:

a. Sea turtles, whales and Florida manatees have been sighted in the general vicinity of the project. The contractor shall maintain a special watch for these species for the duration of this contract and any sightings will be reported to the Contracting Officer.

b. Endangered Species Watch Plan. A watch plan (see sample in BATES, Appendix E) that is adequate to protect endangered species from the impacts of the dredging and associated operations must be approved by the Contracting Officer before any dredging activities take place. The watch plan shall be for the entire period of dredging and transportation of material from the borrow area to the beach project area and shall include the following:

1. Watch plan coordinator's name
2. Names and qualifications of designated observers
3. Name(s) of the person(s) responsible for reporting sightings.

c. The contractor will instruct all personnel associated with the dredging and renourishing of the beach of the presence of manatees, whales, and sea turtles and the need to avoid collisions with these species.

d. All personnel associated with the dredging and renourishing of the beach will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972. The contractor may be held responsible for any manatee harmed, harassed, or killed as a result of project activities.

e. All vessels associated with the project shall operate at "no wake/idle" speed at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

f. Siltation or turbidity barriers will be made of material in which manatees cannot become entangled, be properly secured, and be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

g. Extreme care will be taken in lowering equipment or materials, including, but not limited to pipelines, dredging equipment, anchors, etc., below the water surface to the ocean floor; taking any precaution not to harm any manatee(s) that may have entered the project area undetected. All such equipment will be lowered at the lowest possible speed.

h. To prevent a crushing hazard to manatees, the pipeline used to transport material from the borrow site to the beach will be secured to the ocean floor or to a fixed object along its length to prevent movement with the tides or wave action.

i. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). (Can delete previous sentence if there will be personnel dedicated to an Endangered Species Watch 24/7/365 days of the year.) All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

j. The contractor agrees that any collision with a manatee shall be reported immediately to the Corps of Engineers (1-912-652-5058), the U.S. Fish and Wildlife Service Coastal Suboffice (1-912-265-9336), and the Georgia Department of Natural Resources (1-800-2-SAVE-ME). Notification will also be made to the above offices upon locating a dead, injured or sick endangered or threatened species specimen. Care will be taken in handling dead specimens to preserve biological materials for later analysis of cause of death. Any dead manatee(s) found in the project area must be secured to a stable object to prevent the carcass from being moved by the current before the authorities arrive. The finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. In the event of injury or mortality of a manatee, all aquatic activity in the project area must cease pending section 7 consultation under the Endangered Species Act between the U.S. Fish and Wildlife Service and the Corps of Engineers.

k. A minimum of two 3-feet by 4-feet temporary manatee awareness construction signs labeled “Manatee Habitat – Idle Speed in Construction Area” shall be installed and maintained at prominent locations within the construction area prior to initiation of construction and removed upon completion of the project. One sign shall be placed visible to vessel operators and one shall be visible to water related dredging crews. See Attachment A: Temporary Construction Signs.

l. The contractor shall keep a log detailing sightings, collisions, or injury to manatees, which have occurred during the contract period. Following project completion, the Corps of Engineers will submit a report summarizing these sightings and incidents to the U.S. Fish and Wildlife Service, 4270 Norwich Street, Brunswick, Georgia 31520 and to the GA Department of Natural Resources, Nongame Conservation Section, 1 Conservation Way, Brunswick, Georgia 31520.

m. All temporary project materials will be removed upon completion of the work. No construction debris or trash will be discarded in the water.

While the renourishment actions may result in short-term adverse effects, it is our belief that the piping plover and designated critical habitat areas would ultimately benefit from them. I have attached an updated copy of our BATES to assist in your preparation of a new Biological Opinion for this project.

Thank you for your efforts in this matter. If you require additional information, please contact Ellie Covington, 912-652-5578.

Sincerely,

Leroy Crosby
Acting Chief, Savannah Unit
Mobile/Savannah Planning Center

Attachment A: Temporary Construction Signs

Approved Sign Suppliers:

The signs are available through the companies listed below and may also be available from other local suppliers throughout the state. Permit/lease holders, marinas, and boat docking/launching facilities should contact sign companies directly to obtain pricing information and arrange for shipping and billing.

Approved Suppliers of Manatee Signs:

Grafix, Inc.
455 Montgomery Street
P.O. Box 1028
Savannah, GA 31402
Voice: 912-691-1117
Fax: 912-232-3845

Image Sign Company
785 King George Blvd., Bldg. 3
Savannah, GA 31419
Voice: 912-961-1444
Fax: 912-961-1499

Doug Bean Signs, Inc.
160 Dean Forest Rd
Savannah, GA 31408
Voice: 912-964-1900
Fax: 912-964-2900

Fendig Signs
411 Arnold Rd
St. Simons Island, GA 31522
Good & Associates
St. Simons Island, GA
(912) 638-7664

Appendix 2. Tybee Island Lighting Survey

Tybee Island Lighting Survey 5/3/04

The purpose of this survey was to document any violations of the City's lighting ordinance (3-230) designed to protect nesting sea protect sea turtles.

Conducted by Mark Dodd (GADNR), Deb Barrerio (GADNR), Mark Williams (City of Tybee)

2100-2315 hrs.

Violation	Location	Fixture	No. of Fixtures
Point source visible from beach	2nd St and Lovell	Streetlight/ Cobra Head	1
Point source visible from beach	2nd St and Butler	Streetlight/ Cobra Head	1
Point source visible from beach	Tybee Lights Condos	Interior Lights	All
Point source visible from beach	1st Terrace and Butler	Streetlight/ Cobra Head	2
Point source visible from beach	Anchor	Streetlight/ Cobra Head	2
Point source visible from beach	Hwy 80 (West of Anchor)	Streetlight/ Cobra Head	6
Point source visible from beach	VanHorn @ Ft. Screven Ent.	Streetlight/ Cobra Head	4
Point source visible from beach	Oceanview Ct (Adam Wilson)	Porchlight	3 (porch)
Point source visible from beach	Seaside Colony	Residential	?
Point source visible from beach	Gulik St Condos	Residential	?
Point source visible from beach	North Beach Parking Lot	Streetlight/ Cobra Head	2
Point source visible from beach	NB Parking Lot & Lighthouse Staff Lot	Gate light	2
Point source visible from beach	Tybee Shrine Club	Security Light	1 (both ends)
Point source visible from beach	Taylor and Meddin	Streetlight/ Cobra Head	2
Point source visible from beach	Taylor St.	Streetlight/ Cobra Head	1
Point source visible from beach	Taylor and Pulaski	Streetlight/ Cobra Head	1
Point source visible from beach	Residential Pulaski	Residental (1st Floor)	1
Point source visible from beach	Lighthouse Point Condos	Residential	?
Point source visible from beach	Captain's Row HOA	Residential	?
Point source visible from beach	Water Treatment Plant	City Security	2
Point source visible from beach	Beach and Raquet Club	Security Light	1
Point source visible from beach	Beach and Raquet Club	Pool Lights	2 (globes) 3 (floods)
Point source visible from beach	Beach and Raquet Club	Security Light	1
Point source visible from beach	Beach and Raquet Club	Breezeway Lights	3
Point source visible from beach	DeSoto St	Security Lights/Coke Machine	6 and 1
Point source visible from beach	DeSoto St	Pool Globes	5

Point source visible from beach	3rd St	Streetlight/ Cobra Head	1
Sign	Summerwinds	Sign on N/W	1
Point source visible from beach	Beachside Colony	Grille/Outside	11
Point source visible from beach	Beachside Colony	Cabana/Office	1
Point source visible from beach	Butler	City Hall Streetlight/ Cobra Head	1
Point source visible from beach	Condos SE Corner @ 0 Center St	Residential	6
Point source visible from beach	Center Terrace	Streetlight/ Cobra Head	1
Point source visible from beach	6th St	Streetlight/ Cobra Head	1
Point source visible from beach	6th St and Butler	Streetlight/ Cobra Head	1
Point source visible from beach	7th St	Streetlight/ Cobra Head	1
Point source visible from beach	7th St and Butler	Streetlight/ Cobra Head	1
Point source visible from beach	8th St	Streetlight/ Cobra Head	1
Point source visible from beach	9th St	Streetlight/ Cobra Head	2
Point source visible from beach	9th St and Butler	Streetlight/ Cobra Head	1
Point source visible from beach	10th St	Streetlight/ Cobra Head	1
Point source visible from beach	10th St and Butler	Streetlight/ Cobra Head	1
Point source visible from beach	13th St	Streetlight/ Cobra Head	2
Point source visible from beach	13th Terrace	Streetlight/ Cobra Head	1
Point source visible from beach	14th St	Streetlight/ Cobra Head	1
Point source visible from beach	City Parking Lot	Streetlight/ Square head	9
Point source visible from beach	Ocean Plaza Hotel	Security and Room	All
Point source visible from beach	15th St	Streetlight/ Cobra Head	3
Point source visible from beach	Tybee Is. Marine Science Center	Floods	?
Point source visible from beach	Pavillion	Overhead lights	13
Point source visible from beach	Tybrissa St. (16th)	Streetlight/ Cobra Head	9
Point source visible from beach	City Parking Lot	Streetlight/ Square head	8
Point source visible from beach	Sandpiper Condos	Residential/Porch	?
Point source visible from beach	17th St	Streetlight/ Cobra Head	3
Point source visible from beach	Strand condos	Residential	?
Point source visible from beach	Butler @ 17th place	Streetlight/ Cobra Head	1
Point source visible from beach	17th St	Streetlight/ Cobra Head	2
Point source visible from beach	18th St	Streetlight/ Cobra Head	2
Point source visible from beach	19th St	Streetlight/ Cobra Head	3
Point source visible from beach	Chatham Ave	Streetlight/ Cobra Head	1

Appendix 3

Assessments: Discerning Problems caused by Artificial Lighting

Excerpt from:
Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches
Florida Wildlife Research Institute Technical Report TR-2
Revised 2003

Assessments: Discerning Problems caused by Artificial Lighting

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This “urban skyglow" is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach.

Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?
Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance (see Appendix H and the section below on sea turtle lighting ordinances) or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION
Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of I problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS
An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. I Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaires need what remedy.

NIGHTIME INSPECTIONS

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; Appendix A), style of fixture (Appendix E), mounting (pole, porch, etc.), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to fourteen days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have" been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

MONITORING SEA TURTLE BEHAVIOR

In part, the behavior of nesting sea turtles and their hatchlings on the beach can be monitored by studying the tracks they leave in the sand. This evidence can reveal how much and where nesting occurs and how well oriented hatchlings are as they attempt to find the sea from their nest. Monitoring this behavior is one way to assess problems caused by artificial lighting, but it is no substitute for a lighting inspection program as described above. Many lighting problems may affect sea turtles and cause mortality without their leaving conspicuous track evidence on the beach.

SEA TURTLE NESTING

On many beaches, sea turtle biologists make early morning surveys of tracks made the previous night in order to gather information on nesting. With training, one can determine the species of sea turtles nesting, the success of their nesting attempts, and where these attempts have occurred. These nesting surveys are one of the most common assessments made of sea turtle populations.

Because many factors affect nest-site choice in sea turtles, monitoring nesting is a not a very sensitive way to assess lighting problems. However, changes that are observed in the distribution or species composition of nesting can indicate serious lighting problems and should be followed with a program of lighting inspections if one is not already in place.

HATCHLING ORIENTATION

Although hatchlings are more sensitive to artificial lighting than are nesting turtles, the evidence they leave behind on the beach is less conspicuous. Evidence of disrupted sea-finding in hatchlings (hatchling disorientation) can vastly under represent the extent of a lighting problem; however, this evidence can be useful in locating specific problems between lighting inspections. There are two ways one can use hatchling-orientation evidence to help assess lighting problems:

HATCHLING-ORIENTATION SURVEYS

Of the two methods, hatchling-orientation surveys, which involve measuring the orientation of hatchling tracks at a sample of sites where hatchlings have emerged, provide the most accurate assessment. Because the jumble of hatchling tracks at most emergence sites is often too confused to allow individual tracks to be measured, simple measures of angular range (the width that the tracks disperse) and modal direction (the direction that most hatchlings seem to have gone) are substituted. If the sampling of hatchling emergence sites does not favor a specific stretch of beach or a particular time of the lunar cycle, data from these samples can be an accurate index of how well hatchlings are oriented (Witherington et al., 1996).

HATCHLING-DISORIENTATION REPORTS

Although many cases of hatchling disorientation go unnoticed, some are observed and reported. The evidence of such events includes numerous circling tracks, tracks that are directed away from the ocean, or the carcasses of hatchlings that have succumbed to dehydration and exhaustion. Because reporters often discover this evidence while conducting other activities, such as nesting surveys, the events reported often include only the most conspicuous cases. Although these reports have a distinct coverage bias, they can still yield valuable information.

Hatchling-disorientation reports can help researchers immediately identify light-pollution problems. Although not every hatchling that is misled by lighting may be observed and reported, each report constitutes a 'documented event. When reports are received by management agencies or conservation groups, action can be taken to correct the light-pollution problem at the specific site recorded in the report. To facilitate the gathering of this information, standardized report forms should be distributed to workers on the beach who may discover evidence of hatchling disorientation. The following is a list of information that should be included on a standardized hatchling-disorientation report form:

1. Date and time (night or morning) that evidence was discovered.
2. Observer's name, address, telephone number, and affiliation (if any). The reporter may need to be contacted so that information about the event can be verified and the site can be located.
3. Location of the event and the possible light sources responsible. Written directions to the locations should be detailed enough to guide a person unfamiliar with the site. The reporter should judge which lighting may have caused the sea-finding disruption, a decision that may involve knowledge about lighting that was on during the previous night and the direction(s) of the tracks on the beach. If possible, the type of lighting responsible should be identified (e.g. a high pressure sodium street light).
4. The number of hatchlings of each species involved in the event. Unless carcasses or live hatchlings are found, the species and numbers involved will be an estimate.
5. Additional notes about the event.

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