# APPENDIX D

# USFWS BIOLOGICAL OPINION

# TYBEE ISLAND, GEORGIA
# SHORE PROTECTION PROJECT
# 2014-2015 RENOURISHMENT

# U.S. ARMY CORPS OF ENGINEERS
# SAVANNAH DISTRICT

# JUNE 2014

# Tybee Island, Georgia

# Shore Protection Project

# 2015 Renourishment

## Biological Opinion

## June 25, 2014

**Prepared by:**

**U. S. Fish and Wildlife Service**

**Georgia Ecological Services**

**Coastal Georgia Sub Office**

**4980 Wildlife Drive, NE**

**Townsend, Georgia**

June 26, 2014

Colonel Thomas J. Tickner
U. S. Army Corps of Engineers
Planning Division
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640
Attention: Ms. Ellie L. Covington

Re: USFWS File Number 2013-0407

Dear Colonel Tickner:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological and conference opinions based on our review of the proposed next periodic beach renourishment of the Tybee Island Beach Erosion Control Project, located in Chatham County, Georgia, and its effects on listed nesting loggerhead sea turtles (*Caretta caretta*) (loggerhead) and leatherback sea turtles (*Dermochelys coriacea*) (leatherback), non-breeding piping plovers (*Charadrius melodus*) and designated critical habitat for the piping plover, and the proposed red knot (*Calidris canutus rufa*). The U. S. Army Corps of Engineers (USACE) determined that the proposed work would not likely adversely affect the red knot based on the inclusion of a shorebird protection plan in your biological assessment of threatened and endangered species (BATES). We concur that the proposed action is not likely to adversely affect the red knot. This opinion is provided in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended; (16 U.S.C. 1531 *et seq.*).

The USACE determined that the proposed work would likely adversely affect (LAA) nesting sea turtles. Loggerhead sea turtles account for 99.5% of the nesting in Georgia. Leatherback sea turtle nests have been documented on Tybee Island in rare instances. Leatherback sea turtle nesting in Georgia in the last 10 years has ranged from zero to 11 nests per year, with a state average of 4.6 nests per year and an average of 0.2% of the nests. The last leatherback nesting on Tybee Island was one nest in 2004, 10 nesting seasons ago. It is the Service's opinion that this project is not likely to adversely affect (NLAA) the leatherback sea turtle based upon the rare nesting occurrence in the state and the project minimization measures in place for loggerhead sea turtles. The green sea turtle *(Chelonia mydas)* has not been documented to nest in the project site.

Formal consultation was initiated on February 10, 2014. This biological opinion is based on information provided in the December 17, 2013 draft environmental assessment (EA) and BATES, field investigations and other sources of information, and further communications with related parties. A complete administrative record of this consultation is on file at the Service's Coastal Georgia Ecological Services Sub Office in Townsend. The Service has assigned USFWS File Number 2013-0407 to this consultation.

## CONSULTATION HISTORY

| | |
|---|---|
| April 5, 2013 | The Service received a letter from the USACE requesting initiation of informal consultation on the effects of the Tybee Island project. The USACE made a determination that the action may affect but was not likely to adversely affect (NLAA) threatened and endangered species present in the area. |
| May 15, 2013 | The Service sent a letter of non-concurrence to the USACE of their determination that the project was NLAA listed species. The Service suggested the USACE initiate formal consultation for sea turtles, piping plovers and their designated critical habitat, and that effects to the red knot be taken into consideration for the project. |
| December 20, 2013 | The USACE sent a letter revising their determination for piping plovers and their designated critical habitat to likely to adversely affect (LAA). The USACE reaffirmed their determination of NLAA for sea turtles. |
| January 18, 2014 | The Service advised the USACE in a letter that they did not agree with the USACE determination for sea turtles and cited literature explaining the effects of renourishment on nesting sea turtles. |
| February 5, 2014 | The USACE replied to the Service that they had considered the information provided and would not change their determination for sea turtles. |
| February 10, 2014 | The Service stated that they would begin formal consultation on the piping plover and its critical habitat. We cautioned the USACE that we disagreed with their determination on sea turtles and advised them to consider the red knot as it is proposed for listing. |

February 27, 2014 — The USACE revised their determination for nesting sea turtles to LAA and considered the project's effects to the red knot to be may affect and NLAA based on the inclusion of shorebird protection measures in the BATES.

## BIOLOGICAL OPINION

### DESCRIPTION OF THE PROPOSED ACTION

Tybee Island is a 3.5-mile long barrier island (Figure 1), located 17 miles east of Savannah at the mouth of the Savannah River on the Atlantic Ocean. The major portion of the land mass above high tide is occupied by the City of Tybee Island (City). The highly developed 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 Lower Low Water (MLLW) and slopes westward to a vast tidal salt 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.

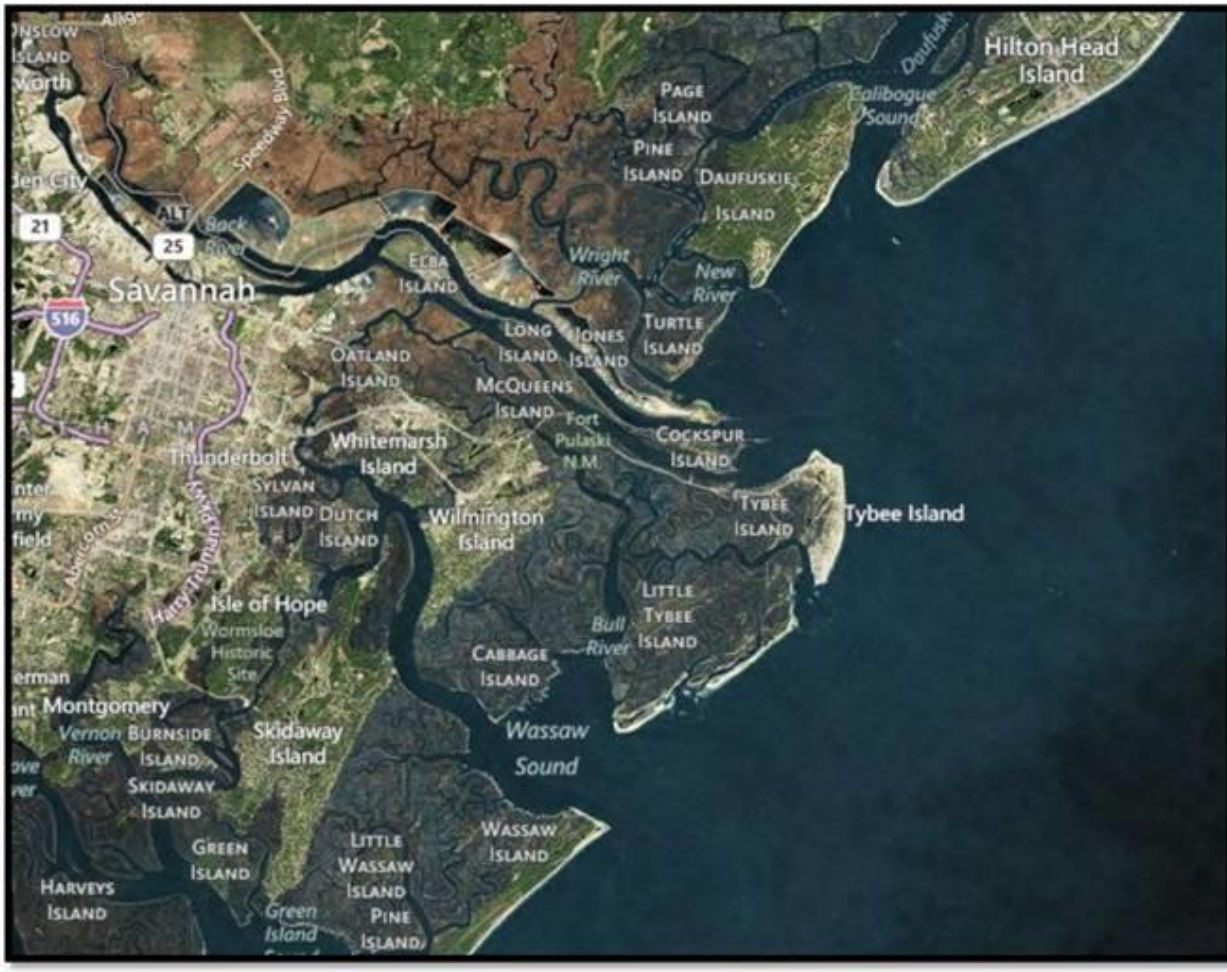


Figure 1. Tybee Island Location

The project was initially constructed in 1974 and has a 50-year project life scheduled to end in 2024. Periodic renourishments are planned for every 7 years. The beach was last renourished in 2008 and is scheduled to be renourished again in 2015. The Savannah District, with the non-Federal sponsor's concurrence, selected to perform the 2015 periodic renourishment with sediment sufficient for the remaining 9 years of the project. This is the proposed action and would be the last renourishment of this 50-year project.

The authorized project consists of renourishment 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 renourishment (referred to as South Tip Beach); and construction of a groin field and renourishment of 1,800 linear feet of the eastern bank of Tybee Creek to the city fishing pier (referred to as Back River Beach). The remaining shoreline from the fishing pier to the mouth of Horse Pen Creek, 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.

The proposed action will be renourishment within this authorized project area. Beach fill final placement will be based on physical conditions and 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 estimated proposed action renourishment fill limits and locations are shown in Figure 2. As shown the proposed action would cover the entire Oceanfront Beach from the north terminal groin to the southern terminal groin and an area in Tybee Creek to the city fishing pier (referred to as Back River Beach).

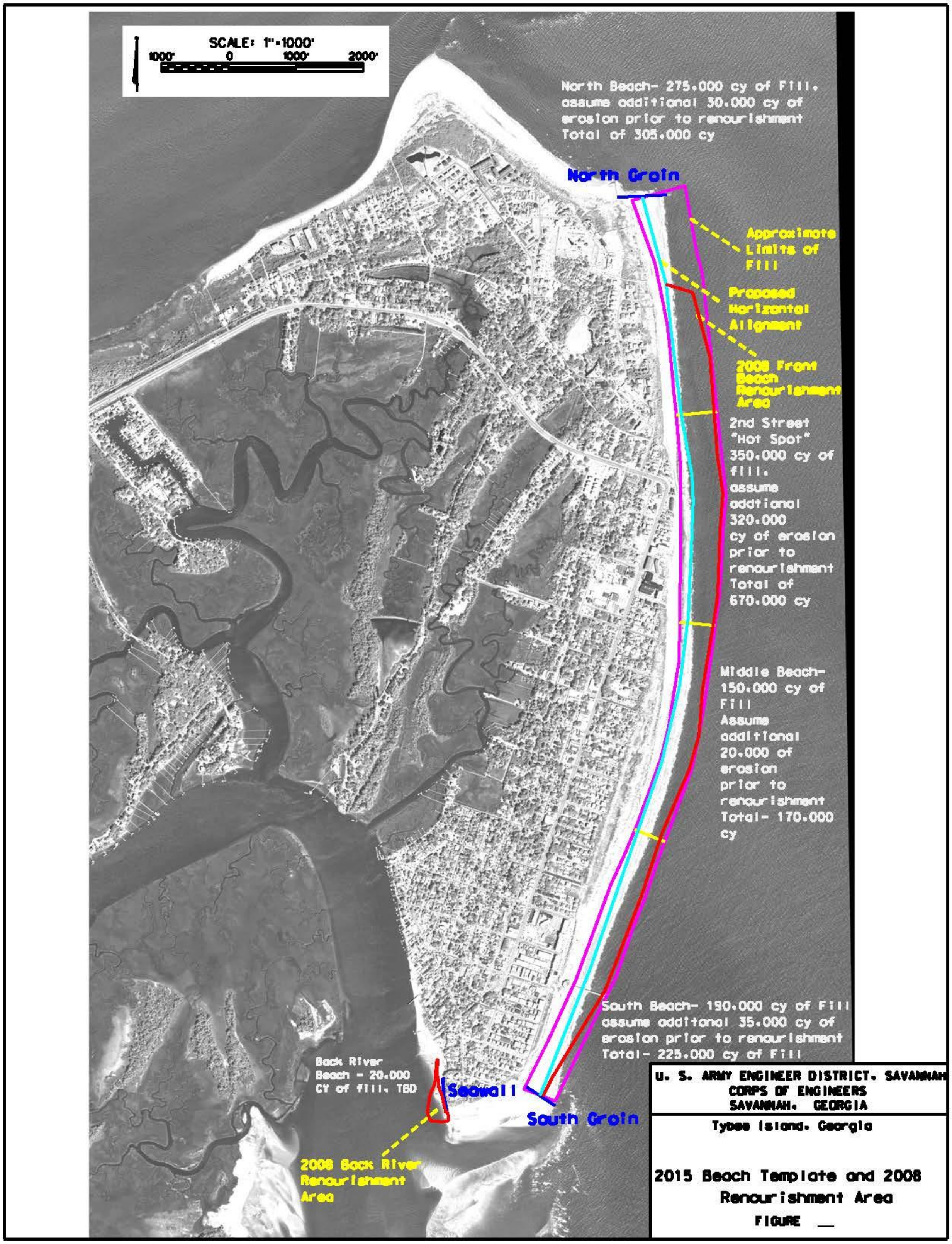


Figure 2. Tybee renourishment template

As the project is proposed, a hydraulic cutterhead dredge would place up to 1,750,000 cubic yards of beach compatible sand along the authorized Federal project shoreline during a construction window between November 1, 2015 and April 30, 2016. The sand source is Borrow Area 4, the same borrow area used in the last renourishment (figure 3). This borrow area is located approximately 4,000 feet southeast of the southern tip of Tybee Island. Since this renourishment would place sediment sufficient for 9 years of erosion instead of the usual seven years, the volume is approximately 312,000 cubic yards more than was placed in 2008. The beach template will be modified from the last renourishment by extending the berm up to the north terminal groin and extending seaward up to 50 feet to allow deposition of the additional volume of material.

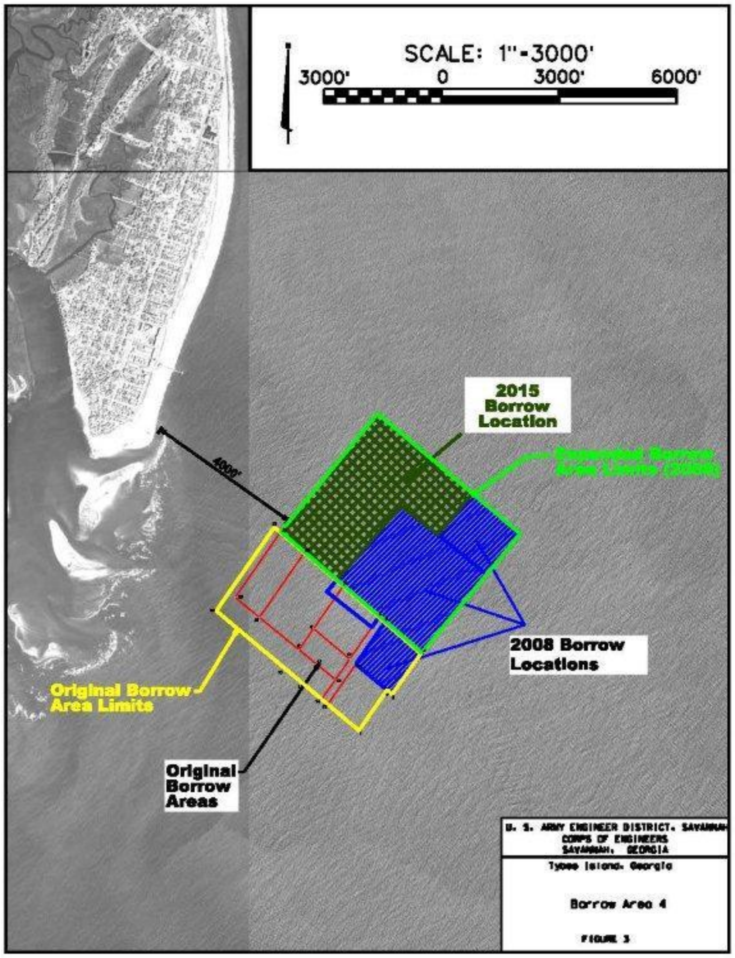


Figure 3. Borrow area location

In the remaining portions of the borrow area available for renourishment approximately 84% of core samples have less than 1% fines to a depth of -16 feet MLLW. The remaining 16% of core samples have between 1% and 4% fine material, with the highest fines content being at 3.5%. Overall this is considered high quality beach sediment. The average percent shell content is very similar to the existing beach, 9.9 % to -16 feet MLLW as compared to 12.6% on the existing beach (Olsen and Associates, 2008).

A submerged pipeline will extend from the borrow site to the southerly tip of Tybee Island. Shore pipe will be progressively added to perform fill placement along the shorefront or creekfront areas to be renourished. The contractor will not impinge on 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.

Conservation Measures Proposed

The USACE included the following conservation measures in their December 2013 Draft EA and BATES to minimize project impacts (USACE 2013a, USACE 2013b):
* 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.
* 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.
* 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.
* 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.
* 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.)
* 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.
* Disturbance to piping plover Critical Habitat GA-1 by the USACE beach renourishment project will be minimized. A watch plan to ensure plovers are not harmed will be utilized. Construction activities will be re-routed or stopped if plovers are in the vicinity of the work area. Shorebird monitoring will be conducted prior to and during construction activities in the vicinity of critical habitat unit GA-1, as well as, the remaining action area. A 200 foot buffer zone will be established around feeding piping plovers. If necessary, construction activities would be modified to minimize any disturbance to wintering or migratory shorebirds on site. Any construction related activities that could potentially harass feeding piping plovers shall cease while piping plovers are in the buffer zone. If birds settle into designated construction areas such as truck routes, the creation of alternate truck routes would avoid disturbance to the

birds. Relocation of the travel corridor shall also be considered if birds appear agitated or disturbed by construction related activities.
* 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. Dredge lighting must be shielded, or low-sodium, to prevent potential disruption of courtship or nesting by sea turtles during 1 May through 30 August.
* A survey of all lighting visible from the renourished beach shall be completed using standard techniques for such a survey.
* The USACE shall ensure that contractors conducting the beach renourishment work fully understand the sea turtle and piping plover protection measures detailed in this incidental take statement.
* The Contractor shall maintain a special watch for sea turtles, whales and Florida Manatee.
* Manatee construction conditions will be prescribed.

Action Area

The Service has described the action area to include the entire Oceanfront Beach from the north terminal groin to the southern terminal groin and continuing around the south end of the island into Tybee Creek to the city fishing pier (referred to as Back River Beach) for reasons that will be explained and discussed in the “Effects of the Action” section of this consultation.

Loggerhead Sea Turtle

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The loggerhead sea turtle, which occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans, was federally listed worldwide as a threatened species on July 28, 1978 (43 Federal Register (FR) 32800). On September 22, 2011, the loggerhead sea turtle’s listing under the ESA was revised from a single threatened species to nine distinct population segments (DPS) listed as either threatened or endangered. The nine DPSs and their statuses are:

Northwest Atlantic Ocean DPS – threatened
Northeast Atlantic Ocean – endangered
Mediterranean Sea DPS – endangered
South Atlantic Ocean DPS – threatened
North Pacific Ocean DPS – endangered
South Pacific Ocean DPS – endangered
North Indian Ocean DPS – endangered
Southwest Indian Ocean – threatened
Southeast Indo-Pacific Ocean DPS – threatened

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (National Marine Fisheries Service (NMFS) 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern United States and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

*Designated Critical Habitat*

On March 25, 2013, the Service proposed to designate critical habitat for the Northwest Atlantic Ocean Distinct Population Segment of the loggerhead sea turtle (78 FR 18000). In total, 1,189.9 kilometers (km) (739.3 miles) of loggerhead sea turtle nesting beaches have been proposed for designation as critical habitat in the States of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi. The closest proposed loggerhead sea turtle critical habitat is Little Tybee Island, LOGG-T-GA-01, 0.5 miles from the action area. The project will not adversely modify LOGG-T-GA-01 as appropriate minimization measures, the terms and conditions and the USACE conservation measures, are included in the project.

*Proposed Critical Habitat Physical or Biological Features (PBFs)*

In accordance with section 3(5)(A)(i) and 4(b)(I)(A) of the ESA and regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, the Service considers the physical or biological features (PBFs) that are essential to the conservation of the species and which may require special management considerations or protection.
These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;
(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;
(3) Cover or shelter;
(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historical, geographic, and ecological distributions of a species.

The Service derived the specific physical or biological features essential for the loggerhead sea turtle from studies of this species' habitat, ecology, and life history based on the following methods. Shaffer and Stein (2000) identify a methodology for conserving imperiled species known as the "three Rs": representation, resiliency, and redundancy. Representation, or preserving some of everything, means conserving not just a species but its associated habitats. Resiliency means ensuring that the habitat is adequate for a species and its representative components. Redundancy ensures an adequate number of sites and individuals. Together, resiliency and redundancy ensures that species can survive into the future. This methodology has been widely accepted as a reasonable conservation strategy (Tear *et al.* 2005). In applying this strategy to terrestrial critical habitat for loggerheads, we have determined that it is important to conserve: (I) Beaches that have the highest nesting densities (representation); (2) beaches that have a good geographic spatial distribution to ensure protection of genetic diversity (resiliency and redundancy); (3) beaches that collectively provide a good representation of total nesting (representation); and (4) beaches adjacent to the high density nesting beaches that can serve as expansion areas and provide sufficient habitat to accommodate and provide a rescue effect for nesting females whose primary nesting beach has been lost (resiliency and redundancy). Therefore, we have determined that the following physical or biological features are essential for the loggerhead sea turtle (78 FR 18000):

PBF 1 - Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

PBF 2 - Habitats Protected From Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

*Proposed Critical Habitat Primary Constituent Elements (PCEs)*

Under the ESA and its implementing regulations, the Service is required to identify the physical or biological features essential to the conservation of the loggerhead sea turtle in areas occupied at the time of listing, focusing on the features' primary constituent elements (PCEs). We consider primary constituent elements to be those specific elements of the physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species.

Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, we determine that the terrestrial primary constituent elements specific to the Northwest Atlantic Ocean DPS of the loggerhead sea turtle are:

PCE 1 - Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings, and (b) is located above mean high water to avoid being inundated frequently by high tides.

PCE 2 - Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and moisture content conducive to embryo development.

PCE 3 - Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and hatchlings and post nesting females orient to the sea.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet. The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 4** (from Bolten 2003).

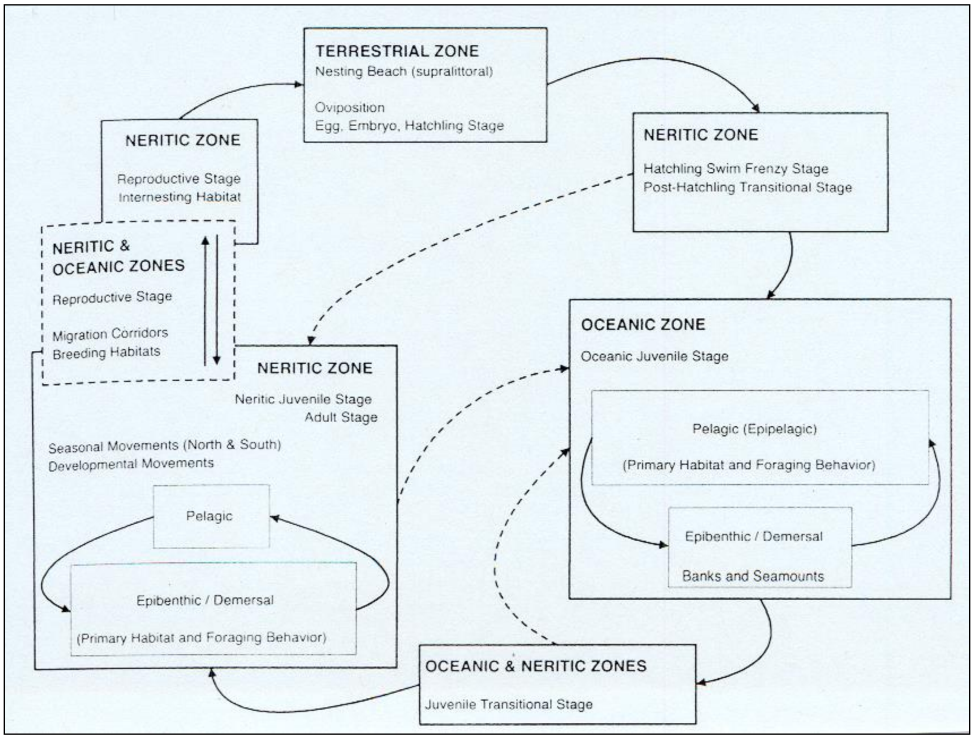


**Figure 4. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).**

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al.* 2002). **Table 1** summarizes key life history characteristics for loggerheads nesting in the U.S.

**Table 1. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).**

| **Life History Trait** | **Data** |
|---|---|
| Clutch size (mean) | 100-126 eggs[1] |
| Incubation duration (varies depending on time of year and latitude) | Range = 42-75 days[2,3] |

| | |
|---|---|
| Pivotal temperature (incubation temperature that produces an equal number of males and females) | 84˚F[5] |
| Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors) | 45-70 percent[2,6] |
| Clutch frequency (number of nests/female/season) | 3-4 nests[7] |
| Internesting interval (number of days between successive nests within a season) | 12-15 days[8] |
| Juvenile (<34 inches Curved Carapace Length) sex ratio | 65-70 percent female[4] |
| Remigration interval (number of years between successive nesting migrations) | 2.5-3.7 years[9] |
| Nesting season | late April-early September |
| Hatching season | late June-early November |
| Age at sexual maturity | 32-35 years[10] |
| Life span | >57 years[11] |

1 Dodd (1988).
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).
4 NMFS (2001); Foley (2005).
5 Mrosovsky (1988).
6 Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
7 Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
8 Caldwell (1962), Dodd (1988).
9 Richardson *et al.* (1978); Bjorndal *et al.* (1983).
10 Snover (2005).
11 Dahlen *et al.* (2000).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington 1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a 1- to 3-day interval and move upward and out of the nest over a 2- to 4-day interval (Christens 1990). The time from pipping to emergence ranges from 4 to 7 days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al*. (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure, and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): Peninsular Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in the U.S. has fluctuated between 49,000 and 90,000 nests per year from 1999-2010 (NMFS and Service 2008, FWC/FWRI 2010a). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U. S. beaches are distributed in waters off the eastern U. S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U. S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989, Baldwin *et al.* 2003). Based on standardized daily surveys of the highest nesting beaches and weekly surveys on all remaining island nesting beaches, approximately 50,000, 67,600, and 62,400 nests, were estimated in 2008, 2009, and 2010, respectively (Conant *et al*. 2009). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Status and distribution

Loggerhead Sea Turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.* 2000, NMFS 2001, Hawkes *et al.* 2005). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen 2010).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U. S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U. S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead recovery unit within the Northwest Atlantic Ocean DPS. Annual nest totals from northern beaches averaged 5446 nests from 2006 to 2011, a period of near-complete surveys of NRU nesting beaches, representing approximately 1,328 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984) (NMFS and Service 2008). In 2008, nesting in Georgia reached what was a new record at that time (1,646 nests), with a downturn in 2009, followed by yet another record in 2011 (1,987 nests). South Carolina had the two highest years of nesting in the 2000s in 2009 (2,183 nests) and 2010 (3,141 nests). The previous high for that 11-year span was 1,433 nests in 2003. North Carolina had 947 nests in 2011, which is above the average of 765. The Georgia, South Carolina, and North Carolina nesting data come from the seaturtle.org Sea Turtle Nest Monitoring System, which is populated with data input by the State agencies. The loggerhead nesting trend from daily beach surveys was declining significantly at 1.3 percent annually from 1983 to 2007 (NMFS and USFWS, 2008). Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina from 1980-2007. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008). Currently, however, nesting for the NRU is showing possible signs of stabilizing (76 FR 58868, September 22, 2011).

The PFRU is the largest loggerhead recovery unit within the Northwest Atlantic Ocean DPS and represents approximately 87 percent of all nesting effort in the DPS (Ehrhart *et al*. 2003). A near-complete nest census of the PFRU undertaken from 1989 to 2007 revealed a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008b, NMFS and Service 2008). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

Using INBS nest counts, a significant declining trend was documented for the Peninsular Florida Recovery Unit, where nesting declined 26 percent over the 20-year period from 1989–2008, and declined 41 percent over the period 1998-2008 (NMFS and USFWS 2008, Witherington *et al*. 2009). However, with the addition of nesting data through 2010, the nesting trend for the PFRU did not show a nesting decline statistically different from zero (76 FR 58868, September 22, 2011).

The NGMRU is the third largest nesting assemblage among the four U. S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984, (FWC 2008b, NMFS and Service 2008). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. Using Florida INBS data for the NGMRU (FWC 2008b), a log-linear regression showed a significant declining trend of 4.7 percent annually from 1997-2008 (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU was undertaken from 1995 to 2004, excluding 2002, (9 years surveyed) revealed a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008b, NMFS and Service 2008). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. A simple linear regression of 1995-2004 nesting data, accounting for temporal autocorrelation, revealed no trend in nesting numbers. Because of the annual variability in nest totals, it was determined that a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean and is the third largest recovery unit within the Northwest Atlantic Ocean DPS, with the majority of nesting at Quintana Roo, Mexico. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, TEWG (2009) reported a greater than 5 percent annual decline in loggerhead nesting from 1995-2006 at Quintana Roo.

*Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, see NMFS and Service 2008)*

1. Number of Nests and Number of Nesting Females
    a. Northern Recovery Unit

i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and
ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

b. Peninsular Florida Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit
   i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
   A network of in-water sites, both oceanic and neritic across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

Analysis of the species/critical habitat likely to be affected

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the ESA. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment.

In accordance with the ESA, the Service completes consultations with all Federal agencies for actions that may adversely affect sea turtles on the nesting beach. The Service's analysis only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS assesses and consults with Federal agencies concerning potential impacts to sea turtles in the marine environment, including updrift and downdrift nearshore areas affected by sand placement projects on the beach.

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting, and 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. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest.

Some individuals in a population are more "valuable" than others in terms of the number of offspring they are expected to produce. An individual's potential for contributing offspring to future generations is its reproductive value. Because of delayed sexual maturity, reproductive longevity, and low survivorship in early life stages, nesting females are of high value to a population. The loss of a nesting female in a small recovery unit would represent a significant loss to the recovery unit. The reproductive value for a nesting female has been estimated to be approximately 253 times greater than an egg or a hatchling (NMFS and Service 2008). However, the sand placement action includes avoidance and minimization measures that reduce the possibility of mortality of a nesting female on the beach as a result of the project. Therefore, we do not anticipate the loss of any nesting females on the beach as a result of the project.

With regard to indirect loss of eggs and hatchlings, on most beaches, nesting success typically declines for the first year or two following sand placement, even though more nesting habitat is available for turtles (Trindell *et al*. 1998, Ernest and Martin 1999, Herren 1999). Reduced nesting success on constructed beaches has been attributed to increased sand compaction, escarpment formation, and changes in beach profile (Nelson *et al*. 1987, Crain *et al*. 1995, Lutcavage *et al*. 1997, Steinitz et al. 1998, Ernest and Martin 1999, Rumbold *et al*. 2001). In addition, even though constructed beaches are wider, nests deposited there may experience higher rates of wash out than those on relatively narrow, steeply sloped beaches (Ernest and Martin 1999). This occurs because nests on constructed beaches are more broadly distributed than those on natural beaches, where they tend to be clustered near the base of the dune. Nests laid closest to the waterline on constructed beaches may be lost during the first year or two following construction as the beach undergoes an equilibration process during which seaward portions of the beach are lost to erosion. As a result, the sand project is anticipated to result in decreased nesting and loss of nests that do get laid within the project area for two subsequent nesting seasons following the completion of the proposed sand placement. However, it is important to note that it is unknown whether nests that would have been laid in a project area during the two subsequent nesting seasons had the project not occurred are actually lost from the population or if nesting is simply displaced to adjacent beaches. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service 2008). Thus, even if the majority of the eggs and hatchlings that would have been produced on the project beach are not realized for up to 2 years following project completion, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) some nesting is likely just displaced to adjacent non-project beaches, 2) not all eggs will produce hatchlings, and 3) destruction and/or failure of nests will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, and predation.

During project construction, direct mortality of the developing embryos in nests within the project area may occur for nests that are missed and not relocated. The exact number of these missed nests is not known. However, in two separate monitoring programs on the east coast of Florida where hand digging was performed to confirm the presence of nests and thus reduce the chance of missing nests through misinterpretation, trained observers still missed about 6 to 8 percent of the nests because of natural elements (Martin 1992, Ernest and Martin 1993). This must be considered a conservative number, because missed nests are not always accounted for. In another study, Schroeder (1994) found that even under the best of conditions, about 7 percent of nests can be misidentified as false crawls by highly experienced sea turtle nest surveyors. Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service 2008). Thus, even if, for example, the number of missed nests approaches twice the rate mentioned above, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) not all eggs in all unmarked nests will produce hatchlings, and 2) destruction and/or failure of a missed nest will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, predation, accretion of sand, and erosional processes.

In the U. S., consultations with the Service have included military missions and operations, beach renourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of along the coast. Much of the Service's section 7 consultation involves beach renourishment projects. The ESA does not require entities conducting projects with no Federal nexus to apply for a section 10(a)(1)(B) permit. This is a voluntary process and is applicant driven. Section 10(a)(1)(A) permits are scientific permits that include activities that would enhance the survival and conservation of a listed species. Those permits are not listed as they are expected to benefit the species and are not expected to contribute to the cumulative take assessment. A list of the Service's consultations completed over the last five years is included in Appendix C.

A list of completed NMFS consultations is included in Appendix D.

The Service proposed critical habitat for the loggerhead NRU in the Federal Register (Vol. 78, No. 57) on March 25, 2013. Critical habitat was not proposed for the action area.

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 2 is a chronology of the recent beach renourishments and erosion control efforts along Tybee Island beach.

Table 2. Chronology of Recent Beach Renourishment and Erosion Control Efforts
Tybee Island, Georgia (USACE 2012)

| **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 renourishment. – Borrow Area #3 was utilized.<br>2,262,100 yard$^3$ of sand placed on the beach between North End Terminal Groin and 18$^{th}$ 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.<br>First renourishment -1,200,000 yard$^3$ of sand placed from between the groins.<br>157,000 yard$^3$ of sand placed on 1,400 foot of shoreline south of South End Groin.<br>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<br>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<br>50,000 yard$^3$ of sand placed within South Tip Groin Field by GPA.<br>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.<br>Back River Groin renourishment quantities are: Armor Stone 4,631 tons, Underlay Stone 619 tons, & Bedding Material 1,847 tons<br>Back River/Tybee Creek Beach 86,319 yard$^3$<br>Second Street Beach 1,267,738 yard$^3$<br>South Beach 118,654 yard$^3$<br>Back River/Tybee Creek/North of Seawall 7,859 yard$^3$ |
| 2001 - 2004 | Monitoring<br>North end groin/start of renourishment area 26,660 yard$^3$ accretion<br>Second Street renourishment area 369,858 yard$^3$ erosion<br>Middle Beach 25,954 yard$^3$ erosion<br>South Beach (Tybrisa) renourishment area 92,620 yard$^3$ erosion<br>South Tip Beach 33,685 yard$^3$ accretion<br>Back River/Tybee Creek at seawall 24,428 yard$^3$ erosion<br>Back River/Tybee Creek north of seawall 27,913 yard$^3$ accretion<br>Average annual 142,084 yard$^3$ erosion |
| 2008 | Oceanfront Beach Renourishment with material from Borrow Area 4<br>Back River/Tybee Creek- 39,679 yd3<br>Oceanfront Beach- 1,187,469 yd3 (between Gulick Street and the South End Groin- 13,200 feet long) |

## Status of the species within the action area

### Loggerhead Sea Turtle

One of the five loggerhead sea turtle recovery units, the NRU, occurs within the proposed action area. 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 a 10-year average of 10.3 sea turtle nests per year (Table 3) and a 25-year average of 7.6 nests. The last two years, 2012 and 2013, have had the highest number of nests, 23 and 21 respectively in records dating back to 1989 (Georgia Department of Natural Resources (GADNR) unpublished data).

The number of sea turtle nests on Tybee Island is much lower than the numbers on larger or government owned islands. The islands owned by the Federal or State government are usually protected from heavy human development, alteration, and disturbance. However, considering the perceived longterm 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 between the terminal groins, it does contribute to the total sea turtle nesting on Georgia's coast. The numbers of sea turtle nests on the Tybee Island beach each year fluctuates, as it does on all beaches. Figure 5 shows sea turtle nesting on Tybee from 1999 to 2013. Figure 6 shows sea turtle false crawls during the same period.

Table 3. Tybee Island, Georgia – 10-year sea turtle nesting by year (GADNR unpublished data)

| Year | Number of nests |
|---|---|
| 2004 | 5 |
| 2005 | 4 |
| 2006 | 10 |
| 2007 | 11 |
| 2008 | 6 |
| 2009 | 3 |
| 2010 | 10 |
| 2011 | 10 |
| 2012 | 23 |
| 2013 | 21 |

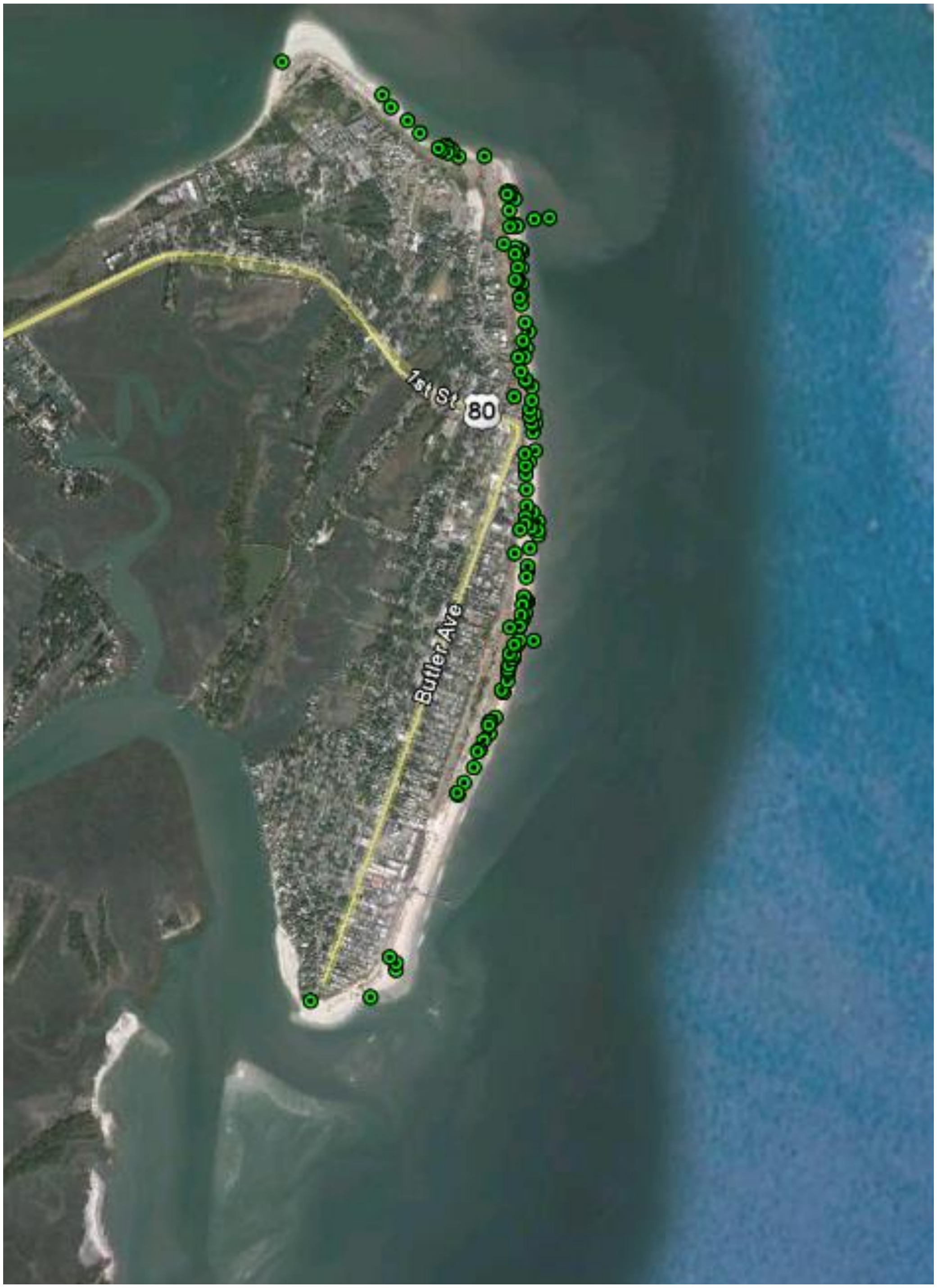

Figure 5  Sea turtle nesting on Tybee Island from 1999 to 2013.

Figure 6  Sea turtle false crawls on Tybee Island from 1999 to 2013.

Factors affecting the species environment within the action area

The Service and the NMFS share Federal jurisdiction for sea turtles under the ESA.  The Service has responsibility for sea turtles on the nesting beach.  NMFS has jurisdiction for sea turtles in the marine environment. Activities proposed in this formal consultation would involve only impacts to sea turtles in the terrestrial environment, which includes the following life stages: nesting sea turtles, nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea.

A number of ongoing anthropogenic and natural factors may affect loggerheads. 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.

*Coastal Development*

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

Service reviews of permits for development and redevelopment indicate that the City of Tybee continues to grow in human population. This brings more human activity, construction, and disturbance to the beaches.

*Hurricanes*

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct loss of sea turtle nests, either by erosion or washing away of the nests by wave action and inundation or “drowning” of the eggs or pre-emergent hatchlings within the nest, or indirectly by causing the loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). The manner in which hurricanes affect sea turtle nesting also depends on their characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no immediate development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their pre-storm locations can result in a loss of nesting habitat.

*Beachfront Lighting*

Artificial lights along a beach can deter females from coming ashore to nest or misdirect females trying to return to the surf after a nesting event. A significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Artificial beachfront lighting may also cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. In addition, research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2010 sea turtle nesting season in Florida, over 47,000 turtle hatchlings were documented as being disoriented (FWC/FWRI 2011).

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 will continue to have the potential to impact sea turtles on Tybee Island. Periodic lighting surveys and vigilant enforcement efforts will be needed to protect turtles from lighting impacts. Periodic lighting surveys done by GADNR and Tybee Island show an improvement in ordinance compliance through time (Mark Dodd, GADNR, personal communication, 2013).

*Predation*

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U. S. are ghost crabs (*Ocypode quadrata*), raccoons (*Procyon lotor*), feral hogs (*Sus scrofa*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos (*Dasypus novemcinctus*), and fire ants (*Solenopsis invicta*) (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U. S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al*. 1980, Schroeder 1981, Labisky *et al.* 1986).

*Beach Driving*

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach that interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing pre-emergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

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

*Climate Change*

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U. S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007).

In the southeastern U. S., climatic change could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other “at risk” species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Temperatures are predicted to rise from 1.6°F to 9°F for North America by the end of this century (IPCC 2007a, b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2009).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council 1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

*Recreational Beach Use*

There is increasing popularity in the southeastern United States, especially in Florida, for beach communities to carry out beach cleaning operations to improve the appearance of beaches for visitors and residents. Beach cleaning occurs on private beaches and on some municipal or county beaches that are used for nesting by loggerhead sea turtles. Beach cleaning activities effectively remove “seaweed, fish, glass, syringes, plastic, cans, cigarettes, shells, stone, wood, and virtually any unwanted debris” (Barber and Sons 2012). Removal of wrack material (organic material that is washed up onto the beach by surf, tides, and wind) reduces the natural sand-trapping abilities of beaches and contributes to their destabilization. As beach cleaning vehicles and equipment move over the sand, sand is displaced downward, lowering the substrate. Although the amount of sand lost due to single sweeping actions may be small, it adds up considerably over a period of years (Neal *et al.* 2007). In addition, since the beach cleaning vehicles and equipment also inhibit plant growth and open the area to wind erosion, the beach and dunes may become unstable. Beach cleaning "can result in abnormally broad unvegetated zones that are inhospitable to dune formation or plant colonization, thereby enhancing the likelihood of erosion" (Defeo *et al.* 2009). This is also a concern because dunes and vegetation play an important role in minimizing the impacts of artificial beachfront lighting, which causes disorientation of sea turtle hatchlings and nesting turtles, by creating a barrier that prevents residential and commercial business lighting from being visible on the beach.

Human presence on the beach at night during the nesting season can reduce the quality of nesting habitat by deterring or disturbing and causing nesting turtles to avoid otherwise suitable habitat. In addition, human foot traffic can make a beach less suitable for nesting and hatchling emergence by increasing sand compaction and creating obstacles to hatchlings attempting to reach the ocean (Hosier *et al.* 1981).

The use and storage of lounge chairs, cabanas, umbrellas, catamarans, and other types of recreational equipment on the beach at night can also make otherwise suitable nesting habitat unsuitable by hampering or deterring nesting by adult females and trapping or impeding hatchlings during their nest to sea migration. The documentation of non-nesting emergences (also referred to as false crawls) at these obstacles is becoming increasingly common as more recreational beach equipment is left on the beach at night. Sobel (2002) describes nesting turtles being deterred by wooden lounge chairs that prevented access to the upper beach.

*Sand Placement*

Sand placement projects may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach renourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after renourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005)

Beach compaction and unnatural beach profiles resulting from beach renourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on renourished 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 renourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches renourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a renourished 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 renourished beach will remain uncompacted for only up to 1 year. Thus, multi-year beach compaction monitoring and, if necessary, tilling would help to ensure that project impacts on sea turtles are minimized.

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

Renourishment previously occurred along portions of the action area in 1993, 1994, 1998, and 2008. 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 renourishment were temporary as subsequent tilling of the new beach offset sand compaction concerns.

*In-water and Shoreline Alterations*

Many navigable mainland or barrier island tidal inlets along the Atlantic and Gulf of Mexico coasts are stabilized with jetties or groins. Jetties are built perpendicular to the shoreline and extend through the entire nearshore zone and past the breaker zone to prevent or decrease sand deposition in the channel (Kaufman and Pilkey 1979). Groins are also shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents and can cause downdrift erosion (Kaufman and Pilkey 1979).

These in-water structures have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Jetties and groins placed to stabilize a beach or inlet prevent normal sand transport, resulting in accretion of sand on updrift beaches and acceleration of beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation. In addition to decreasing nesting habitat suitability, construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting.

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 September 30, 2013, 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. Some of these structures are still functioning. However, some of the structures do not appear to be holding sand and are instead, may be an impediment to female sea turtles attempting to crawl onto the upper beach to successfully nest.

EFFECTS OF THE ACTION

The proposed project will occur within habitat that is used by sea turtles for nesting. The proposed project is expected to commence November 2015, and be completed by April 30, 2016. This time period is outside of loggerhead nesting season. The previous two renourishments in 2000 and 2008, were scheduled and occurred outside of sea turtle nesting season. There is the possibility this proposed project may be constructed during a portion of 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*: Sand placement activities would occur within nesting habitat for sea turtles and adjacent to dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead nesting females, their nests, and hatchling sea turtles.

*Distribution*: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur in Chatham County, on Tybee Island. The proposed action would cover the entire Oceanfront Beach from the north terminal groin to the southern terminal groin and an area on the southwest side of the island in Tybee Creek to the city fishing pier (referred to as Back River Beach). Construction pipeline and heavy equipment may be on the beach between the southern terminal groin and the Back River Beach area to facilitate movement of renourishment sand onto the southwest side of the island.

*Timing*: The sea turtle nesting season for Tybee Island is considered to extend between May 1 and October 31. The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles if conducted between these times.

*Nature of the effect*: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, and cause reduced hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in the southeastern United States.

*Duration*: The proposed beach renourishment on Tybee Island is the last periodic renourishment in the currently authorized 50-year project. Generally, Tybee Island beach is planned to be renourished every seven years. This renourishment is planned to last the nine years left in the 50-year authorized project. The maximum amount of beach that will be renourished is shown in Figure 2. Tentative plans are to begin the project after October 31, 2015. Completion is tentatively scheduled by April 30, 2016. 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 2016 sea turtle nesting season would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

*Disturbance frequency*: Sea turtle populations in the southeastern United States may experience decreased nesting success, hatching success, and hatchling emerging success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of one or two nesting seasons.

*Disturbance intensity and severity*: Depending on the need (including post-disaster work) and the timing of the sand placement activities during the sea turtle nesting season, effects to the sea turtle populations in the southeastern United States could be important. For loggerheads, extirpation of the Tybee Island nesting population may be able to be replenished by regional dispersal from other barrier islands.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a renourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach renourishment can have adverse effects on nesting and hatchling sea turtles and sea turtle nests. Results of monitoring sea turtle nesting and beach renourishment activities provide additional information on how sea turtles respond to renourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach renourishment monitoring is used to manage beach renourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach renourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles.

Direct Effects

Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 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 surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981,

McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach renourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties, and future sand migration.

2. Equipment

The use of heavy machinery and placement of construction pipeline on beaches during a construction project may also have adverse effects on sea turtles. Equipment and pipe left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a nesting turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over hatchlings attempting to reach the ocean, and vehicle ruts on the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of a rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire 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, as well as directly kill pre-emergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on duration of the project, vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, the areas for the truck transport and bulldozer/bobcat equipment to work in should be designated and marked.

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 2007). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity, leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach renourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected renourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to pre-nourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the renourished area. Disorientations on beaches in the County that were not renourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was renourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including renourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after renourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the renourished area in 1998 and 66 percent of the reports were in the renourished area in 1999 (Howard and Davis 1999).

Indirect Effects

Many of the direct effects of beach renourishment 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 future sand migration.

1. Increased susceptibility to catastrophic events
Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be

subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

2. Increased beachfront development

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

3. Changes in the physical environment

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

Beach renourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after renourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 7**).

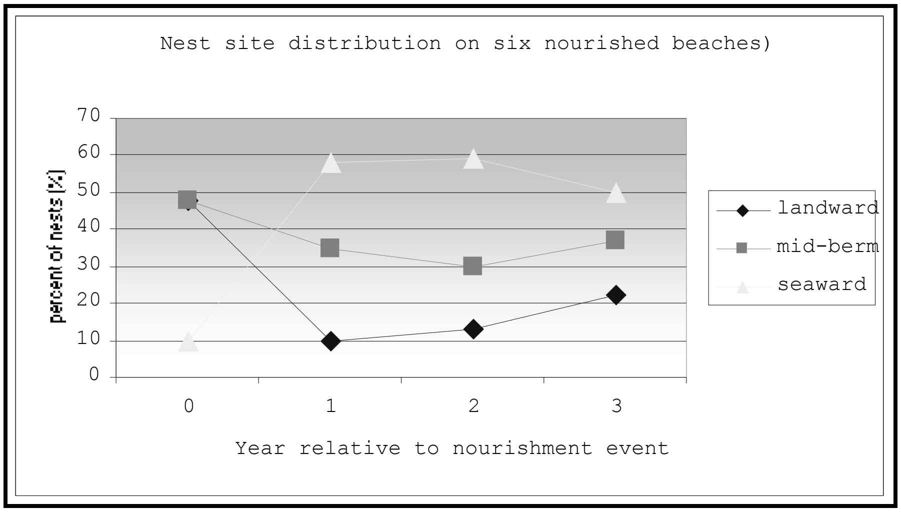


**Figure 7. Review of sea turtle nest site selection following nourishment (Trindell 2005).**

Beach compaction and unnatural beach profiles resulting from beach renourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on renourished 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 renourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches renourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a renourished 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 renourished beach will remain uncompacted for only up to 1 year. Thus, multi-year beach compaction monitoring and, if necessary, tilling would help to ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the renourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark renourishment 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 renourished 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). Escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

6. Erosion
Future sand displacement on nesting beaches is a potential effect of the renourishment project. Dredging of sand offshore from a project area has the potential to cause erosion of the newly created beach or other areas on the same or adjacent beaches by creating a sand sink. The remainder of the system responds to this sand sink by providing sand from the beach to attempt to reestablish equilibrium (National Research Council 1990b).

The proposed project would dredge sand from a borrow area 4,000 feet (0.75 miles) from the southeast corner of Tybee Island. General sand migration is north to south in this area. The adjacent island to the south is Little Tybee Island. The USACE states in the draft EA, section E.3.04.04. Erosion History, Little Tybee Island, that no discernible cause and effect relationship between ongoing shoreline protection projects at Tybee Island and measured shoreline changes at Little Tybee Island has been made or expected.

<u>Species' response to a proposed action</u>

The following summary illustrates sea turtle responses to and recovery from a renourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on renourished 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 renourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on renourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on renourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the renourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour.

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

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 ESA. The Service is not aware of any cumulative effects in the project area.

***Piping Plover***

**STATUS OF THE SPECIES/CRITICAL HABITAT**

***Species/critical habitat description***

*Listing*

On January 10, 1986, the piping plover (*Charadrius melodus*) was listed under the Endangered Species Act (ESA) 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). However, the final listing rule did not utilize subspecies. The preamble of this rule acknowledged the continuing recognition of two subspecies, *Charadrius melodus melodus* (Atlantic Coast of North America) and *Charadrius melodus circumcinctus* (Northern Great Plains of North America) in the American Ornithologist Union's most recent treatment of subspecies (AOU 1957). However, it also noted that allozyme studies with implications for the validity of the subspecies were in progress. The final rule determined the species as endangered in the Great Lakes watershed of both the U. S. and Canada and as threatened in the remainder of its range in the U.S. (Northern Great Plains, Atlantic and Gulf Coasts, Puerto Rico, Virgin Islands), Canada, Mexico, Bahamas, and the West Indies (USFWS 1985).

Subsequent ESA actions have consistently recognized three separate breeding populations of piping plovers on the Atlantic Coast (threatened), Great Lakes (endangered) and Northern Great Plains (NGP) (threatened). Piping plovers that breed on the Atlantic Coast of the U. S. and Canada belong to the subspecies *C. m. melodus*. The second subspecies, *C. m. circumcinctus,* is comprised of two Distinct Population Segments (DPS). One DPS breeds on the Northern Great Plains of the U.S. and Canada, while the other breeds on the Great Lakes. Each of these three entities is demographically independent. The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004) (**Figure 8**).

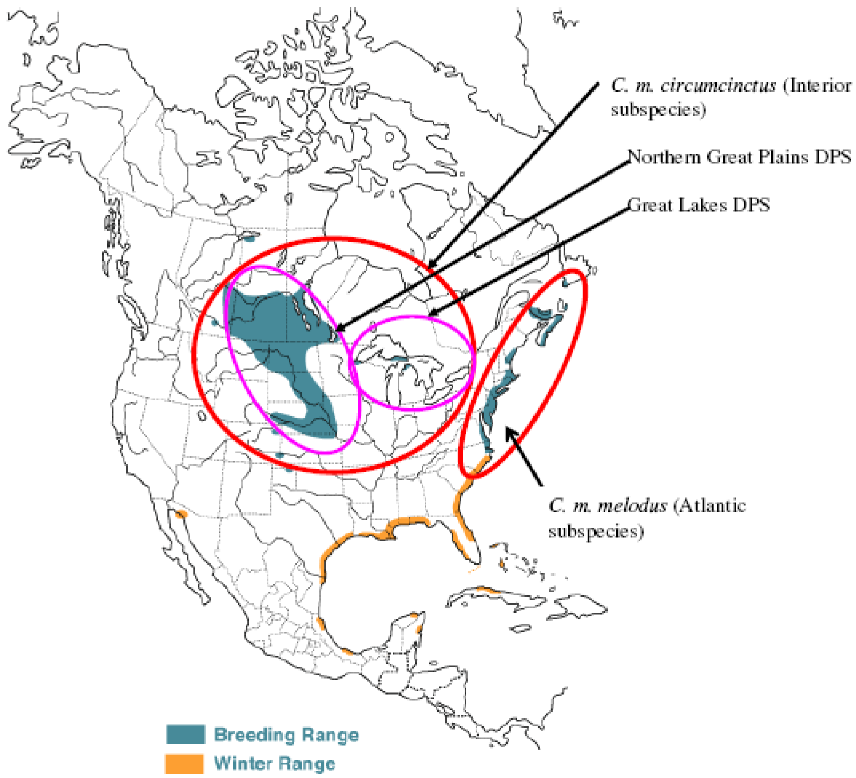


**Figure 8**. **Distribution and range of piping plovers (base map from Elliott-Smith and Haig 2004). Conceptual presentation of subspecies and DPS ranges are not intended to convey precise boundaries.**

Two successive recovery plans established delisting criteria for the threatened Atlantic Coast breeding population (USFWS 1988a, 1996). A joint recovery plan specified separate criteria for the endangered Great Lakes and threatened Northern Great Plains populations (USFWS 1988b), and the Service later approved a recovery plan exclusive to the Great Lakes population (USFWS 2003).

*Designated Critical Habitat*

The Service has designated critical habitat for the piping plover on three occasions. Two of these designations protected different breeding populations. Critical habitat for the Great Lakes breeding population was designated May 7, 2001, (66 [FR] (Federal Register) 22938, USFWS 2001a), and critical habitat for the northern Great Plains breeding population was designated September 11, 2002, (67 FR 57637, USFWS 2002a). No critical habitat has been proposed or designated for the Atlantic Coast breeding population, but the needs of all three breeding populations were considered in the 2001 critical habitat designation for wintering piping plovers (66 FR 36038, USFWS 2001b) and subsequent redesignations (USFWS 2008d, 2009d). 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.

Critical habitat for wintering piping plovers currently comprises 141 units totaling 256,513 acres along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. The original designation included 142 areas (the rule erroneously states 137 units) encompassing approximately 1,798 miles of mapped shoreline and 165,211 acres of mapped areas (USFWS 2001b). A revised designation for four North Carolina units was published in 2008 (USFWS 2008d). Eighteen revised Texas critical habitat units were designated in 2009, replacing 19 units that were vacated and remanded by a 2006 court order (USFWS 2009d). Designated areas include habitats that support roosting, foraging, and sheltering activities of piping plovers.

The primary constituent elements (PCEs) 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 those coastal areas that support intertidal beaches and flats and associated dune systems and flats above annual high tide (USFWS 2001a). PCEs of wintering piping plover critical habitat include sand or mud flats or both with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (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).

***Life History***

The piping plover, named for its melodic call, is a small North American shorebird approximately 17 centimeters (7 inches) long with a wingspan of about 38 cm (15 in) and weighing 40-65 grams (1.4-2.3 oz) (Palmer 1967, Elliot-Smith and Haig 2004). Piping plovers live an average of five years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu *et al*. 1990; Cross 1990; Goldin *et al*. 1990; MacIvor 1990; Hake 1993). 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 re-nest several times if previous nests are lost.

Plovers depart their breeding grounds for their wintering grounds from July through late August, but southward migration extends through November. Piping plovers spend up to 10 months of their life cycle on their migration and winter grounds, generally July 15 through as late as May 15. Piping plovers migrate through and winter in coastal areas of the U. S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from other breeding or wintering piping plovers.

Adult piping plovers can arrive on wintering grounds with partial breeding plumage remaining (a single black breastband, which is often incomplete, and a black bar across the forehead). During the late summer or early autumn, the birds lose the black bands, the legs fade from orange to pale yellow, and the bill turns from orange and black to mostly black (**Figure 9**). Most adults begin their molt into breeding plumage before northward migration and complete the molt before arrival on their breeding sites. Piping plover subspecies are considered phenotypically indistinguishable, although slight clinal breeding plumage variations between populations have been noted (Elliot-Smith and Haig 2004).


**Figure 9. Adult breeding plumage (left) and nonbreeding plumage (right).**

*Habitat Use*

Wintering piping plovers utilize a mosaic of habitat patches and move among these patches in response to local weather and tidal conditions (Nicholls and Baldassarre 1990a, Nicholls and Baldassarre 1990b, Drake *et al*. 2001, Cohen *et al*. 2008). Preferred coastal habitats include sand spits, small islands, tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Nicholls and Baldassarre 1990b, Harrington 2008, Addison 2012). Sandy mud flats, ephemeral pools, seasonally emergent seagrass beds, mud/sand flats with scattered oysters, and overwash fans are considered primary foraging habitats (Nicholls and Baldassarre 1990b, Cohen *et al*. 2008). A South Carolina study strongly links plover habitat use to the abundance of key invertebrate taxa (SCDNR 2011). Plovers vary their use of ocean beaches and bay shorelines and flats in Texas depending on season and in response to weather conditions (Zdravkovic and Durkin 2011, Zonick 2000).

Studies in North Carolina, South Carolina, Texas, and Florida complement earlier investigations of the habitat use patterns (Zivojnovich and Baldassarre 1987, Johnson and Baldassarre 1988, Nicholls and Baldassarre 1990a and 1990b, Fussell 1990, Drake et. al. 2001). Nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound islands for foraging. On ocean beaches they exhibited roosting, preening, and alert behaviors (Cohen *et al*. 2008). The probability of piping plovers being present on the sound islands increased as exposure of the intertidal areas increased (Cohen *et al*. 2008). Maddock *et al*. (2009) also observed shifts in roosting habitats and behaviors during high-tide periods in South Carolina. Similar patterns in Gulf Coast studies confirm high plover numbers on Gulf beaches during migration (July-October) and when wind conditions inundate bayside flats (Zdravkovic and Durkin 2011, Pinkston 2004, Zonick 2000).

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers[1]. Lott *et al*. (2009b) found that more than 90% of roosting piping plovers in southwest Florida were roosting in old wrack. In South Carolina, 45% of roosting piping plovers were in old wrack, and 18% were in fresh wrack (Maddock *et al*. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates (Smith 2007). In Texas, seagrass debris (bayshore wrack) was found to be an important feature of piping plover roost sites (Drake 1999).

Intertidal areas provide key foraging habitats. Exposed intertidal areas were the dominant foraging substrate, both in South Carolina (accounting for 94% of observed foraging piping plovers; Maddock *et al*. 2009) and in northwest Florida (96% of foraging observations; Smith 2007). In southwest Florida, Lott *et al*. (2009b) found approximately 75% of foraging piping plovers on intertidal substrates with bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers. In northwest Florida, however, Smith (2007) reported that landform use by foraging piping plovers was almost equally divided between Gulf (ocean-facing) and bay beaches. Zonick (2000) found dietary differences across the range of piping plovers in Texas, with plovers along the northern Texas coast feeding predominantly on polychaetes while those observed further south largely fed on insects and other arthropods.

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1 Wrack also contains invertebrate organisms consumed by piping plovers and other shorebirds.

Atlantic and Gulf Coast studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90% of observations of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott *et al*. 2009b). In an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008), piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Scores test) at inlet versus non-inlet locations. Wintering plovers on the Atlantic Coast prefer wide beaches in the vicinity of inlets (Nicholls and Baldassarre 1990b, Wilkinson and Spinks 1994). At inlets, foraging plovers are associated with moist substrate features such as intertidal flats, algal flats, and ephemeral pools (Nicholls and Baldassarre 1990b, Wilkinson and Spinks 1994, Dinsmore *et al*. 1998, Addison 2012).

In South Carolina, multivariate analyses showed that many of the taxa responsible for the temporal changes in composition of the invertebrate community at occupied foraging sites were also responsible for the changes associated with site abandonment by piping plovers (SCDNR 2011). This suggests that taxa changes in the diets of migratory and overwintering piping plovers were occurring both within individual foraging sites (leading to subsequent site-abandonment) and within the larger Kiawah Island/Bird Key system, potentially contributing to declines in the overwintering population. The study further suggests that larger, errant polychaetes such as the families Nereididae, Glyceridae, and Oenonidae may be particularly important to piping plover overwintering in this region. Consequently, habitat changes, whether natural or anthropogenic in origin, that affect polychaete densities may also affect overwintering populations of the piping plover (SCDNR 2011).

Geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas in washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels) and at the mouths of rivers feeding into major bay systems (Arvin 2008). Earlier studies in Texas indicated the importance of washover passes or fans which were commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997, Zonick 2000). Surveys of the Lower Laguna Madre in Texas found piping plovers using both Gulf beach and bayside areas during the fall 2009 migratory period. These include Gulf beaches, inlet shorelines, bay shorelines of barrier islands, shorelines of islands in the bay (natural and dredged-material), mainland bay shorelines, tidal flats and other habitats such as isolated “pools” of evaporating water also associated with bay habitats. A clear shift from Gulf beaches to bay habitats occurred during the wintering period, as well as during certain wind and weather conditions (Zdravkovic and Durkin 2011). Piping plovers have also been observed in high numbers on seasonally emergent seagrass beds and oyster-studded mud flats in several central Texas coastal bays (Cobb *in* Elliott-Smith *et al*. 2009).

*Winter Site Fidelity*

Piping plovers exhibit a high degree of intra- and inter-annual fidelity to wintering areas, which often encompass several relatively nearby sites (Drake *et al*. 2001, Noel and Chandler 2008, Stucker *et al*. 2010). Gratto-Trevor *et al*. (2012) found little movement between or among regions (**Figure 10**), and reported that 97% of the birds they surveyed remained in the same region, often at the same beach. Only six of 259 banded piping plovers were observed more than once per winter moving across boundaries of seven U. S. regions. Of 216 birds observed in multiple years, only eight changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor *et al*. 2012). Although many sites on the northern Gulf Coast of Texas and in Louisiana were affected by hurricanes after the 2008 fall migration, none of the 17 birds known to have wintered in these areas before the hurricane and resighted afterward moved from their original areas (Gratto-Trevor *et al*. 2012).

The areas used by wintering piping plovers often comprise habitats on both sides of an inlet, nearby sandbars or shoals, and ocean and bayside shorelines. In South Carolina, Maddock *et al*. (2009) documented many movements back and forth across inlets by color-banded piping plovers, as well as occasional movements of up to 18 km by approximately 10% of the banded population. Similarly, eight banded piping plovers that were observed in two locations during the 2006-2007 surveys in Louisiana and Texas were all in close proximity to their original location, such as on the bay and ocean side of the same island or on adjoining islands (Maddock 2008).

The mean-average home-range size for 49 radio-marked piping plovers in southern Texas in 1997-1998 was 12.6 $km^2$; the mean core area was 2.9 $km^2$; and the mean linear distance moved between successive locations, averaged across seasons, was 3.3 km (Drake *et al*. 2001). Seven radio-tagged piping plovers used a 20.1 $km^2$ area at Oregon Inlet, North Carolina, in 2005-2006, and piping plover activity was found to be concentrated in 12 areas totaling 2.2 $km^2$ that were located on both sides of the inlet (Cohen *et al*. 2008). Noel and Chandler (2008) also observed high site fidelity of banded piping plovers to 1-4.5 km sections of beach on Little St. Simons Island, Georgia.

*Intra- and Inter-specific Interactions*

Piping plovers are often found in association with other shorebird species during the nonbreeding season, as many shorebird species utilize the southern Atlantic and Gulf Coasts for migration and wintering (Nicholls and Baldassarre 1990b, Eubanks 1992, Helmers 1992). Migrating and wintering piping plovers often roost close to conspecifics, as well as in multi-species flocks (Nicholls and Baldassarre 1990b, Zonick and Ryan 1993, Elliott and Teas 1996, Drake 1999). During foraging, however, territorial and agonistic interactions with other piping plovers and with similar-sized plover species, including semipalmated and snowy plovers, are relatively common (Johnson and Baldassarre 1988, Zonick and Ryan 1993, Elliott and Teas 1996, Drake 1999). Burger *et al*. (2007) observed competition for foraging space among shorebird species foraging in Delaware Bay, especially between shorebirds and larger gulls. Intra- and inter-specific competition for foraging habitat may be increased by continuing habitat loss and degradation, as well as by disturbance due to human recreation, forcing some piping plovers to forage or roost in suboptimal habitats and thereby affecting their energetic budgets. Shorebirds require extensive fat reserves to complete migrations. Birds with less than maximum fat reserves are expected to show reduced survival rates (Brown *et al*. 2001).

***Population dynamics***

The data from the International Piping Plover Breeding Censuses represent a minimum estimate of all three breeding populations (**Table 4**). Although the effort is as comprehensive as possible, some populations and some areas are able to be more intensively monitored than others outside of Census years. However, some portions of populations are only monitored during Census years (NGP Canada) so this data is currently the best way to get a rough estimate of the status of all three breeding populations. The data from the most recent (2011) Census is still being compiled so the final results are not available at this time. However, the 2006 Piping Plover Breeding Census documented 3,512 breeding pairs with a total of 8,084 birds throughout Canada and U. S (Elliott-Smith *et al*. 2009) (**Table 4**).

**Table 4. Number of Adults Documented During the 1991, 1996, 2001, 2006, and 2011 International Piping Plover Breeding Census (Haig *et al*. 2005, Elliott-Smith *et al*. 2009, USGS preliminary unpublished data).**

| **Population** | **Number of piping plovers** | | | | |
|---|---|---|---|---|---|
| | **1991** | **1996** | **2001** | **2006** | **2011 (preliminary)** |
| NGP | 3469 | 3286 | 2953 | 4662 | 2209 |
| *Canada* | 1437 | 1687 | 972 | 1703 | 996 |
| *U.S.* | 2032 | 1599 | 1981 | 2959 | 1213 |
| Great Lakes | 40 | 48 | 72 | 110 | - |
| *Canada* | 0 | 1 | 1 | 1 | - |
| *U.S.* | 40 | 47 | 71 | 109 | - |
| Atlantic Coast | 1641 | 2591 | 2911 | 3312 | - |
| *Canada* | 509 | 422 | 481 | 457 | - |
| *U.S.* | 1462 | 2169 | 2430 | 2855 | - |
| **Total** | **5480** | **5925** | **5936** | **8084** | **-** |

*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 decline of piping plovers on rivers in the Northern Great Plains has been largely attributed to the loss of sandbar island habitat and forage base due to dam construction and operation. Nesting occurs on sand flats or bare shorelines of rivers and lakes, including sandbar islands in the upper Missouri River system, and patches of sand, gravel, or pebbly-mud on the alkali lakes of the northern Great Plains. Plovers do nest on shorelines of reservoirs created by the dams, but

reproductive success is often low and reservoir habitat is not available in many years due to high water levels or vegetation. Dams operated with steady constant flows allow vegetation to grow on potential nesting islands, making these sites unsuitable for nesting. Population declines in alkali wetlands are attributed to wetland drainage, contaminants, and predation.

Since the Northern Great Plains population is geographically widespread, with many birds in very remote places, especially in the U. S. and Canadian alkali lakes. Thus, determining the number of birds or even identifying a clear trend in the population is a difficult task. The International Piping Plover Census (IPPC) was designed, in part, to help deal with this problem by instigating a large effort every five years in which an attempt is made to survey every area with known or potential piping plover breeding habitat during a two-week window (i.e., the first two weeks of June). The relatively short window is designed to minimize double counting if birds move from one area to another. The 1988 recovery plan, which is currently being revised, uses the numbers from the IPPC as a major criterion for delisting, as does the 2006 Canadian Recovery Plan (Environment Canada 2006).

*Great Lakes Population*

The Great Lakes plovers once nested on Great Lakes beaches in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario. Great Lakes piping plovers nest on wide, flat, open, sandy or cobble shoreline with very little grass or other vegetation. Reproduction is adversely affected by human disturbance of nesting areas and predation by foxes, gulls, crows and other avian species. Shoreline development, such as the construction of marinas, breakwaters, and other navigation structures, has adversely affected nesting and brood rearing.

The Great Lakes piping plover population, which has been traditionally represented as the number of breeding pairs, has fluctuated since the completion of the recovery plan in 2003 (Cuthbert and Roche 2006, 2007; Westbrock *et al*. 2005; Stucker and Cuthbert 2004; Stucker *et al*. 2003). The Great Lakes piping plover recovery plan documents the 2002 population at 51 breeding pairs (USFWS 2003). The most recent data from the 2013 breeding season reported 66 breeding pairs. The total population from 2002 through 2013 has fluctuated from a low of 51 in 2002, a high of 71 in 2009, to 66 in 2013.

*Atlantic Coast Population*

The Atlantic Coast piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. Historical population trends for the Atlantic Coast piping plover have been reconstructed from scattered, largely qualitative records. Nineteenth-century naturalists, such as Audubon and Wilson, described the piping plover as a common summer resident on Atlantic Coast beaches (Haig and Oring 1987). However, by the beginning of the $20^{th}$ Century, egg collecting and uncontrolled hunting, primarily for the millinery trade, had greatly reduced the population, and in some areas along the Atlantic Coast, the piping plover was close to extirpation. Following passage of the Migratory Bird Treaty Act (40 Stat. 775; 16

U.S.C. 703-712) in 1918, and changes in the fashion industry that no longer exploited wild birds for feathers, piping plover numbers recovered to some extent (Haig and Oring 1985).

Available data suggest that the most recent population decline began in the late 1940s or early 1950s (Haig and Oring 1985). Reports of local or statewide declines between 1950 and 1985 are numerous, and many are summarized by Cairns and McLaren (1980) and Haig and Oring (1985). While Wilcox (1939) estimated more than 500 pairs of piping plovers on Long Island, New York, the 1989 population estimate was 191 pairs (see Table 4, USFWS 1996). There was little focus on gathering quantitative data on piping plovers in Massachusetts through the late 1960s because the species was commonly observed and presumed to be secure. However, numbers of piping plover breeding pairs declined 50 to 100 percent at seven Massachusetts sites between the early 1970s and 1984 (Griffin and Melvin 1984). Piping plover surveys in the early years of the recovery effort found that counts of these cryptically colored birds sometimes went up with increased census effort, suggesting that some historic counts of piping plovers by one or a few observers may have underestimated the piping plover population. Thus, the magnitude of the species decline may have been more severe than available numbers imply.

*Survival*

Population viability analyses (PVAs) conducted for piping plovers (Ryan *et al.* 1993, Melvin and Gibbs 1996, Plissner and Haig 2000, Wemmer *et al*. 2001, Larson *et al*. 2002, Calvert *et al*. 2006, Brault 2007, McGowan and Ryan 2009) all demonstrate the sensitivity of extinction risk in response to small declines in adult and/or juvenile survival rates. These results further emphasize the importance of nonbreeding habitat to species recovery (Roche *et al*. 2010). Poor overwintering and stopover habitat has been shown to have a negative effect on survival of other shorebird species, which contributed to breeding population declines (Gill *et al*. 2001, Baker *et al*. 2004, Morrison and Hobson 2004).

There is limited information specific to survival rates during the nonbreeding portion of the annual cycle. Drake *et al*. (2001) observed no mortality among 49 radio-marked piping plovers (total of 2,704 transmitter-days) in Texas in the 1990s. Cohen *et al*. (2008) also reported no mortality among a small sample (n=7) of radio-marked piping plovers at Oregon Inlet, North Carolina in 2005-2006. Analysis of resighting data for 87 banded piping plovers observed in South Carolina during 2006-2007 and 2007-2008 found 100% survival from December to April[2] (J. Cohen, pers. comm. 2009). At Little St. Simons Island, Georgia, Noel *et al*. (2007) inferred two winter mortalities among 21 banded (but not radio-tagged) overwintering piping plovers in 2003-2004, and nine mortalities among 19 overwintering birds during the winter of 2004-2005. In a study of 150 after-hatch-year Great Lakes piping plovers, LeDee (2008) found higher apparent survival[3] rates during breeding and southward migration than during winter and northward migration.

2 However, two of those birds were seen in the first winter and resighted in the second fall, but were not seen during the second winter (Maddock et al. 2009).

3 "Apparent survival" does not account for permanent emigration. If marked individuals leave a survey site, apparent survival rates will be lower than

Analysis of piping plover mark-recapture data by Roche *et al*. (2010) found that after-hatch-year apparent survival declined in four of their seven study populations. They found evidence of correlated year-to-year fluctuations in annual survival among populations wintering primarily along the southeastern U. S. Atlantic Coast, as well as indications that shared overwintering or stopover sites may influence annual variation in survival among geographically disparate breeding populations. Additional mark-resighting analysis of color-banded individuals across piping plover breeding populations has the potential to shed light on threats that may affect survival in the migration and wintering range, and also to further elucidate survival within the annual cycle (Cohen 2009, Roche *et al*. 2010).

***Status and distribution***

<u>*Breeding Range*</u>

*Northern Great Plains Population*

The IPPC numbers indicate that the Northern Great Plains population (including Canada) declined from 1991 through 2001, and then increased dramatically in 2006, followed by a decline in 2011 (Haig *et al*. 2005, Elliott-Smith *et al*. 2009, USGS unpublished data). The 2006 increase corresponded with a multi-year drought in the Missouri River basin that exposed a great deal of nesting habitat, suggesting that the population can respond fairly rapidly to changes in habitat quantity and quality. Despite this recent improvement, we do not consider the numeric, distributional, or temporal elements of the population recovery criteria achieved. In addition, the IPPC numbers for 2011 are still preliminary, but they document another decline.

As the Missouri River basin emerged from drought and breeding habitat became inundated, the population declined. The management activities carried out in many areas during drought conditions have undoubtedly helped to maintain and increase the piping plover population, especially to mitigate for otherwise poor reproductive success during wet years when habitat is limited.

While the population increase seen in 2006 demonstrates the possibility that the population can rebound from low population numbers, ongoing efforts are needed to maintain and increase the population. In the U. S., piping plover crews attempt to locate most piping plover nests and take steps to improve their success. This work has suffered from insufficient and unstable funding in most areas.

Emerging threats, such as energy development (particularly wind, oil and gas and associated infrastructure) and climate change are likely to impact piping plovers both on the breeding and wintering grounds. The potential impact of both of these threats is not well understood, and measures to mitigate for them are also uncertain at this time.

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true survival. If a survey area is sufficiently large, such that emigration out of the site is unlikely, apparent survival will approach true survival.

In the 2009 status review, the Service concluded that the Northern Great Plains piping plover population remains vulnerable, especially due to management of river systems throughout the breeding range (Service 2009). Many of the threats identified in the 1988 recovery plan, including those affecting Northern Great Plains piping plover population during the two-thirds of its annual cycle spent in the wintering range, remain today or have intensified.

*Great Lakes Population*

The population has shown significant growth, from approximately 17 pairs at the time of listing in 1986, to 66 pairs in 2013. The 66 breeding pairs represent approximately 44% of the current recovery goal of 150 breeding pairs for the Great Lakes population. Although initial information considered at the time of the 2003 recovery plan suggested the population may be at risk from a lack of genetic diversity, currently available information suggests that genetic diversity may not pose a high risk to the Great Lakes population. Additional genetic information is needed to assess genetic structure of the population and verify the adequacy of a 150 pair population to maintain long-term heterozygosity and allelic diversity.

Population growth is evidence of the effectiveness of the ongoing Great Lakes piping plover recovery program. Most major threats, however, including habitat degradation, predation, and human disturbance remain persistent and pervasive. Severe threats from human disturbance and predation remain ubiquitous within the Great Lakes. Expensive labor-intensive management to minimize the effects of these continuing threats, as specified in recovery plan tasks, are implemented every year by a network of dedicated governmental and private partners. Because threats to Great Lakes piping plovers persist, reversal of gains in abundance and productivity are expected to quickly follow if current protection efforts are reduced.

Emerging potential threats to piping plovers in the Great Lakes basin include disease, wind turbine generators and, potentially, climate change. An out-break of Type E botulism in the Northern Lake Michigan basin resulted in several piping plover mortalities. Future outbreaks in areas that support a concentration of breeding piping plovers could impact survival rates and population abundance. Wind turbine projects, many of which are currently in the planning stages, need further study to determine potential risks to piping plovers and/or their habitat, as well as the need for specific protections to prevent or mitigate impacts. Climate change projections for the Great Lakes include the potential for significant water-level decreases. The degree to which this factor will impact piping plover habitat is unknown, but prolonged water-level decreases are likely to alter habitat condition and distribution.

In the 2009 status review, the Service concluded that the Great Lakes population remains at considerable risk of extinction due to its small size, limited distribution and vulnerability to stochastic events, such as disease outbreak (USFWS 2009c). In addition, the factors that led to the piping plover's 1986 listing remain present.

*Atlantic Coast Population*

Substantial population growth, from approximately 790 pairs in 1986 to a preliminary estimate of 1,898 pairs in 2012 (2013 numbers are not available), has decreased the Atlantic Coast piping plover's vulnerability to extinction since ESA listing (USFWS unpublished data). Annual estimates of breeding pairs of Atlantic Coast piping plovers are based on multiple surveys at most occupied sites. Sites that cannot be monitored repeatedly in May and June (primarily sites with few pairs or inconsistent occupancy) are surveyed at least once during a standard nine-day count period (Hecht and Melvin 2009).
Considerable progress has been made towards the overall goal of 2,000 breeding pairs articulated in recovery criterion 1. As discussed in the 1996 revised recovery plan, however, the overall security of the Atlantic Coast piping plover is fundamentally dependent on even distribution of population growth, as specified in subpopulation targets, to protect a sparsely-distributed species with strict biological requirements from environmental variation (including catastrophes) and increase the likelihood of interchange among subpopulations.

Productivity goals (criterion 3) specified in the 1996 recovery plan must be revised to accommodate new information about latitudinal variation in productivity needed to maintain a stationary population. Population growth, particularly in the three U.S. recovery units, provides indirect evidence that adequate productivity has occurred in at least some years. However, overall security of a 2,000 pair population will require long-term maintenance of these revised recovery-unit-specific productivity goals concurrent with population numbers at or above abundance goals.

Twenty years of relatively steady population growth, driven by productivity gains, also evidences the efficacy of the ongoing Atlantic Coast piping plover recovery program. However, all of the major threats (habitat loss and degradation, predation, human disturbance, and inadequacy of other (non-ESA) regulatory mechanisms) identified in the 1986 ESA listing and 1996 revised recovery plan remain persistent and pervasive. Indeed, recent information heightens the importance of conserving the low, sparsely vegetated beaches juxtaposed with abundant moist foraging substrates preferred by breeding Atlantic Coast piping plovers; development and artificial shoreline stabilization pose continuing widespread threats to this habitat. Severe threats from human disturbance and predation remain ubiquitous along the Atlantic Coast. Expensive labor-intensive management to minimize the effects of these continuing threats, as specified in recovery plan tasks, are implemented every year by a network of dedicated governmental and private cooperators.

Finally, two emerging potential threats, wind turbine generators and climate change (especially sea-level rise) are likely to affect Atlantic Coast piping plovers throughout their life cycle. These two threats must be evaluated to ascertain their effects on piping plovers and/or their habitat, as well as the need for specific protections to prevent or mitigate impacts that could otherwise increase overall risks the species.

In the 2009 status review, the Service concluded that the Atlantic Coast piping plover remains vulnerable to low numbers in the Southern and Eastern Canada (and, to a lesser extent, the New

York-New Jersey) Recovery Units (USFWS 2009c). Furthermore, the factors that led to the piping plover's 1986 listing remain operative rangewide (including in New England), and many of these threats have increased. Interruption of costly, labor-intensive efforts to manage these threats would quickly lead to steep population declines.

*Nonbreeding Range*

Piping plovers spend up to 10 months of their annual cycle on their migration and winter grounds, typically from 15 July through 15 May (Elliott-Smith and Haig 2004, Noel *et al*. 2007, Stucker *et al*. 2010). Southward migration from the breeding grounds primarily occurs from July to September, with the majority of birds initiating migration by the end of August (USFWS 1996, USFWS 2003). However, the New Jersey Division of Fish and Wildlife documented sustained presence of low numbers of piping plovers at several sites through October 2011 (C. Davis, New Jersey Division of Fish and Wildlife, pers. comm. 2012). Piping plovers depart the wintering grounds as early as mid-February and as late as mid-May, with peak migration in March (Haig 1992). In their analysis of 10 years of band sightings, Stucker *et al*. (2010) found that wintering adult males and females from the Great Lakes population exhibit latitudinal segregation. Female plovers arrived on the winter grounds before males and returned later to breeding sites. Second year birds arrived latest on the breeding grounds, rarely appearing on the breeding grounds before the third week of May (Stucker *et al*. 2010).

Routes of migration and habitat use overlap breeding and wintering habitats and, unless the birds are banded, migrants passing through a site are indistinguishable from breeding or wintering piping plovers. Coastal migration stopovers of plovers banded in the Great Lakes region have been documented in New Jersey, Maryland, Virginia, North Carolina, South Carolina and Georgia (Stucker *et al*. 2010). Migrating birds from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault *et al*. 2005). Piping plovers banded in the Bahamas have been sighted during migration in nine Atlantic Coast states and provinces between Florida and Nova Scotia (C. Gratto-Trevor, Environment Canada, pers. comm. 2012a). In general, the distance between stopover locations and the duration of stopovers throughout the coastal migration range remain poorly understood.

International Piping Plover Winter Censuses, which began in 1991, have been conducted during mid-winter at five-year intervals across the species' range (**Table 5**). Total numbers have fluctuated over time, with some areas increasing while other areas showed declines. Regional and local fluctuations may reflect changes in the quantity and quality of suitable foraging and roosting habitat, which vary in response to natural coastal formation processes as well as anthropogenic habitat changes (e.g., inlet relocation, dredging of shoals and spits). See, for example, discussions of survey number changes in Mississippi, Louisiana, and Texas in Elliott-Smith *et al*. (2009). Fluctuations may also reflect localized weather conditions during surveys or different survey coverage; for example, changes in wind-driven tides can cause large rapid shifts in the distribution of piping plovers on the Texas Laguna Madre (Zonick 2000). In another example, Cobb (*in* Elliott-Smith *et al*. 2009) notes that use of airboats during the 1991 and 2006 censuses facilitated greater coverage in central Texas than in 1996 and 2001, when airboats were not used and counts were lower. Changes in wintering numbers within a given area may also be influenced by growth or decline in particular breeding populations.

Increased survey effort in the Bahamas since approximately 2006 resulted in dramatic increases in wintering population estimates. More than 1,000 birds were counted in the Bahamas during the 2011 International Piping Plover Winter Census (E. Elliott-Smith, U.S. Geological Survey, pers. comm. 2012a), compared to 417 birds in 2006 and 35 birds in 2001. Additional habitat in the Bahamas remains to be surveyed, as do many other sites in the Caribbean. Piping Plovers have been reported from Nicaragua, St. Vincent and the Grenadines, Turks and Caicos Islands, and St. Croix (L. Schibley, Manomet Center for Conservation Science, pers. comm. 2011, and C. Lombard, USFWS, pers. comm. 2010), but follow-up is needed to determine where and in what numbers piping plovers were seen and if the sites are used regularly.

**Table 5. Results of the 1991, 1996, 2001, and 2006 international piping plover winter censuses (Haig *et al*. 2005, Elliott-Smith *et al*. 2009) and preliminary 2011 results (Elliott-Smith pers. comm. 2012).**

| **Location** | **Number of piping plovers** | | | | |
|---|---|---|---|---|---|
| | **1991** | **1996** | **2001** | **2006** | **2011 (preliminary)** |
| Virginia | ns[a] | ns | ns | 1 | 1 |
| North Carolina | 20 | 50 | 87 | 84 | 43 |
| South Carolina | 51 | 78 | 78 | 100 | 86 |
| Georgia | 37 | 124 | 111 | 212 | 63 |
| Florida | 551 | 375 | 416 | 454 | 306 |
| -*Atlantic* | *70* | *31* | *111* | *133* | *83* |
| -*Gulf* | *481* | *344* | *305* | *321* | *223* |
| Alabama | 12 | 31 | 30 | 29 | 38 |
| Mississippi | 59 | 27 | 18 | 78 | 88 |
| Louisiana | 750 | 398 | 511 | 226 | 86 |
| Texas | 1,904 | 1,333 | 1,042 | 2,090 | 2,145 |
| Puerto Rico | 0 | 0 | 6 | ns | 2 |
| **U.S. Total** | **3,384** | **2,416** | **2,299** | **3,355** | **2,858** |
| Mexico | 27 | 16 | ns | 76 | 30 |
| Bahamas | 29 | 17 | 35 | 417 | 1066 |
| Cuba | 11 | 66 | 55 | 89 | 19 |
| Other Caribbean Islands | 0 | 0 | 0 | 28 | 2 |
| **GRAND TOTAL** | **3,451** | **2,515** | **2,389** | **3,884** | **3,975** |

[a] ns = not surveyed

Survey timing and intensity affect abundance estimates and the ability to detect local movements of nonbreeding piping plovers. Mid-winter surveys (such as the International Census) may substantially underestimate the number of nonbreeding piping plovers using a site or region during other months. Along the central Texas Gulf Coast, Pinkston (2004) observed much heavier use of ocean-facing beaches between early September and mid-October (approximately 16 birds per mile) than during the period from December to March (approximately two birds per mile). Zdravkovic and Durkin (2011) reported a similar pattern in southern Texas. In late September, 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (NPS 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith *et al*. 2009). Differences among fall, winter, and spring counts in South Carolina were less pronounced, but large inter-year fluctuations (e.g., 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) were observed (Maddock *et al*. 2009). Noel *et al*. (2007) observed up to 100 piping plovers during peak migration and only about 40 overwintering at Little Saint Simons Island, Georgia in 2003-2005. Monthly counts at Phipps Preserve in Franklin County, Florida ranged from a mid-winter low of four piping plovers in December 2006 to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Zdravkovic and Durkin (2011) attributed substantially higher counts during surveys in the Lower Laguna Madre, Texas in 2010 compared with the 2006 International Census (881 plovers versus 459 plovers) to more complete survey coverage.

Abundance estimates for nonbreeding piping plovers may also be affected by the number of surveyor visits to the site. A preliminary analysis found 87% detection during the mid-winter period at South Carolina sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42% detection at sites surveyed only three times per year (J. Cohen, Virginia Tech, pers. comm. 2009, review of data by Maddock *et al*. 2009). Gratto-Trevor *et al*. (2012) found distinct patterns (but no exclusive partitioning) in winter distribution of banded piping plovers from four breeding areas (**Figure 10**). Resightings of more than 700 uniquely marked birds from 2001 to 2008 were used to analyze winter distributions along the Atlantic and Gulf Coasts. Plovers from eastern Canada and most Great Lakes birds wintered from North Carolina to Southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, while a larger proportion of Great Lakes piping plovers were found in South Carolina, Georgia, and Florida. This pattern is consistent with analysis of band sightings of Great Lakes plovers from 1995-2005 by Stucker *et al*. (2010). Gratto-Trevor *et al*. (2012) also found that Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. The majority of birds from the Canadian Prairie were observed in Texas (particularly southern Texas), while individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast from Texas to Florida. Seventy-nine percent of 57 piping plovers banded in the Bahamas in 2010 have been reported breeding on the Atlantic Coast, and none have been resighted at interior locations (preliminary results, Gratto-Trevor pers. comm. 2012a). However, consistent with patterns observed in other parts of the wintering range, a few banded individuals from the Great Lakes and Northern Great Plains populations have been observed in the Bahamas (Gratto-Trevor pers. comm. 2012b, D. Catlin, Virginia Polytechnic Institute, pers. comm. 2012a). Collectively, these studies demonstrate an intermediate level of connectivity between breeding and wintering areas. Specific breeding populations will be disproportionately affected by habitat and threats occurring where they are most concentrated in the winter.

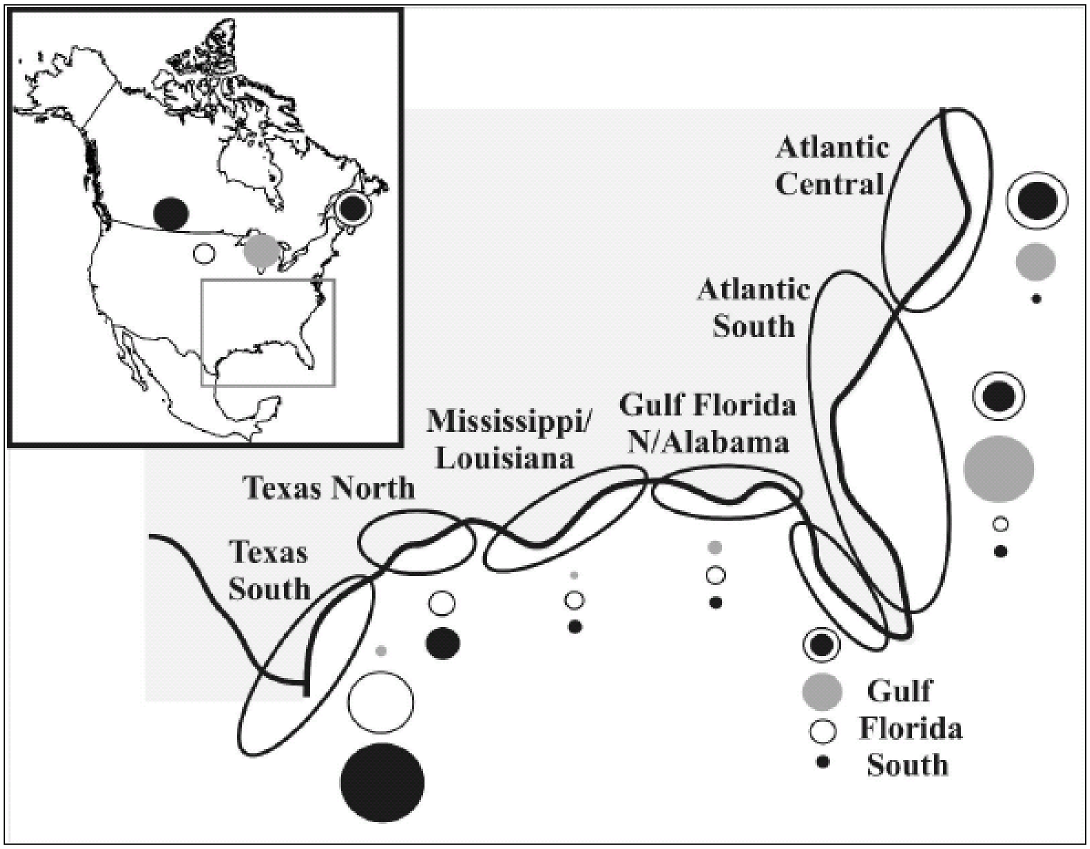


**Figure 10. The winter distribution in the continental U.S. of piping plovers from four breeding locations (inset), including eastern Canada (white circle with central black dot), Great Lakes (gray circle), U. S. Northern Great Plains (white circle), and Prairie Canada (black circle). The wintering range is expanded to the right, divided into different wintering regions. The size of the adjacent circles relative to the others represents the percentage of individuals from a specific breeding area reported in that wintering region (from Gratto-Trevor *et al*. 2012; reproduced by permission).**

<u>*Threats to Piping Plovers*</u>

The three recovery plans stated that shoreline development throughout the wintering range poses a threat to all populations of piping plovers. The plans further stated that beach maintenance and renourishment, inlet dredging, and artificial structures, such as jetties and groins, could eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat.

*Loss, Modification, and Degradation of Habitat*

The wide, flat, sparsely vegetated barrier beaches, spits, sandbars, and bayside flats preferred by piping plovers in the U. S. are formed and maintained by natural forces and are thus susceptible to degradation caused by development and shoreline stabilization efforts. As described below, barrier island and beachfront development, inlet and shoreline stabilization, inlet dredging, beach maintenance and renourishment activities, seawall installations, and mechanical beach grooming continue to alter natural coastal processes throughout the range of migrating and wintering piping plovers. Dredging of inlets can affect spit formation adjacent to inlets, as well as ebb and flood tidal shoal formation. Jetties stabilize inlets and cause island widening and subsequent vegetation growth on the updrift inlet shores; they also cause island narrowing and/or erosion on the downdrift inlet shores. Seawalls and revetments restrict natural island movement and exacerbate erosion. Although dredge and fill projects that place sand on beaches and dunes may restore lost or degraded habitat in some areas, in other areas these projects may degrade habitat quality by altering the natural sediment composition, depressing the invertebrate prey base, hindering habitat migration with sea level rise, and replacing the natural habitats of the dune-beach-nearshore system with artificial geomorphology. Construction of any of these projects during months when piping plovers are present also causes disturbance that disrupts the birds' foraging and roosting behaviors. These threats are exacerbated by accelerating sea level rise, which increases erosion and habitat loss where existing development and hardened stabilization structures prevent the natural migration of the beach and/or barrier island. Although threats from sea level rise are discussed on pages 29-31, its specific synergistic effects on threats from coastal development and artificial coastal stabilization are also described in the pertinent subsections, below.

*Development and Construction*

Development and associated construction threaten the piping plover in its migration and wintering range by degrading, fragmenting, and eliminating habitat. Constructing buildings and infrastructure adjacent to the beach can eliminate roosting and loafing habitat within the development's footprint and degrade adjacent habitat by replacing sparsely vegetated dunes or back-barrier beach areas with landscaping, pools, fences, etc. In addition, bayside development can replace foraging habitat with finger canals, bulkheads, docks and lawns. High-value plover habitat becomes fragmented as lots are developed or coastal roads are built between oceanside and bayside habitats. Development activities can include lowering or removing natural dunes to improve views or grade building lots, planting vegetation to stabilize dunes, and erecting sand fencing to establish or stabilize continuous dunes in developed areas; these activities can further degrade, fragment, and eliminate sparsely vegetated and unvegetated habitats used by the piping plover and other wildlife. Development and construction of other infrastructure in close proximity to barrier beaches often creates economic and social incentives for subsequent shoreline stabilization projects, such as shoreline hardening and beach renourishment.

At present, there are approximately 2,119 miles of sandy beaches within the U.S. continental wintering range of the piping plover (**Table 6**). Approximately 40% (856 miles) of these sandy beaches are developed, with mainland Mississippi (80%), Florida (57%), Alabama (55%), South Carolina (51%), and North Carolina (49%) comprising the most developed coasts, and Mississippi barrier islands (0%), Louisiana (6%), Texas (14%) and Georgia (17%) the least developed (Rice 2012b). As discussed further below, developed beaches are highly vulnerable to further habitat loss because they cannot migrate in response to sea level rise.

Several studies highlight concerns about adverse effects of development and coastline stabilization on the quantity and quality of habitat for migrating and wintering piping plovers and other shorebirds. For example, Zdravkovic and Durkin (2011) observed fewer plovers on the developed portions of the Laguna and Gulf beach sides of South Padre Island than on undeveloped portions during both migratory and wintering surveys. Drake *et al*. (2001) observed that radio-tagged piping plovers overwintering along the southern Laguna Madre of Texas seldom used tidal flats adjacent to developed areas (five of 1,371 relocations of radio-marked individuals), suggesting that development and associated anthropogenic disturbances influence piping plover habitat use. Detections of piping plovers during repeated surveys of the upper Texas coast in 2008 were low in areas with significant beach development (Arvin 2008).

The development of bayside or estuarine shorelines with finger canals and their associated bulkheads, docks, buildings, and landscaping leads to direct loss and degradation of plover habitat. Finger canals are channels cut into a barrier island or peninsula from the soundside to increase the number of waterfront residential lots. Finger canals can lead to water pollution, fish kills, loss of aquatic nurseries, saltwater intrusion of groundwater, disruption of surface flows, island breaching due to the funneling of storm surge, and a perpetual need for dredging and disposal of dredged material in order to keep the canals navigable for property owners (Morris *et al*. 1978, Bush *et al*. 1996).

Rice (2012b) has identified over 900 miles (43%) of sandy beaches in the wintering range that are currently “preserved” through public ownership, ownership by non-governmental conservation organizations, or conservation easements (**Table 6**). These beaches may be subject to some erosion as they migrate in response to sea level rise or if sediment is removed from the coastal system, and they are vulnerable to recreational disturbance. However, they are the areas most likely to maintain the geomorphic characteristics of suitable piping plover habitat.

**Table 6. The lengths and percentages of sandy oceanfront beach in each state that are developed, undeveloped, and preserved as of December 2011 (Rice 2012b).**

| State | Approximate Shoreline Beach Length (miles) | Approximate Miles of Beach Developed (percent of total shoreline length) | Approximate Miles of Beach Undeveloped (percent of total shoreline length)[a] | Approximate Miles of Beach Preserved (percent of total shoreline length)[b] |
|---|---|---|---|---|
| **North Carolina** | 326 | 159 (49%) | 167 (51%) | 178.7 (55%) |
| **South Carolina** | 182 | 93 (51%) | 89 (49%) | 84 (46%) |
| **Georgia** | 90 | 15 (17%) | 75 (83%) | 68.6 (76%) |
| **Florida** | 809 | 459 (57%) | 351 (43%) | 297.5 (37%) |
| ***-Atlantic*** | *372* | *236 (63%)* | *136 (37%)* | *132.4 (36%)* |
| ***-Gulf*** | *437* | *223 (51%)* | *215 (49%)* | *168.0. (38%)* |
| **Alabama** | 46 | 25 (55%) | 21 (45%) | 11.2 (24%) |
| **Mississippi barrier island coast** | 27 | 0 (0%) | 27 (100%) | 27 (100%) |
| **Mississippi mainland coast** | 51[c] | 41 (80%) | 10 (20%) | 12.6 (25%) |
| **Louisiana** | 218 | 13 (6%) | 205 (94%) | 66.3 (30%) |
| **Texas** | 370 | 51 (14%) | 319 (86%) | 152.7 (41%) |
| **TOTAL** | **2,119** | **856 (40%)** | **1,264 (60%)** | **901.5 (43%)** |

[a] Beaches classified as "undeveloped" occasionally include a few scattered structures.

[b] Preserved beaches include public ownership, ownership by non-governmental conservation organizations, and conservation easements. The miles of shoreline that have been preserved generally overlap with the miles of undeveloped beach but may also include some areas (e.g., in North Carolina) that have been developed with recreational facilities or by private inholdings.

[c] The mainland Mississippi coast along Mississippi Sound includes 51.3 miles of sandy beach as of 2010-2011, out of approximately 80.7 total shoreline miles (the remaining portion is non-sandy, either marsh or armored coastline with no sand). See Rice 2012b for details.

In summary, approximately 40% of the sandy beach shoreline in the migration and wintering range is already developed, while 43% are largely preserved. This means, however, that the remaining 17% of shoreline habitat (that which is currently undeveloped but not preserved) is susceptible to future loss to development and the attendant threats from shoreline stabilization activities and sea level rise[4].

*Dredging and Sand Mining*

The dredging and mining of sediment from inlet complexes threatens the piping plover on its wintering grounds through habitat loss and degradation. The maintenance of navigation channels by dredging, especially deep shipping channels such as those in Alabama and Mississippi, can significantly alter the natural coastal processes on inlet shorelines of nearby barrier islands, as described by Otvos (2006), Morton (2008), Otvos and Carter (2008), Beck and Wang (2009), and Stockdon *et al*. (2010). Cialone and Stauble (1998) describe the impacts of mining ebb shoals within inlets as a source of beach fill material at eight locations and provide a recommended monitoring protocol for future mining events; Dabees and Kraus (2008) also describe the impacts of ebb shoal mining in southwest Florida.

Forty-four percent of the tidal inlets within the U.S. wintering range of the piping plover have been or continue to be dredged, primarily for navigational purposes (**Table 7**). States where more than two-thirds of inlets have been dredged include Alabama (three of four), Mississippi (four of six), North Carolina (16 of 20), and Texas (13 of 18), and 16 of 21 along the Florida Atlantic coast. The dredging of navigation channels or relocation of inlet channels for erosion-control purposes contributes to the cumulative effects of inlet habitat modification by removing or redistributing the local and regional sediment supply; the maintenance dredging of deep shipping channels can convert a natural inlet that normally bypasses sediment from one shoreline to the other into a sediment sink, where sediment no longer bypasses the inlet.

Among the dredged inlets identified in Rice (2012a), dredging efforts began as early as the 1800s and continue to the present, generating long-term and even permanent effects on inlet habitat; at least 11 inlets were first dredged in the 19$^{th}$ century, with the Cape Fear River (North Carolina) being dredged as early as 1826 and Mobile Pass (Alabama) in 1857. Dredging can occur on an annual basis or every two to three years, resulting in continual perturbations and modifications to inlet and adjacent shoreline habitat. The volumes of sediment removed can be major, with 2.2 million cubic yards (mcy) of sediment removed on average every 1.9 years from the Galveston Bay Entrance (Texas) and 3.6 mcy of sediment removed from Sabine Pass (Texas) on average every 1.4 years (USACE 1992).

4 See chapters 1 and 2 in Titus (2011) for a detailed discussion of the relationship between shoreline development and sea level rise.

**Table 7. The number of open tidal inlets, inlet modifications, and artificially closed inlets in each state as of December 2011 (Rice 2012a).**

| State | Existing Inlets | | | | | | | Artificially closed |
|---|---|---|---|---|---|---|---|---|
| | Number of Inlets | Total Number of Modified Inlets | Habitat Modification Type | | | | | |
| | | | structures[a] | dredged | relocated | mined | artificially opened | |
| **North Carolina** | 20 | 17 (85%) | 7 | 16 | 3 | 4 | 2 | 11 |
| **South Carolina** | 47 | 21 (45%) | 17 | 11 | 2 | 3 | 0 | 1 |
| **Georgia** | 23 | 6 (26%) | 5 | 3 | 0 | 1 | 0 | 0 |
| **Florida -*Atlantic*** | 21 | 19 (90%) | 19 | 16 | 0 | 3 | 10 | 0 |
| **Florida -*Gulf*** | 48 | 24 (50%) | 20 | 22 | 0 | 6 | 7 | 1 |
| **Alabama** | 4 | 4 (100%) | 4 | 3 | 0 | 0 | 0 | 2 |
| **Mississippi** | 6 | 4 (67%) | 0 | 4 | 0 | 0 | 0 | 0 |
| **Louisiana** | 34 | 10 (29%) | 7 | 9 | 1 | 2 | 0 | 46 |
| **Texas** | 18 | 14 (78%) | 10 | 13 | 2 | 1 | 11 | 3 |
| **TOTAL** | 221 | 119 (54%) | 89 (40%) | 97 (44%) | 8 (4%) | 20 (9%) | 30 (14%) | 64 (N/A) |

[a] Structures include jetties, terminal groins, groin fields, rock or sandbag revetments, seawalls, and offshore breakwaters.

Among the dredged inlets identified in Rice (2012a), dredging efforts began as early as the 1800s and continue to the present, generating long-term and even permanent effects on inlet habitat; at least 11 inlets were first dredged in the 19$^{th}$ century, with the Cape Fear River (North Carolina) being dredged as early as 1826 and Mobile Pass (Alabama) in 1857. Dredging can occur on an annual basis or every two to three years, resulting in continual perturbations and modifications to inlet and adjacent shoreline habitat. The volumes of sediment removed can be major, with 2.2 million cubic yards (mcy) of sediment removed on average every 1.9 years from the Galveston Bay Entrance (Texas) and 3.6 mcy of sediment removed from Sabine Pass (Texas) on average every 1.4 years (USACE 1992).

As sand sources for beach renourishment projects have become more limited, the mining of ebb tidal shoals for sediment has increased (Cialone and Stauble 1998). This is a problem because exposed ebb and flood tidal shoals and sandbars are prime roosting and foraging habitats for piping plovers. In general, such areas are only accessible by boat; and as a result, they tend to receive less human recreational use than nearby mainland beaches. Rice (2012a) found that the ebb shoal complexes of at least 20 inlets within the wintering range of the piping plover have been mined for beach fill. Ebb shoals are especially important because they act as “sand bridges” that connect beaches and islands by transporting sediment via longshore transport from one side (updrift) to the other (downdrift) side of an inlet. The mining of sediment from these shoals upsets the inlet system equilibrium and can lead to increased erosion of the adjacent inlet shorelines (Cialone and Stauble 1998). Rice (2012a) noted that this mining of material from inlet shoals for use as beach fill is not equivalent to the natural sediment bypassing that occurs at unmodified inlets for several reasons, most notably for the massive volumes involved that are "transported" virtually instantaneously instead of gradually and continuously and for the placement of the material outside of the immediate inlet vicinity, where it would naturally bypass. The mining of inlet shoals can remove massive amounts of sediment, with 1.98 mcy mined for beach fill from Longboat Pass (Florida) in 1998, 1.7 mcy from Shallotte Inlet (North Carolina) in 2001 and 1.6 mcy from Redfish Pass (Florida) in 1988 (Cialone and Stauble 1998, USACE 2004). Cialone and Stauble (1998) found that monitoring of the impacts of ebb shoal mining has been insufficient, and in one case the mining pit was only 66% recovered after five years; they conclude that the larger the volume of sediment mined from the shoals, the larger the perturbation to the system and the longer the recovery period.

Information is limited on the effects to piping plover habitat of the deposition of dredged material, and the available information is inconsistent. Drake *et al*. (2001) concluded that the conversion of bayshore tidal flats of southern Texas mainland to dredged material impoundments results in a net loss of habitat for wintering piping plovers because such impoundments eventually convert to upland habitat. Zonick *et al*. (1998) reported that dredged material placement areas along the Gulf Intracoastal Waterway in Texas were rarely used by piping plovers, and noted concern that dredge islands block the wind-driven water flows that are critical to maintaining important shorebird habitats. Although Zdravkovic and Durkin (2011) found 200 piping plovers on the Mansfield Channel dredge material islands during a survey in late 2009, none were counted there in early 2011. By contrast, most of the sound islands where Cohen *et al*. (2008) found foraging piping plovers at Oregon Inlet, North Carolina were created by the USACE from dredged material. Another example is Pelican Island, in Corpus Christi Bay, Texas, where dredged material is consistently used by piping plovers (R. Cobb, USFWS, pers. comm. 2012a). Research is needed to understand why piping plovers use some dredge material islands, but are not regularly found using many others.

In summary, the removal of sediment from inlet complexes via dredging and sand mining for beach fill has modified nearly half of the tidal inlets within the continental wintering range of the piping plover, leading to habitat loss and degradation. Many of these inlet habitat modifications have become permanent, existing for over 100 years. The expansion of several harbors and ports to accommodate deeper draft ships poses an increasing threat as more sediment is removed from the inlet system, causing larger perturbations and longer recovery times; maintenance dredging conducted annually or every few years may prevent full recovery of the inlet system. Sand removal or sediment starvation of shoals, sandbars and adjacent shoreline habitat has resulted in habitat loss and degradation, which may reduce the system's ability to maintain a full suite of inlet habitats as sea level continues to rise at an accelerating rate. Rice (2012a) noted that the adverse impacts of this threat to piping plovers may be mitigated, however, by eliminating dredging and mining activities in inlet complexes with high habitat value, extending the interval between dredging cycles, discharging dredged material in nearshore downdrift waters so that it can accrete more naturally than when placed on the subaerial beach, and designing dredged material islands to mimic natural shoals and flats.

*Inlet Stabilization and Relocation*

Many navigable tidal inlets along the Atlantic and Gulf coasts are stabilized with hard structures. A description of the different types of stabilization structures typically constructed at or adjacent to inlets – jetties, terminal groins, groins, seawalls, breakwaters and revetments – can be found in Rice (2009) as well in the *Manual for Coastal Hazard Mitigation* (Herrington 2003, available online) and in *Living by the Rules of the Sea* (Bush *et al*. 1996).

The adverse direct and indirect impacts of hard stabilization structures at inlets and inlet relocations can be significant. The impacts of jetties on inlet and adjacent shoreline habitat have been described by Cleary and Marden (1999), Bush *et al*. (1996, 2001, 2004), Wamsley and Kraus (2005), USFWS (2009a), Thomas *et al*. (2011), and many others. The relocation of inlets or the creation of new inlets often leads to immediate widening of the new inlet and loss of adjacent habitat, among other impacts, as described by Mason and Sorenson (1971), Masterson *et al*. (1973), USACE (1992), Cleary and Marden (1999), Cleary and Fitzgerald (2003), Erickson *et al*. (2003), Kraus *et al*. (2003), Wamsley and Kraus (2005) and Kraus (2007).

Rice (2012a) found that, as of 2011, an estimated 54% of 221 mainland or barrier island tidal inlets in the U.S continental wintering range of the piping plover had been modified by some form of hardened structure, dredging, relocation, mining, or artificial opening or closure (**Table 5**). On the Atlantic Coast, 43% of the inlets have been stabilized with hard structures, whereas 37% were stabilized on the Gulf Coast. The Atlantic coast of Florida has 17 stabilized inlets adjacent to each other, extending between the St. John’s River in Duval County and Norris Cut in Miami-Dade County, a distance of 341 miles. A shorebird would have to fly nearly 344 miles between unstabilized inlets along this stretch of coast.

The state with the highest proportion of natural, unmodified inlets is Georgia (74%). The highest number of adjacent unmodified, natural inlets is 15, which is the number of inlets found in Georgia between Little Tybee Slough at Little Tybee Island Nature Preserve and the entrance to Altamaha Sound at the south end of Wolf Island National Wildlife Refuge, a distance of approximately 54 miles. Another relatively long stretch of adjacent unstabilized inlets is in Louisiana, where 17 inlets between a complex of breaches on the West Belle Pass barrier headland (in Lafourche Parish) and Beach Prong (near the western boundary of the state Rockefeller Wildlife Refuge) have no stabilization structures; one of these inlets (the Freshwater Bayou Canal), however, is dredged (Rice 2012a).

Unstabilized inlets naturally migrate, reforming important habitat components over time, particularly during a period of rising sea level. Inlet stabilization with rock jetties and revetments alters the dynamics of longshore sediment transport and the natural movement and formation of inlet habitats such as shoals, unvegetated spits and flats. Once a barrier island becomes “stabilized” with hard structures at inlets, natural overwash and beach dynamics are restricted, allowing encroachment of new vegetation on the bayside that replaces the unvegetated (open) foraging and roosting habitats that plovers prefer. Rice (2012a) found that 40% (89 out of 221) of the inlets open in 2011 have been stabilized in some way, contributing to habitat loss and degradation throughout the wintering range. Accelerated erosion may compound future habitat loss, depending on the degree of sea level rise (Titus *et al*. 2009). Due to the complexity of impacts associated with projects such as jetties and groins, Harrington (2008) noted the need for a better understanding of potential effects of inlet-related projects, such as jetties, on bird habitats.

Relocation of tidal inlets also can cause loss and/or degradation of piping plover habitat. Although less permanent than construction of hard structures, the effects of inlet relocation can persist for years. For example, December-January surveys documented a continuing decline in wintering plover numbers from 20 birds pre-project (2005-2006) to three birds during the 2009 - 2011 seasons (SCDNR 2011). Subsequent decline in the wintering population on Kiawah is strongly correlated with the decline in polychaete worm densities, suggesting that plovers emigrated to other sites as foraging opportunities in these habitats became less profitable (SCDNR 2011). At least eight inlets in the migration and wintering range have been relocated; a new inlet was cut and the old inlet was closed with fill. In other cases, inlets have been relocated without the old channels being artificially filled (**Table 7** and Rice 2012a).

The artificial opening and closing of inlets typically creates very different habitats from those found at inlets that open or close naturally (Rice 2012a). Rice (2012a) found that 30 inlets have been artificially created within the migration and wintering range of the piping plover, including 10 of the 21 inlets along the eastern Florida coast (**Table 7**). These artificially created inlets tend to need hard structures to remain open or stable, with 20 of the 30 (67%) of them having hard structures at present. An even higher number of inlets (64) have been artificially closed, the majority in Louisiana (**Table 7**). One inlet in Texas was closed as part of the Ixtoc oil spill response efforts in 1979 and 32 were closed as part of Deepwater Horizon oil spill response efforts in 2010-2011. Of the latter, 29 were in Louisiana, two in Alabama and one in Florida. To date only one of these inlets, West (Little Lagoon) Pass in Gulf Shores, Alabama, has been reopened, and the rest remain closed with no plans to reopen any of those identified by Rice (2012a). Most other artificial inlet closures in Louisiana are part of barrier island restoration projects, because much of that state's barrier islands are disintegrating (Otvos 2006, Morton 2008, Otvos and Carter 2008). Inlets closed during coastal restoration projects in Louisiana are purposefully designed to approximate low, wide naturally closed inlets and to allow overwash in the future. By contrast, most artificially closed inlets have higher elevations and tend to have a constructed berm and dune system. Overwash may occur periodically at a naturally closed inlet but is prevented at an artificially closed inlet by the constructed dune ridge, hard structures, or sandbags (Rice 2012a).

The construction of jetties, groins, seawalls and revetments at inlets leads to habitat loss and both direct and indirect impacts to adjacent shorelines. Rice (2012a) found that these structures result in long-term effects, with at least 13 inlets across six of the eight states having hard structures initially constructed in the 19$^{th}$ century. The cumulative effects are ongoing and increasing in intensity, with hard structures built as recently as 2011 and others proposed for 2012. With sea level rising and global climate change altering storm dynamics, pressure to modify the remaining half of sandy tidal inlets in the range is likely to increase, notwithstanding that this would be counterproductive to the climate change adaptation strategies recommended by the Service (2010d), CCSP (2009), Williams and Gutierrez (2009), Pilkey and Young (2009), and many others.

*Groins*

Groins pose an ongoing threat to piping plover beach habitat within the continental wintering range. Groins are hard structures built perpendicular to the shoreline (sometimes in a T-shape), designed to trap sediment traveling in the littoral drift and to slow erosion on a particular stretch of beach or near an inlet. “Leaky” groins, also known as permeable or porous groins, are low-crested structures built like typical groins but which allow some fraction of the littoral drift or longshore sediment transport to pass through the groin. They have been used as terminal groins near inlets or to hold beach fill in place for longer durations. Although groins can be individual structures, they are often clustered along the shoreline in “groin fields.” Because they intentionally act as barriers to longshore sand transport, groins cause downdrift erosion, which degrades and fragments sandy beach habitat for the piping plover and other wildlife. The resulting beach typically becomes scalloped in shape, thereby fragmenting plover habitat over time.

Groins and groin fields are found throughout the southeastern Atlantic and Gulf Coasts and are present at 28 of 221 sandy tidal inlets (Rice 2012a). Leaky terminal groins have been installed at the south end of Amelia Island, Florida, the west end of Tybee Island, Georgia, and the north end of Hilton Head Island, South Carolina. Permeable or leaky groins have also been constructed on the beaches of Longboat Key and Naples, Florida, and terminal groins were approved in 2011 for use in up to four inlet locations in North Carolina (reversing a nearly 30-year prohibition on hard stabilization structures in that state).

Although most groins were in place before the piping plover’s 1986 ESA listing, new groins continue to be installed, perpetuating the threat to migrating and wintering piping plovers. Two groins were built in South Carolina between 2006 and 2010, bringing the statewide total to 165 oceanfront groins (SC DHEC 2010). Eleven new groins were built in Florida between 2000 and 2009. The East Pass Navigation Project in Okaloosa County, Florida (USFWS 2009a) illustrates the negative impacts to plover habitat that can be associated with groins, which are often built as one component of a much larger shoreline or inlet stabilization project. The East Pass Navigation Project includes two converging jetties, one with a groin at the end, with dredged material placed on either side to stabilize the jetties; minimal piping plover foraging habitat remains due to changed inlet morphology. As sea level rises at an accelerating rate, the threat of habitat loss, fragmentation and degradation from groins and groin fields may increase as communities and beachfront property owners seek additional ways to protect infrastructure and property.

*Seawalls and Revetments*

Seawalls and revetments are hard vertical structures built parallel to the beach in front of buildings, roads, and other facilities[5]. Although they are intended to protect human infrastructure from erosion, these armoring structures often accelerate erosion by causing scouring both in front of and downdrift from the structure, which can eliminate intertidal plover foraging and adjacent roosting habitat. Physical characteristics that determine microhabitats and biological communities can be altered after installation of a seawall or revetment, thereby depleting or changing composition of benthic communities that serve as the prey base for piping plovers (see *Loss of Macroinvertebrate Prey Base due to Shoreline Stabilization*). Dugan and Hubbard (2006) found in a California study that intertidal zones were narrower and fewer in the presence of armoring, armored beaches had significantly less macrophyte wrack, and shorebirds responded with significantly lower abundance (more than three times lower) and species richness (2.3 times lower) than on adjacent unarmored beaches. As sea level rises, seawalls will prevent the coastline from moving inland, causing loss of intertidal foraging habitat (Galbraith *et al*. 2002, Defeo *et al*. 2009). Geotubes (long cylindrical bags made of high-strength permeable fabric and filled with sand) are less permanent alternatives, but they prevent overwash and thus the natural production of sparsely vegetated habitat.

Rice (2012b) found that at least 230 miles of beach habitat has been armored with hard erosion-control structures[6]. Data were not available for all areas, so this number is a minimum estimate of the length of habitat that has been directly modified by armoring. Out of 221 inlets surveyed, 89 were stabilized with some form of hard structure, of which 24 had revetments or seawalls along their shorelines (Rice 2012b). The Texas coast is armored with nearly 37 miles of seawalls, bulkheads and revetments, the mainland Mississippi coast has over 45 miles of armoring, the Florida Atlantic coast has at least 58 miles, and the Florida Gulf coast over 59 miles (Rice 2012b). Shoreline armoring has modified plover beachfront habitat in all states, but Alabama (4.7 miles), Georgia (10.5 miles) and Louisiana (15.9 miles) have the fewest miles of armored beaches.

Although North Carolina has prohibited the use of hard erosion-control structures or armoring since 1985[7] the "temporary" installation of sandbag revetments is allowed. As a result the precise length of armored sandy beaches in North Carolina is unknown, but at least 350 sandbag revetments have been constructed (Rice 2012b). South Carolina also limits the installation of some types of new armoring but already has 24 miles (27% of the developed shoreline or 13% of the entire shoreline) armored with some form of shore-parallel erosion-control structure (SC DHEC 2010).

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5 See references describing these stabilization structures.

6 Although Rice (2012b) included jetties and groins in this inventory, structures that are perpendicular to the shoreline comprised a very small proportion of the armored shoreline; seawalls and revetments predominated.

7 In 2011 North Carolina made a further exception for authorization of up to four terminal groins.

The repair of existing armoring structures and installation of new structures continues to degrade, destroy, and fragment beachfront plover habitat throughout its continental wintering range. As sea level rises at an accelerating rate, the threat of habitat loss, fragmentation and degradation from hard erosion-control structures is likely to increase as communities and property owners seek to protect their beachfront development. As coastal roads become threatened by rising sea level and increasing storm damage, additional lengths of beachfront habitat may be modified by riprap, revetments, and seawalls.

*Sand Placement Projects*

Sand placement projects threaten the piping plover and its habitat by altering the natural, dynamic coastal processes that create and maintain beach strand and bayside habitats, including the habitat components that piping plovers rely upon. Although specific impacts vary depending on a range of factors, so-called "soft stabilization" projects may directly degrade or destroy roosting and foraging habitat in several ways. Beach habitat may be converted to an artificial berm that is densely planted in grass, which can in turn reduce the availability of roosting habitat. Over time, if the beach narrows due to erosion, additional roosting habitat between the berm and the water can be lost. Berms can also prevent or reduce the natural overwash that creates and maintains sparsely vegetated roosting habitats. The growth of vegetation resulting from impeding the natural overwash can also reduce the availability of bayside intertidal feeding habitats.

Overwash is an essential process, necessary to maintain the integrity of many barrier islands and to create new habitat (Donnelly *et al*. 2006). In a study on the Outer Banks of North Carolina, Smith *et al*. (2008) found that human "modifications to the barrier island, such as construction of barrier dune ridges, planting of stabilizing vegetation, and urban development, can curtail or even eliminate the natural, self-sustaining processes of overwash and inlet dynamics." They also found that such modifications led to island narrowing from both oceanside and bayside erosion. Lott (2009) found a strong negative correlation between ocean shoreline sand placement projects and the presence of piping and snowy plovers in the Panhandle and southwest Gulf Coast regions of Florida[8].

Sand placement projects threaten migration and wintering habitat of the piping plover in every state throughout the range (**Table 8**). At least 684.8 miles (32%) of sandy beach habitat in the continental wintering range of the piping plover have received artificial sand placement via dredge disposal activities, beach renourishment or restoration, dune restoration, emergency berms, inlet bypassing, inlet closure and relocation, and road reconstruction projects. In most areas, sand placement projects are in developed areas or adjacent to shoreline or inlet hard stabilization structures in order to address erosion, reduce storm damages, or ameliorate sediment deficits caused by inlet dredging and stabilization activities.

8 Lott (2009) noted that sand placement projects may directly degrade plover habitat, but they may also correlate with high human density, where disturbance is higher.

The beaches along the mainland coast of Mississippi are the most modified by sand placement activities with at least 85% affected (**Table 8**). Of the oceanfront beaches, the Atlantic coast of Florida has had the highest proportion (at least 51%) of beaches modified by sand placement activities. Approximately 47% of Florida's sandy beach coastline has received sand placement of some type, with many areas receiving fill multiple times from dredge disposal, emergency berms, beach renourishment, dune restoration and other modifications (Rice 2012b).

In Louisiana, the sustainability of the coastal ecosystem is threatened by the inability of the barrier islands to maintain geomorphologic functionality. The state's coastal systems are starved for sediment sources (USACE 2010). Consequently, most of the planned sediment placement projects in Louisiana are conducted as environmental restoration projects by various federal and state agencies because without the sediment many areas would erode below sea level. Several Louisiana Coastal Wetland Planning, Protection, and Restoration Act projects have been constructed on portions of undeveloped islands within the Terrebonne Basin to restore and maintain the diverse functions of those barrier island habitats (USFWS 2010a). Altogether over 60 miles of sandy beaches have been modified with sand placement projects in Louisiana, both through restoration projects and in response to the Deepwater Horizon oil spill (Rice 2012b).

**Table 8. Approximate shoreline miles of sandy beach that have been modified by sand placement activities for each state in the U.S. continental wintering range of the piping plover as of December 2011. These totals are minimum numbers, given missing data for some areas (Rice 2012b).**

| State | Known Approximate Miles of Beach Receiving Sand | Proportion of Modified Sandy Beach Shoreline |
|---|---|---|
| **North Carolina** | 91.3 | 28% |
| **South Carolina** | 67.6 | 37% |
| **Georgia** | 5.5 | 6% |
| **Florida Atlantic coast** | 189.7 | 51% |
| **Florida Gulf coast** | 189.9 | 43% |
| **Alabama** | 7.5 | 16% |
| **Mississippi barrier island coast** | 1.1 | 4% |
| **Mississippi mainland coast** | 43.5 | 85% |
| **Louisiana** | 60.4 | 28% |
| **Texas** | 28.3 | 8% |
| **TOTAL** | **684.8+** | **32%** |

Both the number and the size of sand projects along the Atlantic and Gulf coasts are increasing (Trembanis *et al*. 1998), and these projects are increasingly being chosen as a means to combat sea level rise and related beach erosion problems (Klein *et al*. 2001). Lott *et al*. (2009a) documented an increasing trend in sand placement events in Florida (**Figure 11**). In northwest Florida, the Service consulted on first-time sand placement projects along 46 miles of shoreline in 2007-2008. Much of this work was authorized on public lands (Gulf Islands National Seashore [USFWS 2007a], portions of Saint Joseph State Park [USFWS 2007b], and at Eglin Air

Force Base [USFWS 2008a]). Throughout the plover migration and wintering range, the number of sand placement events has increased every decade for which records are available, with at least 710 occurring between 1939 and 2007, and more than 75% occurring since 1980 (PSDS 2011). The cumulative volume of sand placed on East Coast beaches has risen exponentially since the 1920s (Trembanis *et al*. 1998). As a result, sand placement projects increasingly pose threats to plover habitat. As of 2011, at least 32% (~ 685 miles) of the sandy beaches in the continental wintering range have had one or more sand placement projects.

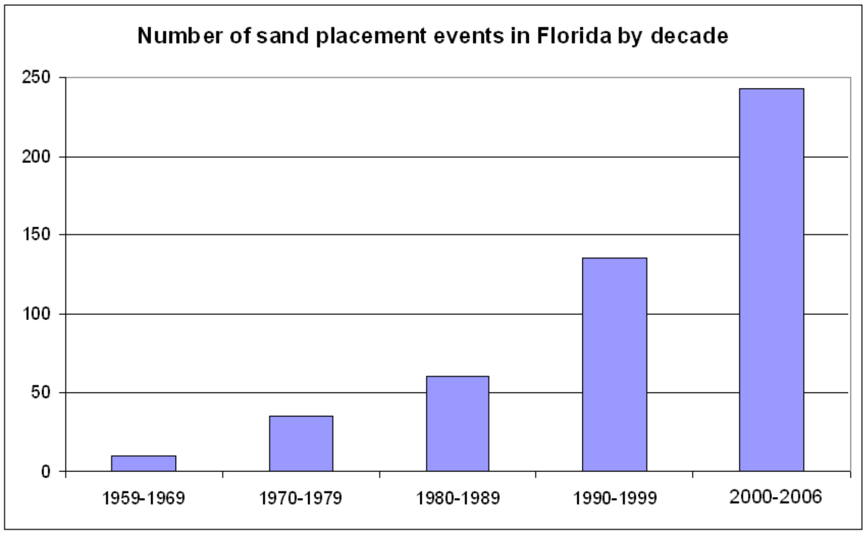


**Figure 11. Number of sand placement events per decade in Florida between 1959-1999, and 2000-2006 (from Lott *et al*. 2009a).**

*Loss of Macroinvertebrate Prey Base due to Shoreline Stabilization*

Wintering and migrating piping plovers depend on the availability and abundance of macroinvertebrates as an important food item. Studies of invertebrate communities have found that communities are richer (greater total abundance and biomass) on protected (bay or lagoon) intertidal shorelines than on exposed ocean beach shorelines (McLachlan 1990, Cohen *et al*. 2006, Defeo and McLachlan 2011). Polychaete worms tend to have a more diverse community and be more abundant in more protected shoreline environments, and mollusks and crustaceans such as amphipods thrive in more exposed shoreline environments (McLachlan and Brown 2006). Polychaete worms comprise the majority of the shorebird diet (Kalejta 1992, Mercier and McNeil 1994, Tsipoura and Burger 1999, Verkuil *et al*. 2006); and of the piping plover diet in particular (Hoopes 1993, Nicholls 1989, Zonick and Ryan 1996).

The quality and quantity of the macroinvertebrate prey base is threatened by shoreline stabilization activities, including the approximately 685 miles of beaches that have received sand placement of various types. The addition of dredged sediment can temporarily affect the benthic fauna of intertidal systems. Invertebrates may be crushed or buried during project construction. Although some benthic species can burrow through a thin layer of additional sediment (38-89 cm for different species), thicker layers (i.e., >1 meter) are likely to smother these sensitive benthic organisms (Greene 2002). Numerous studies of such effects indicate that the recovery of benthic fauna after beach renourishment or sediment placement projects can take anywhere from six months to two years, and possibly longer in extreme cases (Thrush *et al*. 1996, Peterson *et al*. 2000, Zajac and Whitlatch 2003, Bishop *et al*. 2006, Peterson *et al*. 2006).

Invertebrate communities may also be affected by changes in the physical environment resulting from shoreline stabilization activities that alter the sediment composition or degree of exposure. For example, SCDNR (2011) found the decline in piping plovers to be strongly correlated with a decline in polychaete densities on the east end of Kiawah Island, South Carolina, following an inlet relocation project in 2006. Similar results were documented on Bird Key, South Carolina, in 2006 when rapid habitat changes occurred within the sheltered lagoon habitat following dredge disposal activities, and piping plovers shifted to more exposed areas. Their di*et al*so appeared to have shifted to haustoriid amphipods, based on analysis of fecal samples containing pieces of *Neohaustorius schmitzi*, *Lepidactylus dytiscus*, and *Acanthohaustorius* sp., which were also found during the invertebrate sampling in both locations (SCDNR 2011).

Shoreline armoring with hard stabilization structures such as seawalls and revetments can also alter the degree of exposure of the macroinvertebrate prey base by modifying the beach and intertidal geomorphology, or topography. Seawalls typically result in the narrowing and steepening of the beach and intertidal slope in front of the structure, eventually leading to complete loss of the dry and intertidal beach as sea level continues to rise (Pilkey and Wright 1988, Hall and Pilkey 1991, Dugan and Hubbard 2006, Defeo *et al*. 2009, Kim *et al*. 2011).

Sand placement projects bury the natural beach with up to millions of cubic yards of new sediment, and grade the new beach and intertidal zone with heavy equipment to conform to a predetermined topographic profile. This can lead to compaction of the sediment (Nelson *et al*. 1987, USACE 2008, Defeo *et al*. 2009). If the material used in a sand placement project does not closely match the native material on the beach, the sediment incompatibility may result in modifications to the macroinvertebrate community structure, because several species are sensitive to grain size and composition (Rakocinski *et al*. 1996; Peterson *et al*. 2000, 2006; Peterson and Bishop 2005; Colosio *et al*. 2007; Defeo *et al*. 2009).

Delayed recovery of the benthic prey base or changes in their communities due to physical habitat changes may affect the quality of piping plover foraging habitat. The duration of the impact can adversely affect piping plovers because of their high site fidelity. Although recovery of invertebrate communities has been documented in many studies, sampling designs have typically been inadequate and have only been able to detect large-magnitude changes (Schoeman *et al*. 2000, Peterson and Bishop 2005). Therefore, uncertainty persists about the impacts of various projects to invertebrate communities and how these impacts affect shorebirds, particularly the piping plover. Rice (2009) has identified several conservation measures that can avoid and minimize some of the known impacts.

*Invasive Vegetation*

The spread of invasive plants into suitable wintering piping plover habitat is a relatively recently identified threat (USFWS 2009c). Such plants tend to reproduce and spread quickly and to exhibit dense growth habits, often outcompeting native plants. Uncontrolled invasive plants can shift habitat from open or sparsely vegetated sand to dense vegetation, resulting in the loss or degradation of piping plover roosting habitat, which is especially important during high tides and migration periods. The propensity of invasive species to spread, and their tenacity once established, make them a persistent threat that is only partially countered by increasing landowner awareness and willingness to undertake eradication activities.

Many invasive species are either currently affecting or have the potential to affect coastal beaches and thus plover habitat. Beach vitex (*Vitex rotundifolia*) is a woody vine introduced into the southeastern U. S. as a dune stabilization and ornamental plant which has spread to coastal communities throughout the southeastern U.S. from Virginia to Florida, and west to Texas (Westbrooks and Madsen 2006). Hundreds of beach vitex occurrences and targeted eradication efforts in North and South Carolina and a small number of known locations in Georgia and Florida are discussed in the 5-Year Review (USFWS 2009c). Crowfootgrass (*Dactyloctenium aegyptium*), which grows invasively along portions of the Florida coastline, forms thick bunches or mats that can change the vegetative structure of coastal plant communities and thus alter shorebird habitat (USFWS 2009c, Florida Exotic Pest Plant Council 2009). Australian pine (*Casuarina equisetifolia*) affects piping plovers and other shorebirds by encroaching on foraging and roosting habitat (Stibolt 2011); it may also provide perches for avian predators. Japanese sedge (*Carex kobomugi*), which aggressively encroaches into sand beach habitats (USDA plant profile website), was documented in Currituck County, North Carolina, in the mid-1970s and as recently as 2003 on Currituck National Wildlife Refuge (J. Gramling, Department of Biology, The Citadel, pers. comm. 2011), at two sites where migrating piping plovers have also been documented. Early detection and rapid response are the keys to controlling this and other invasive plants (R. Westbrooks, U.S. Geological Survey, pers. comm. 2011).

Defeo *et al*. (2009) cite biological invasions of both plants and animals as global threats to sandy beaches, with the potential to alter the food web, nutrient cycling and invertebrate assemblages. Although the extent of the threat is uncertain, this may be due to poor survey coverage more than an absence of invasions.

*Wrack Removal and Beach Cleaning*

Wrack on beaches and baysides provides important foraging and roosting habitat for piping plovers (Drake 1999, Smith 2007, Maddock *et al*. 2009, Lott *et al*. 2009b; see also discussion of piping plover use of wrack substrates in *Habitat Use*) and for many other shorebirds. Because shorebird numbers are positively correlated both with wrack cover and the biomass of their invertebrate prey that feed on wrack (Tarr and Tarr 1987, Hubbard and Dugan 2003, Dugan *et al*. 2003), beach grooming has been shown to decrease bird numbers (Defeo *et al*. 2009).

It is increasingly common for beach-front communities to carry out "beach cleaning" and "beach raking" activities. Beach cleaning is conducted on private beaches, where piping plover use is not well documented, and on some municipal or county beaches used by piping plovers. Most wrack removal on state and federal lands is limited to post-storm cleanup and does not occur regularly. Wrack removal and beach raking both occur on the Gulf beach side of the developed portion of South Padre Island in the Lower Laguna Madre in Texas, where plovers have been documented during both the migratory and wintering periods (Zdravkovic and Durkin 2011). Wrack removal and other forms of beach cleaning have been the subject of formal consultations between the USACE, municipalities, and the Service in Neuces County, Texas (USFWS 2008b, 2009c).

Although beach cleaning and raking machines effectively remove human-made debris, these efforts also remove accumulated wrack, topographic depressions, emergent foredunes and hummocks, and sparse vegetation nodes used by roosting and foraging piping plovers (Nordstrom 2000, Dugan and Hubbard 2010). Removal of wrack also reduces or eliminates natural sand-trapping, further destabilizing the beach. Cathcart and Melby (2009) found that beach grooming and raking beaches "fluffs the sand" whereas heavy equipment compacts the sand below the top layer; the fluffed sand is then more vulnerable to erosion by storm water runoff and wind. These authors found that beach raking and grooming practices on mainland Mississippi beaches "exacerbate the erosion process and shorten the time interval between renourishment projects" (Cathcart and Melby 2009). Furthermore, the sand adhering to seaweed and trapped in the cracks and crevices of wrack also is lost to the beach when the wrack is removed. Although the amount of sand lost during a single sweeping activity may be small, over a period of years this loss could be significant (Neal *et al*. 2007).

Tilling beaches to reduce soil compaction, which is sometimes required by the Service for sea turtle protection after beach renourishment activities, has similar impacts to those described above. In northwest Florida, tilling on public lands is currently conducted only if the land manager determines that it is necessary. Where tilling is needed, adverse effects are reduced by Florida Service sea turtle protection provisions that require tilling to be above the primary wrack line, rather than within it.

As of 2009, the Florida Department of Environmental Protection's Beaches and Coastal Management Systems section had issued 117 permits allowing multiple entities to conduct beach raking or cleaning operations. The Florida Department of Environmental Protection estimated that 240 of 825 miles (29%) of sandy beach shoreline in Florida are cleaned or raked on varied schedules, i.e., daily, weekly, monthly (L. Teich, Florida DEP, pers. comm. 2009). Beach cleaning along 45 miles of coastline in Nueces, Kleberg, and Cameron Counties in Texas was addressed in five Service biological opinions completed between 2008 and 2012 (Cobb pers. comm. 2012c).

Dugan and Hubbard (2010), studying beach grooming activities on the beaches and dunes of southern California, concluded that "beach grooming has contributed to widespread conversion of coastal strand ecosystems to unvegetated sand" by removing wrack cover, increasing the transport of windblown sediment, lowering the seed bank and the survival and reproduction of native plants, and decreasing native plant abundance and richness. They argue that conserving beach ecosystems by reducing beach grooming and raking activities "could help retain sediment, promote the formation of dunes, and maintain biodiversity, wildlife, and human use in the face of rising sea level (Dugan and Hubbard 2010)."

*Accelerating Sea Level Rise and other Climate Change Impacts*

Accelerating sea level rise poses a threat to piping plovers during the migration and wintering portions of their life cycle. As noted in the previous section, threats from sea level rise are tightly intertwined with artificial coastal stabilization activities that modify and degrade habitat. Potential effects of storms, which could increase in frequency or intensity due to climate change, are discussed in the Storm Events section. If climate change increases the frequency or magnitude of extreme temperatures (see discussion in Severe Cold Weather), piping plover survival rates may be affected. Other potential adverse and beneficial climate change-related effects (e.g., changes in the composition or availability of prey, emergence of new diseases, fewer periods of severe cold weather) are poorly understood, but cannot be discounted.

Numerous studies have documented accelerating rise in sea levels worldwide (Rahmstorf *et al*. 2007, Douglas *et al*. 2001 as cited in Hopkinson *et al*. 2008, CCSP 2009, Pilkey and Young 2009, Vermeer and Rahmstorf 2009, Pilkey and Pilkey 2011). Predictions include a sea level rise of between 50 and 200 cm above 1990 levels by the year 2100 (Rahmstorf 2007, Pfeffer *et al*. 2008, Vermeer and Rahmstorf 2009, Grinsted *et al*. 2010, Jevrejeva *et al*. 2010) and potential conversion of as much as 33% of the world's coastal wetlands to open water by 2080 (IPCC 2007a, CCSP 2008). Potential effects of sea level rise on piping plover roosting and foraging habitats may vary regionally due to subsidence or uplift, the geological character of the coast and nearshore, and the influence of management measures such as beach renourishment, jetties, groins, and seawalls (CCSP 2009, Galbraith *et al*. 2002, Gutierrez *et al*. 2011). Sea level rise along the U.S. Gulf Coast exceeded the global average by 13-15 cm because coastal lands there are subsiding (EPA 2009). The rate of sea level rise in Louisiana is particularly high (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Sediment compaction and oil and gas extraction compound tectonic subsidence along the Gulf of Mexico coastline (Penland and Ramsey 1990, Morton *et al*. 2003, Hopkinson *et al*. 2008).

Low elevations and proximity to the coast make all nonbreeding piping plover foraging and roosting habitats vulnerable to the effects of rising sea level. Areas with small tidal ranges are the most vulnerable to loss of intertidal wetlands and flats (EPA 2009). Sea level rise was cited as a contributing factor in the 68% decline in tidal flats and algal mats in the Corpus Christi, Texas region (i.e., Lamar Peninsula to Encinal Peninsula) between the 1950s and 2004 (Tremblay *et al*. 2008). Mapping by Titus and Richman (2001) showed that more than 80% of the lowest land along the Atlantic and Gulf coasts was in Louisiana, Florida, Texas, and North Carolina. Gutierrez *et al*. (2011) found that along the Atlantic coast, the central and southern Florida coast is the most likely Atlantic portion of the wintering and migration range to experience moderate to severe erosion with sea level rise.

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat, especially if those shorelines are armored with hardened structures (Brown and McLachlan 2002, Dugan and Hubbard 2006, Fish *et al*. 2008, Defeo *et al*. 2009). Overwash and sand migration are impeded on the developed portions of sandy ocean beaches (Smith *et al*. 2008) that comprise 40% of the U.S. nonbreeding range (Rice 2012b). As the sea level rises, the ocean-facing beaches erode and attempt to migrate inland. Buildings and artificial sand dunes then prevent sand from washing back toward the lagoons (i.e., bayside), and the lagoon side becomes increasingly submerged during extreme high tides (Scavia *et al*. 2002). Barrier beach shorebird habitat and natural features that protect mainland developments are both diminished as a result.

Modeling by Galbraith *et al*. (2002) for three sea level rise scenarios at five important U.S. shorebird staging and wintering sites predicted aggregate loss of 20-70% of current intertidal foraging habitat. The most severe losses were projected at sites where the coastline is unable to move inland due to steep topography or seawalls. Of five study sites, the model predicted the lowest loss of intertidal shorebird foraging habitat at Bolivar Flats, Texas (a designated piping plover critical habitat unit) by 2050 because the habitat at that site will be able to migrate inland in response to rising sea level. The potential for such barrier island migration with rising sea level is most likely in the 42% of plover's U.S. nonbreeding range that is currently preserved from development (Rice 2012b). Although habitat losses in some areas are likely to be offset by gains in other locations, Galbraith *et al*. (2002) noted that time lags between these losses and the creation of replacement habitat elsewhere may have serious adverse effects on shorebird populations. Furthermore, even if piping plovers are able to move their wintering locations in response to accelerated habitat changes, there could be adverse effects on the birds' survival rates or subsequent productivity.

In summary, the magnitude of threats from sea level rise is closely linked to threats from shoreline development and artificial stabilization. These threats will be perpetuated in places where damaged structures are repaired or replaced, exacerbated where the height and strength of structures are increased, and increased at locations where development and coastal stabilization is expanded. Sites that are able to adapt to sea level rise are likely to become more important to piping plovers as habitat at developed or stabilized sites degrades.

*Weather events*

<u>Storm Events</u>

Storms are an integral part of the natural processes that form coastal habitats used by migrating and wintering piping plovers, and positive effects of storm-induced overwash and vegetation removal have been noted in portions of the wintering range. For example, biologists reported piping plover use of newly created habitats at Gulf Islands National Seashore in Florida within six months of overwash events that occurred during the 2004 and 2005 hurricane seasons (M. Nicholas, Gulf Islands National Seashore, pers. comm. 2005). Hurricane Katrina created a new inlet and improved habitat conditions on some areas of Dauphin Island, Alabama, but subsequent localized storms contributed to habitat loss there (D. LeBlanc, USFWS, pers. comm. 2009) and the inlet was subsequently closed with a rock dike as part of Deepwater Horizon oil spill response efforts (Rice 2012a). Following Hurricane Ike in 2008, Arvin (2009) reported decreased numbers of piping plovers at some heavily eroded Texas beaches in the center of the storm impact area and increases in plover numbers at sites about 100 miles to the southwest. Piping plovers were observed later in the season using tidal lagoons and pools that Hurricane Ike created behind the eroded beaches (Arvin 2009).

Adverse effects attributed to storms alone are sometimes actually due to a combination of storms and other environmental changes or human use patterns. For example, four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Winter Census (Haig and Plissner 1992) tallied more than 350 birds. Comparison of imagery taken three years before and again several days after Hurricane Katrina found that the Chandeleur Islands had lost 82% of their combined surface area (Sallenger 2010). A review of aerial photographs taken before the 2006 Census suggested that little piping plover habitat remained (Elliott-Smith *et al*. 2009). However, Sallenger *et al*. (2009) noted that habitat changes in the Chandeleur Islands stem not only from the effects of these storms, but rather from the combined effects of the storms, and more than a thousand years of diminishing sand supply and sea level rise. Although the Chandeleur Islands marsh platform continued to erode for 22 months post-Katrina, some sand was released from the marsh sediments which in turn created beaches, spits, and welded swash bars that advanced the shoreline seaward. Despite the effects of intense erosion, the Chandeleur Islands are still providing high quality shorebird habitat in the form of sand flats, spits, and beaches used by substantial numbers of piping plovers (Catlin *et al*. 2011), a scenario that could continue if restoration efforts[9] are sustainable and successful from a shorebird perspective (USACE 2010).

Storm-induced adverse effects include post-storm acceleration of human activities such as beach renourishment, sand scraping, closure of new inlets, and berm and seawall construction. As discussed previously, such stabilization activities can result in the loss and degradation of feeding and resting habitats. Land managers sometimes face public pressure after big storm events to plant vegetation, install sandfences, and bulldoze artificial “dunes.” For example, national wildlife refuge managers sometimes receive pressure from local communities to “restore” the beach and dunes following blow-outs from storm surges that create the overwash foraging habitat preferred by plovers (C. Hunter, USFWS, pers. comm. 2011). At least 64 inlets have been artificially closed, the vast majority of them shortly after opening in storm events[10] (**Table 7**). Storms also can cause widespread deposition of debris along beaches. Subsequent removal of this debris often requires large machinery that in turn can cause extensive disturbance and adversely affect habitat elements such as wrack. Challenges associated with management of public use can grow when storms increase access (e.g., merger of Pelican Island with Dauphin Island in Alabama following a 2007 storm (Gibson et. al. 2009, D. LeBlanc pers. comm. 2009)).

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9 The State of Louisiana built a sand berm along the northern end of the Chandeleur Island chain during the Deepwater Horizon oil spill response effort, restoring a sand supply to seven miles of the chain and closing approximately 11 inlets (Rice 2012b).

10 See discussion of differences between naturally and artificially closed inlets, page 20.

Some available information indicates that birds may be resilient, even during major storms, and move to unaffected areas without harm. Other reports suggest that birds may perish in or following storm events. Noel and Chandler (2005) suspected that changes in habitat caused by multiple hurricanes along the Georgia coastline altered the spatial distribution of piping plovers and may have contributed to the winter mortality of three individuals. Wilkinson and Spinks (1994) suggested that low plover numbers in South Carolina in January 1990 could have been partially influenced by effects on habitat from Hurricane Hugo the previous fall, while Johnson and Baldassarre (1988) found a redistribution of piping plovers in Alabama following Hurricane Elena in 1985.

Climate change studies indicate a trend toward increasing numbers and intensity of hurricane events (Emanuel 2005, Webster *et al*. 2005). Combined with the predicted effects of sea level rise, this trend indicates potential for increased cumulative impact of future storms on habitat. Major storms can create or enhance piping plover habitat while causing localized losses elsewhere in the wintering and migration range.

Severe Cold Weather

Several sources suggest the potential for adverse effects of severe winter cold on survival of piping plovers. The Atlantic Coast piping plover recovery plan mentioned high mortality of coastal birds and a drop from approximately 30-40 to 15 piping plovers following an intense 1989 snowstorm along the North Carolina coast (Fussell 1990). A preliminary analysis of survival rates for Great Lakes piping plovers found that the highest variability in survival occurred in spring and correlated positively with minimum daily temperature (weighted mean based on proportion of the population wintering near five weather stations) during the preceding winter (E. Roche, Univ. of Tulsa, pers. comm. 2010 and 2012). Catlin (pers. comm. 2012b) reported that the average mass of ten piping plovers captured in Georgia during unusually cold weather in December 2010 was 5.7 grams (g) less than the average for nine birds captured in October of the same year (46.6 g and 52.4 g, respectively; $p = 0.003$).

*Disturbance from Recreation Activities*

Increasing human disturbance is a major threat to piping plovers in their coastal migration and wintering range (USFWS 2009c). Intense human disturbance in shorebird winter habitat can be functionally equivalent to habitat loss if the disturbance prevents birds from using an area (Goss-Custard *et al*. 1996). Nicholls and Baldassarre (1990a) found less people and off-road vehicles at sites where nonbreeding piping plovers were present than at sites without piping plovers. Pfister *et al*. (1992) implicate anthropogenic disturbance as a factor in the long-term decline of migrating shorebirds at staging areas. Disturbance can cause shorebirds to spend less time roosting or foraging and more time in alert postures or fleeing from the disturbances (Burger 1991, 1994; Elliott and Teas 1996; Lafferty 2001a, 2001b; Thomas *et al*. 2003). Shorebirds that are repeatedly flushed in response to disturbance expend energy on costly short flights (Nudds and Bryant 2000).

Shorebirds are more likely to flush from the presence of dogs than people, and breeding and nonbreeding shorebirds react to dogs from farther distances than people (Lafferty 2001a, 2001b; Lord *et al*. 2001, Thomas *et al*. 2003). Hoopes (1993) found that dogs flush breeding piping plovers from further distances than people and that both the distance the plovers move and the duration of their response is greater. Foraging shorebirds at a migratory stopover on Delaware Bay, New Jersey responded most strongly to dogs compared with other disturbances; shorebirds often failed to return within ten minutes after the dog left the beach (Burger *et al*. 2007). Dogs off-leash were disproportionate sources of disturbance in several studies (Thomas *et al*. 2003, Lafferty 2001b), but leashed dogs also disturbed shorebirds. Pedestrians walking with dogs often go through flocks of foraging and roosting shorebirds; some even encourage their dogs to chase birds.

Off-road vehicles can disrupt piping plover's normal behavior patterns. The density of off-road vehicles negatively correlated with abundance of piping plovers on the ocean beach in Texas (Zonick 2000). Cohen *et al*. (2008) found that radio-tagged wintering piping plovers using ocean beach habitat at Oregon Inlet in North Carolina were far less likely to use the north side of the inlet where off-road vehicle use was allowed. Ninety-six percent of piping plover detections occurred on the south side of the inlet even though it was more than four times farther away from foraging sites, prompting a recommendation that controlled management experiments be conducted to determine if recreational disturbance drives roost site selection (Cohen *et al*. 2008). Zdravkovic and Durkin (2011) stated that Laguna Madre Gulf beaches are considered part of the Texas state highway system and are severely impacted by unrestricted public recreational off-road vehicle use.

In a study of migrating shorebirds in Maryland, Forgues (2010) found that shorebird abundance declined with increased off-road vehicle frequency, as did the number and size of roosts. Migrants spent less time foraging in the presence of vehicles. In a before-after control-impact experiment, densities of three focal species were significantly reduced after a vehicle closure was lifted, while densities outside the closure zone exhibited little change; densities of two other species also decreased more in the area where the closure was removed, but the difference was not significant (Forgues 2010). In North Carolina, a before-after control-impact experiment using the undisturbed plots as the controls found that vehicle disturbance decreased abundance of shorebirds and altered their habitat use during fall migration (Tarr 2008).

Recreational activities, especially off-road vehicles, may degrade piping plover habitat. Tires that crush wrack into the sand render it unavailable as a roosting habitat or foraging substrate (Goldin 1993, Hoopes 1993). At four study beaches in New York and Massachusetts, Kluft and Ginsberg (2009) found that abundance of invertebrates in pitfall trap samples and abundance of wrack was higher on vehicle-free beaches, although invertebrate abundance in wrack clumps and cores taken below them did not show consistent differences between areas open and closed to vehicles. Off-road vehicles significantly lessened densities of invertebrates on intertidal flats on the Cape Cod National Seashore in Massachusetts (Wheeler 1979). In eastern Australia, off-road vehicles use has been documented as a significant cause of invertebrate mortality on beaches (Schlacher *et al*. 2008a, 2008b). Results of Schlacher and Thompson (2012) in eastern Australia also suggest that channeling major pedestrian access points away from key shorebird habitat may enhance protection of their prey base.

Various local and regional examples also illustrate threats from recreation. On a 12-kilometer stretch of Mustang Island in Texas, Foster *et al*. (2009) observed a 25% decline in piping plover abundance and a simultaneous five-fold increase in human use over a 29-year study period, 1979 – 2007. This trend was marginally significant, but declines in two other plover species were significant; declining shorebird abundance was attributed to a combination of human disturbance and overall declines in shorebird populations (Foster *et al*. 2009). In South Carolina, almost half of sites with five or more piping plovers had ten or more people present during surveys conducted in 2007-2008 and more than 60% allow dogs (Maddock and Bimbi unpubl. data). Zdravkovic and Durkin (2011) noted disturbance to piping plovers in Texas from kite-boarding, windsurfing, and horseback riding.

LeDee *et al*. (2010) surveyed land managers of designated critical habitat sites across seven southern states and documented the extent of beach access and recreation. All but four of the 43 reporting sites owned or managed by federal, state, and local governmental agencies or by non-governmental organizations allowed public beach access year-round (88% of the sites). At the sites allowing public access, 62% of site managers reported more than 10,000 visitors during September-March, and 31% reported more than 100,000 visitors in this period. However, more than 80% of the sites allowing public access did not allow vehicles on the beach and half did not allow dogs during the winter season.

*Oil Spills and Other Contaminants*

Piping plovers may accumulate contaminants from point and non-point sources at migratory and wintering sites. Depending on the type and degree of contact, contaminants can have lethal and sub-lethal effects on birds, including behavioral impairment, deformities, and impaired reproduction (Rand and Petrocelli 1985, Gilbertson *et al*. 1991, Hoffman *et al*. 1996). Notwithstanding documented cases of lightly oiled piping plovers that have survived and successfully reproduced (Amirault-Langlais *et al*. 2007, A. Amos, University of Texas Marine Science Institute, pers. comm. 2009, 2012), contaminants have both the potential to cause direct toxicity to individual birds and to negatively impact their invertebrate prey base (Chapman 1984, Rattner and Ackerson 2008). Piping plovers' extensive use of the intertidal zone puts them in constant contact with coastal habitats likely to be contaminated by water-borne spills. Negative impacts can also occur during rehabilitation of oiled birds. Frink *et al*. (1996) describe how standard treatment protocols were modified to reflect the extreme susceptibility of piping plovers to handling and other stressors.

<u>Oil Spills</u>

Following the Ixtoc spill, which began on June 3, 1979 off the coast of Mexico, approximately 350 metric tons of oil accumulated on South Texas barrier beaches, resulting in a 79% decrease in the total number of infaunal organisms on contaminated portions of the beach (Kindinger 1981, Tunnell *et al*. 1982). Chapman (1984) collected pre- and post-spill data on the abundance, distribution, and habitat use of shorebirds on the beaches in the affected area and saw declines in the numbers of birds as well as shifts in the habitats used. Shorebirds avoided the intertidal area of the beach, occupying the backshore or moving to estuarine habitats when most of the beach was coated. Chapman surmised that the decline in infauna probably contributed to the observed shifts in habitats used. His observations indicated that all the shorebirds, including piping plovers, avoided the contaminated sediments and concentrated in oil-free areas. Amos, however, reported that piping plovers ranked second to sanderlings in the numbers of oiled birds he observed on the beach, although there was no recorded mortality of plovers due to oil (Amos pers. comm. 2009, 2012). Oiled birds were seen for a year or more following the initial spill, likely due to continued washing in of sunken tar; but there were only occasional subsequent observations of oiled or tarred plovers (Amos pers. comm. 2009).

According to government estimates, the 2010 Deepwater Horizon Mississippi Canyon Well #252 oil spill discharged more than 200 million gallons of oil into the Gulf of Mexico (U.S. Government 2010). Containment activities, recovery of oil-water mix, and controlled burning removed some oil, but additional impacts to natural resources may stem from the 1.84 million gallons of dispersant that were applied to the spill (U. S. Government 2010). At the end of July 2010, approximately 625 miles of Gulf of Mexico shoreline was oiled. This included approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama, and 94 miles in Florida (U. S. Government 2010). These numbers do not address cumulative impacts or include shoreline that was cleaned earlier. The U. S. Coast Guard, the states, and responsible parties that form the Unified Command (with advice from federal and state natural resource agencies) initiated protective measures and clean-up efforts as provided in contingency plans for each state's coastline. The contingency plans identified sensitive habitats, including all ESA-listed species' habitats, which received a higher priority for response actions.

Efforts to prevent shoreline oiling and cleanup response activities can disturb piping plovers and their habitat. Although most piping plovers were on their breeding grounds in May, June, and early July when the Deepwater well was discharging oil, oil was still washing onto Gulf beaches when the plovers began arriving back on the Gulf in mid-July. Ninety percent of piping plovers detected during the prior four years of surveys in Louisiana were in the Deepwater Horizon oil spill impact zone, and Louisiana's Department of Wildlife and Fisheries reported significant disturbance to birds and their habitat from response activities. Wrack lines were removed, and sand washing equipment "cleansed" beaches (M. Seymour, Louisiana Natural Heritage Program, pers. comm. 2011). Potential long-term adverse effects stem from the construction of sand berms and closing of at least 32 inlets (Rice 2012a). Implementation of prescribed best management practices reduced, but did not negate, disturbance to plovers (and to other beach-dependent wildlife) from cleanup personnel, all-terrain vehicles, helicopters, and other equipment. Service and state biologists present during cleanup operations provided information about breeding, migrating, and wintering birds and their habitat protection needs. However, high staff turnover during the extended spill response period necessitated continuous education and training of clean up personnel (M. Bimbi, USFWS, pers. comm. 2011). Limited clean-up operations were still on-going throughout the spill area in November 2012 (H. Herod, USFWS, pers. comm. 2012). Results of a natural resources damage assessment study to assess injury to piping plovers (Fraser *et al*. 2010) are not yet available.

More subtle but cumulatively damaging sources of oil and other contaminants are leaking vessels located offshore or within the bays on the Atlantic and Gulf coasts, offshore oil rigs and undersea pipelines in the Gulf of Mexico, pipelines buried under the bay bottoms, and onshore facilities such as petroleum refineries and petrochemical plants. In Louisiana, about 2,500-3,000 oil spills are reported in the Gulf region each year, ranging in size from very small to thousands of barrels (L. Carver, Louisiana Department of Wildlife and Fisheries, pers. comm. 2011). Chronic spills of oil from rigs and pipelines and natural seeps in the Gulf of Mexico generally involve small quantities of oil. The oil from these smaller leaks and seeps, if they occur far enough from land, will tend to wash ashore as tar balls. In cases such as this, the impact is limited to discrete areas of the beach, whereas oil slicks from larger spills coat longer stretches of the shoreline (K. Rice, USFWS, pers. comm. 2009). In late July and early August 2009, for example, oil suspected to have originated from an offshore oil rig in Mexican waters was observed on plumage or legs of 14 piping plovers in south Texas (Cobb pers. comm. 2012b).

Pesticides and Other Contaminants

A piping plover was found among dead shorebirds discovered on a sandbar near Marco Island, Florida following the county's aerial application of the organophosphate pesticide Fenthion for mosquito control in 1997 (Pittman 2001, Williams 2001). Subsequent to further investigations of bird mortalities associated with pesticide applications and to a lawsuit being filed against the Environmental Protection Agency in 2002, the manufacturer withdrew Fenthion from the market, and Environmental Protection Agency banned all use after November 30, 2004 (American Bird Conservancy 2007).

Absent identification of contaminated substrates or observation of direct mortality of shorebirds on a site used by migrating and wintering piping plovers, detection of contaminants threats is most likely to occur through analysis of unhatched eggs. Contaminants in eggs can originate from any point in the bird's annual cycle, and considerable effort may be required to ascertain where in the annual cycle exposure occurred (see, for example, Dickerson *et al*. 2011 characterizing contaminant exposure of mountain plovers).

There has been limited opportunistic testing of piping plover eggs. Polychlorinated biphenol (PCB) concentrations in several composites of Great Lakes piping plover eggs tested in the 1990s had potential to cause reproductive harm. Analysis of prey available to piping plovers at representative Michigan breeding sites indicated that breeding areas along the upper Great Lakes region were not likely the major source of contaminants to this population (D. Best, USFWS, pers. comm. 1999 in USFWS 2003). Relatively high levels of PCB, dichloro diphenyl dichloroethylene (DDE), and polybrominated diphenyl ether (PBDE) were detected in one of two clutches of Ontario piping plover eggs analyzed in 2009 (V. Cavalieri, USFWS, pers. comm. 2011). Results of opportunistic egg analyses to date from Atlantic Coast piping plovers did not warrant follow-up investigation (Mierzykowski 2009, 2010, 2012; S. Mierzykowski, USFWS pers. comm. 2012). No recent testing has been conducted for contaminants in the Northern Great Plains piping plover population.

*Energy Development*

Land-based Oil and Gas Exploration and Development

Various oil and gas exploration and development activities occur along the Gulf Coast. Examples of conservation measures prescribed to avoid adverse effects on piping plovers and their habitats include conditions on driving on beaches and tidal flats, restrictions on discharging fresh water across unvegetated tidal flats, timing exploration activities during times when the plovers are not present, and use of directional drilling from adjacent upland areas (USFWS 2008c; B. Firmin, USFWS, pers. comm. 2012). With the implementation of appropriate conditions, threats to nonbreeding piping plovers from land-based oil and gas extraction are currently very low.

Wind Turbines

Wind turbines are a potential future threat to piping plovers in their coastal migration and wintering range[11]. Relatively small single turbines have been constructed along the beachfront in at least a few locations (e.g., South Carolina; M. Caldwell, USFWS, pers. comm. 2012). Current risk to piping plovers from several wind farms located on the mainland north and west of several bays in southern Texas is deemed low during months of winter residency because the birds are not believed to traverse these areas in their daily movements (D. Newstead, Coastal Bend Bays and Estuaries Program, pers. comm. 2012a). To date, no piping plovers have been reported from post-construction carcass detection surveys at these sites (P. Clements, USFWS, pers. comm. 2012). However, Newstead (pers. comm. 2012a) has raised questions about collision risk during migration departure, as large numbers of piping plovers have been observed in areas of the Laguna Madre east of the wind farms during the late winter. Furthermore, there is concern that, as sea level rises, the intertidal zone (and potential piping plover activity) may move closer to these sites. Several off-shore wind farm proposals in South Carolina are in various stages of early scoping (Caldwell pers. comm. 2012). A permit application was filed in 2011 for 500 turbines in three areas off the coast of south Texas (USACE 2011), but it is unknown whether piping plovers transit these areas.

In addition to uncertainty regarding the location and design (e.g., number and height of turbines) of future wind turbines, the magnitude of potential threats is difficult to assess without better information about piping plover movements and behaviors. For wind projects situated on barrier beaches, bay shorelines, or within bays, relevant information includes the flight routes of piping plovers moving among foraging and roosting sites, flight altitude, and avoidance rates under varying weather and light conditions. For off-shore wind projects, piping plover migration routes and altitude, as well as avoidance rates will be key determinants of threats.

11 Piping plovers are under consideration for inclusion in a habitat conservation plan addressing wind energy development that overlaps the piping plover's interior migration routes (USFWS 2011b).

*Predation*

The extent of predation on migrating or wintering piping plovers remains largely unknown and is difficult to document. Avian and mammalian predators are common throughout the species' wintering range. Human activities affect the types, numbers, and activity patterns of some predators, thereby exacerbating natural predation on breeding piping plovers (USFWS 1996). One incident involving a cat observed stalking piping plovers was reported in Texas (NY Times 2007). It has been estimated that free-roaming cats kill over one billion birds every year in the U. S., representing one of the largest single sources of human-influenced mortality for small native wildlife (Gill 1995, Sax and Gaines 2008).

Predatory birds, including peregrine falcons, merlin, and harriers, are present in the nonbreeding range. Newstead (pers. comm. 2012b) reported two cases of suspected avian depredation of piping plovers in a Texas telemetry study, but he also noted that red tide may have compromised the health of these plovers. It has been noted, however, that the behavioral response of crouching when in the presence of avian predators may minimize avian predation on piping plovers (Morrier and McNeil 1991, Drake 1999, Drake *et al*. 2001). Drake (1999a) theorized that this piping plover behavior enhances concealment associated with roosting in depressions and debris in Texas.

Nonbreeding piping plovers may reap some collateral benefits from predator management conducted for the primary benefit of other species. Florida Keys Refuges National Wildlife Refuge (USFWS 2011a), for example, released a draft integrated predator management plan that targets predators, including cats, for the benefit of native fauna and flora. Other predator control programs are ongoing in North Carolina, South Carolina, Florida, and Texas beach ecosystems (USFWS 2009c).

Although the extent of predation to nonbreeding piping plovers is unknown, it remains a potential threat. At this time, however, the Service considers predator control and related research on wintering and migration grounds to be a low priority[12].

*Military Operations*

Five of the eleven coastal military bases located in the U.S. continental range of nonbreeding piping plovers have consulted with the Service about potential effects of military activities on plovers and their habitat (USFWS 2009c, USFWS 2010a). Formal consultation under section 7 of the ESA with Camp Lejeune, North Carolina in 2002 provided for year-round piping plover surveys, but restrictions on activities on Onslow Beach only pertain to the plover breeding season (J. Hammond, USFWS, pers. comm. 2012). Informal consultations with three Florida bases (Naval Station Mayport, Eglin Air Force Base, Tyndall Air Force Base) addressed training activities that included beach exercises and occasional use of motorized equipment on beaches

12 However, the threat of predation should be distinguished from the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash.

and bayside habitats. Eglin Air Force Base conducts twice-monthly surveys for piping plovers, and habitats consistently used by piping plovers are posted with avoidance requirements to minimize direct disturbance from troop activities. Operations at Tyndall Air Force Base and Naval Station Mayport were determined to occur outside optimal piping plover habitats. A 2001 consultation with the Navy for one-time training operations on Peveto Beach in Louisiana concluded informally (USFWS 2010a). Current threats to wintering and migrating piping plovers posed by military activities appear minimal.

*Disease*

No instances of disease have been documented in piping plovers outside the breeding range. In the southeastern U.S., the cause of death of one piping plover received from Texas was emaciation (C. Acker, U. S. Geological Survey, pers. comm. 2009). Newstead (pers. comm. 2012b) reported circumstantial evidence that red tide weakened piping plovers in the vicinity of the Laguna Madre and Padre Island, Texas during the fall of 2011. Samples collected in Florida from two live piping plovers in 2006 both tested negative for avian influenza (M. Hines, U. S. Geological Survey, pers. comm. 2009). The 2009 5-Year Review concluded that West Nile virus and avian influenza remain minor threats to piping plovers on their wintering and migration grounds.

*Summary and Synthesis of Threats*

A review of threats to piping plovers and their habitat in their migration and wintering range shows a continuing loss and degradation of habitat due to sand placement projects, inlet stabilization, sand mining, groins, seawalls and revetments, dredging of canal subdivisions, invasive vegetation, and wrack removal. This cumulative habitat loss is, by itself, of major threat to piping plovers, as well as the many other shorebird species competing with them for foraging resources and roosting habitats in their nonbreeding range. However, artificial shoreline stabilization also impedes the processes by which coastal habitats adapt to storms and accelerating sea level rise, thus setting the stage for compounding future losses. Furthermore, inadequate management of increasing numbers of beach recreationists reduces the functional suitability of coastal migration and wintering habitat and increases pressure on piping plovers and other shorebirds depending upon a shrinking habitat base. Experience during the Deepwater Horizon oil spill illustrates how, in addition to the direct threat of contamination, spill response activities can result in short- and long-term effects on habitat and disturb piping plovers and other shorebirds. If climate change increases the frequency and magnitude of severe weather events, this may pose an additional threat. The best available information indicates that other threats are currently low, but vigilance is warranted, especially in light of the potential to exacerbate or compound effects of very significant threats from habitat loss and degradation and from increasing human disturbance.

*Recovery criteria*

<u>Northern Great Plains Population (USFWS 1988b, 1994)</u>

1. Increase the number of birds in the U.S. northern Great Plains states to 2,300 pairs (USFWS 1994).
2. Increase the number of birds in the prairie region of Canada to 2,500 adult piping plovers (USFWS 1988).
3. Secure long-term protection of essential breeding and wintering habitat (USFWS 1994).

<u>Great Lakes Population (USFWS 2003)</u>

1. At least 150 pairs (300 individuals), for at least 5 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 (USFWS 1996)</u>

1. Increase and maintain for 5 years a total of 2,000 breeding pairs, distributed among 4 recovery units.

| *Recovery Unit* | *Minimum Subpopulation* |
|---|---|
| *Atlantic (eastern) Canada* | *400 pairs* |
| *New England* | *625 pairs* |
| *New York-New Jersey* | *575 pairs* |
| *Southern (DE-MD-VA-NC)* | *400 pairs* |

2. Verify the adequacy of a 2,000 pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term.
3. Achieve a 5-year average productivity of 1.5 fledged chicks per pair in each of the 4 recovery units described in criterion 1, based on data from sites that collectively support at least 90% of the recover unit’s population.
4. Institute long-term agreements to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit.

5. Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population.

**Analysis of the species/critical habitat likely to be affected**

The proposed action has the potential to adversely affect wintering and migrating piping plovers within the proposed project area and Action Area. The effects of the proposed action on piping plovers will be considered further in the remaining sections of this opinion. The construction activities may lead to a temporary diminished quantity and quality of intertidal foraging habitats within the project area and Action Area, resulting in decreased survivorship of plovers.

***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 Winter Waterbird Surveys that have evolved from the International Piping Plover Census. From reviewing the Tybee Island survey results (**Table 9**) from winter of 2004-5 to winter of 2012-13, piping plovers were observed three of nine years. (GADNR, unpublished data). Numbers ranged up to seven plovers. Tim Keys of the GADNR reports the plover usage of the beach for foraging and roosting is weather and tide dependent. He sees very light, widely scattered usage on front of island. The plovers that are observed are usually on the northern and southern ends of island, in accretion areas. From eBird, a citizen science web site, most piping plovers are seen on the north end of the island, north of the groin, in Critical Habitat Unit GA-1. When seen, they are usually seen in small numbers, one to three birds.

**Table 9. 2005-2013 Tybee Island Piping Plover Winter Waterbird Survey  Data.**

| Season | Number of birds |
|---|---|
| 2004/2005 | 7 |
| 2005/2006 | 0 |
| 2006/2007 | 0 |
| 2007/2008 | 0 |
| 2008/2009 | 4 |
| 2009/2010 | 0 |
| 2010/2011 | 0 |
| 2011/2012 | 2 |
| 2013/2013 | 0 |

**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.

By City of Tybee Ordinance (section 12-1 (a)(4)), dogs are not allowed on Tybee Island beach. This seems to be enforced. 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 has received attention for several years.  The Milton Project, a local nonprofit organization practiced trap, neuter and return of the feral cats on Tybee for approximately eight years from 2004 to 2012.  Anecdotal information is that the program is continuing informally and the feral cat population is extant and fed.  There are no reports of cats seen on the beach.

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***

The proposed action will affect the piping plover 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 northern-most portion of the action area includes the southeastern part of designated critical habitat unit GA-1 for the wintering population of the piping plover, below the northern groin.

This section is an analysis of the beneficial, direct and indirect effects of the proposed action on migrating and wintering piping plovers within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

**Factors to be considered**

The proposed 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 2,300 feet of Unit GA-1 is within the Project Area or approximately 21% 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 November 2015 and be completed by April 30, 2016. 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 renourishment 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 may affect some wrack that has accumulated on the "new" beach. Tilling may occur landward of the primary wrack line and must avoid all vegetated areas three square feet or greater. 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 2016. 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 nine years before needing more sand to replace that which will be lost through sand transport and episodic storm events.

*Proximity of action*: Construction activities associated with beach renourishment will occur within and adjacent to piping plover foraging habitat.

*Distribution*: Project construction activities that may impact migrants and the wintering population of piping plovers on the Tybee Island shoreline.

*Timing*: The timing of project construction could directly and indirectly impact migrating and wintering piping plovers.

*Nature of the effect*: The effects of the project construction include a temporary reduction in foraging habitat and disturbance to foraging plovers. A decrease in the survival of piping plovers on the migration and winter grounds due to the lack of optimal habitat may contribute to decreased survival rates, decreased productivity on the breeding grounds, and increased vulnerability to the three populations.

*Duration*: The beach renourishment will be a one-time activity. It is proposed to occur during a six month period. The direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact migrating and wintering plovers in subsequent seasons.

*Disturbance frequency*: Disturbance from construction activities will be short term lasting up to six months. Recreational disturbance may increase after project completion since the beach would become accessible at all tides.

*Disturbance intensity and severity*: Project construction is anticipated to be conducted during portions of the piping plover wintering and migration season. Conservation measures have been incorporated into the project to minimize impacts and monitor prey base recovery.

**Analyses 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 nine 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., beach renourishment) will extend through approximately one piping plover migration and winter season. There will be sections of pipe on the beach as the project moves south to north up the beach. At approximately the half-way point the pipe may be relocated into the nearshore waters. Heavy machinery and equipment (e.g., trucks and bulldozers operating on project area beaches) may adversely affect migrating piping plovers in the project area by disturbance and disruption of normal activities such as foraging, and possibly forcing birds to expend valuable energy reserves to seek available habitat elsewhere.

Burial and suffocation of invertebrate species will occur along the entire three miles of beach renourished. Timeframes projected for benthic recruitment and re-establishment following beach renourishment are between 6 months to 2 years (Thrush *et al*. 1996, Peterson *et al*. 2000, Zajac and Whitlatch 2003, Bishop *et al*. 2006, Peterson *et al*. 2006). Depending on actual recovery rates, impacts may occur even if renourishment activities occur outside the plover migration and wintering seasons.

*Indirect effects:* Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. The proposed project may increase the attractiveness of these beaches for recreation increasing recreational pressures within the project area. Recreational activities that potentially adversely affect plovers include disturbance by increased pedestrian use and the routine removal of marsh wrack (used by piping plovers for habitat) to "clean up" the beach for tourists.

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 renourished 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. However the impact could be longer depending on the prey base recovery. 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 2,300 feet of the unit, primarily on the upper part of the beach near the dunes. If this area becomes hardened from the renourishment 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 2,300 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 limiting and degrading foraging habitat, and disturbance from construction activities and increased recreational use. It is anticipated that 3.1 miles of Tybee Island shoreline and an unknown number of piping plovers could be impacted. 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. Depending on the timing of the project, plovers may avoid the area during construction. After project construction, plovers may avoid foraging in the area the following season depending on prey base recovery rates.

Elliott and Teas (1996) found a significant difference in actions between piping plovers encountering pedestrians and those not encountering pedestrians. Piping plover encountering pedestrians spend proportionately more time in 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).

Disturbance from the construction activity on the 3.1 miles of 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.

Disturbance reduces the time migrating shorebirds spend foraging (Burger 1991). Pfister *et al.* (1992) implicate disturbance as a factor in the long-term decline of migrating shorebirds at staging areas. 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.

## CUMULATIVE EFFECTS

This project occurs on non-federal lands. 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 ESA.

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 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 renourished beach would contribute to the development and recreational use of the shoreline.

Continued shoreline stabilization and beach renourishment projects in this area in the future is also expected since erosion and sea-level rise increases would impact the existing beachfront development.

## CONCLUSION

### Loggerhead Sea Turtle

After reviewing the current status of the loggerhead sea turtle, the environmental baseline for the action area, the effects of the proposed beach renourishment, and the cumulative effects, it is the Service's biological opinion that the beach renourishment project, as proposed, is not likely to jeopardize the continued existence of the loggerhead sea turtle and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for the loggerhead sea turtle in the continental United States; therefore, none will be affected. Although critical habitat has been proposed to be designated for the loggerhead sea turtle in the continental United States, none has been proposed on Tybee Island.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. One of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the NRU. The NRU averages 5,215 nests per year (based on 1989-2008 nesting data). Of the available nesting habitat within the NRU, sand placement activities will occur on 3.1 miles of beach.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year or two following project construction. Research has also shown that the impacts of a renourishment project on sea turtle nesting habitat are typically short-term because a renourished 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 renourishment 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 proposed beach renourishment, 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 nonbreeding piping plover. 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.

Tybee Island has had varying numbers of wintering plovers observed in the winter waterbird survey, from zero to seven since 2004. Piping plovers from all three breeding populations are assumed on the island from time to time. Plovers from the federally endangered Great Lakes breeding population have been recorded on Tybee. The survival and recovery of all breeding populations of piping plovers are fundamentally dependent on the continued availability of sufficient habitat in their coastal migration and wintering range, where the species spends more than two-thirds of its annual cycle. All piping plover populations are inherently vulnerable to even small declines in their most sensitive vital rates, i.e., survival of adults and fledged juveniles. Mark-recapture analysis of resightings of uniquely banded Piping plovers from seven breeding areas by Roche *et al*. (2010) found that apparent adult survival declined in four populations and increased in none over the life of the studies. Some evidence of correlation in year-to-year fluctuations in annual survival of Great Lakes and eastern Canada populations, both of which winter primarily along the southeastern U. S. Atlantic Coast, suggests that shared over-wintering and/or migration habitats may influence annual variation in survival. Further concurrent mark-resighting analysis of color-banded individuals across piping plover breeding populations has the potential to shed light on threats that affect survival in the migration and wintering range. Progress towards recovery, which has been attained primarily through intensive protections to increase productivity on the breeding grounds, would be quickly slowed or reversed by even small sustained decreases in survival rates during migration and wintering.

## INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA 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 ESA 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 applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. 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

Loggerhead Sea Turtle

The Service anticipates 3.1 miles of nesting beach habitat could be taken as a result of this proposed action. The project is scheduled to occur outside of sea turtle nesting season. Incidental take of nesting and hatchling sea turtles is anticipated to be more severe if, due to unforeseen construction delays, the project is extended beyond April 30, 2016 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. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) misdirection of nesting sea turtles or hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of lights from beachfront development that reach the elevated berm postconstruction; (7) 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; (8) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service; and (9) a reduction in nesting success for the first year or two following sand placement.

Incidental take is anticipated for only the 3.1 miles of beach that have been identified for sand placement. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and prevent an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; and (2) the renourishment project will modify the incubation substrate, beach slope, and sand compaction. A higher level of take can be anticipated if: beach renourishment occurs during a portion of the nesting season and artificial lighting is used for night work deterring and/or misdirecting nesting and hatchling turtles.

Piping Plovers and GA-Unit 1

The Service anticipates that 2,300 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 3.1 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 loggerhead sea turtle and the piping plover. The project will not result in destruction or adverse modification of piping plover Critical Habitat Unit GA-1. Loggerhead sea turtle critical habitat has not been proposed or designated in the project area;

therefore, the project will not result in destruction or adverse modification of critical habitat for the loggerhead sea turtle.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead sea turtles and piping plovers.

1. Conservation Measures included in the permit application/project plans must be implemented (unless revised below in the Terms and Conditions) in the proposed project.
2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

3. All derelict material or other debris must be removed from the beach prior to any sand placement.

4. Daily early morning surveys for sea turtle nests will be required if any portion of the beach renourishment project extends into loggerhead sea turtle nesting season (beyond April 30).

5. If the beach renourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. If nests are constructed in the area of beach renourishment, the eggs must be relocated. Nest relocation will be on a selected area of beach that is not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or subject to artificial lighting. Nesting surveys and relocation must be initiated 65 days prior to renourishment activities or by May 1, whichever is later.

6. During the nesting season, construction equipment and materials must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable.

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

8. Prior to the beginning of the project, the USACE shall submit a lighting plan for the dredge that will be used in the project. The plan shall include a description of each light source that will be visible from the beach and the measures implemented to minimize this lighting.

9. If a dune system is already part of the project design, the placement and design of the dune must emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

10. Predator-proof trash receptacles must be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and piping plovers.

11. A meeting between representatives of the Applicant's or USACE contractor, Service, GADNR, the permitted sea turtle surveyor (Contractor's Endangered Species Observer), and other species surveyors, as appropriate, must be held prior to the commencement of work on this project.

12. Immediately after completion of the beach renourishment project and prior to the next four 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.)

13. Immediately after completion of the beach renourishment project and prior to the next four 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.

14. During the sea turtle nesting season, the contractor must not extend the beach fill more than 500 feet and must confine work activities within this area between dusk and the time of completion the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

15. A report describing the actions taken must be submitted to the Service following completion of the proposed work for each year when the activity has occurred.

16. The Service and the GADNR must be notified if a sea turtle adult, hatchling, or egg is harmed or destroyed as a direct or indirect result of the project.

17. Disturbance to piping plover Critical Habitat GA-1 by the USACE beach renourishment 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 in Critical Habitat GA-1 should also be recorded. Unleashed pet occurrences should also be recorded throughout the entire action area.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, 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.

1. Conservation Measures included in the permit application/project plans must be implemented (unless modified in these terms and conditions) in the proposed project. This includes the timing of the proposed project to avoid the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. The USACE shall ensure that contractors conducting the beach renourishment work fully understand the sea turtle and piping plover conservation/protection measures.

2. Beach compatible fill must be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. Beach compatible fill must be sand solely of natural sediment and shell material, containing no construction debris, toxic material or other foreign matter. The beach compatible fill must be similar in both color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the native material in the project area and not result in cementation of the beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.

3. All derelict concrete, metal, and coastal armoring geotextile material and other debris must be removed from the beach prior to any sand placement to the maximum extent possible. If debris removal activities take place during the sea turtle nesting season, the work must be conducted during daylight hours only and must not commence until completion of the sea turtle nesting survey each day.

4. Daily early morning surveys for sea turtle nests must be required if any portion of the beach renourishment project occurs during the period from May 1 to September 30.

5. If nests are constructed in the area of sand placement, the eggs must be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation. For sand placement projects that occur during the period from May 1 through October 31, daily early morning (before 9 a.m.) surveys and egg relocation must be conducted. If nests are laid in areas where they may be affected by construction activities, eggs must be relocated per the requirements listed in a through d.

    a. Nesting surveys must be initiated 65 days prior to sand placement activities or by May 1, whichever is later. Nesting surveys and egg relocation must continue through the end of the project or through September 30, whichever is earlier. If nests are laid in areas where they may be affected by construction activities, eggs must be relocated per the requirements listed in b through d.

    b. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by the Service or the GADNR. Nesting surveys must 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.

c. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation must not occur upon completion of the project. Nests requiring relocation must 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 must not be placed in organized groupings. Relocated nests must be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or subject to artificial lighting. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests.

d. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the renourished berm prior to tilling must be marked for avoidance and left in situ unless other factors threaten the success of the nest. Nests must be marked with four stakes at a 10-foot distance around the perimeter of the nest for the buffer zone. The turtle permit holder must install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activities that could result in impacts to the nest will occur within the marked area. Nest sites must be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

6. From May 1 to September 30, staging areas for construction equipment must be located off the beach. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune must be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes must be off the beach to the maximum extent possible. If the pipes are stored on the beach, they must be placed in a manner that will minimize the impact to nesting habitat and must not compromise the integrity of the dune systems.

7. 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. Direct lighting of the beach and nearshore waters must be limited to the immediate construction area during peak nesting season (May 1 through October 31) and must comply with safety requirements. Lighting on all equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast

Guard, USACE EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment must be reduced to the minimum standard required by OSHA for General Construction areas, in order to not misdirect sea turtles or disrupt piping plover roosting activities. Shields must be affixed to the light housing and be large enough to block light from all on-beach lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach (**Figure 12**).

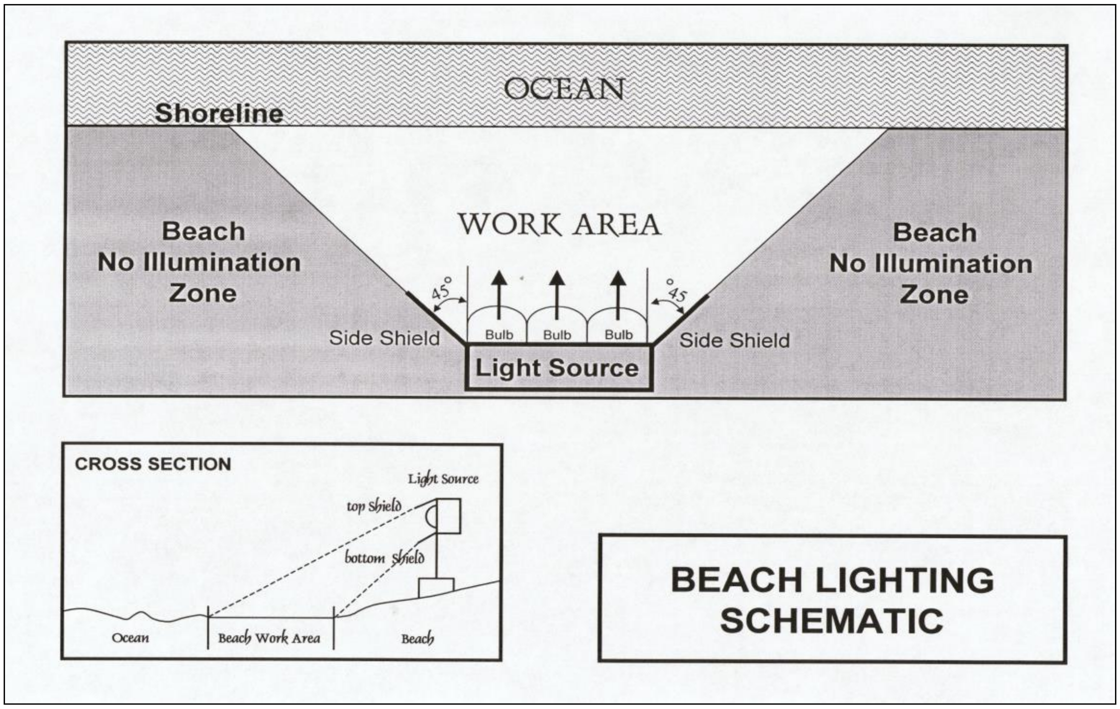


**Figure 12. Beach lighting schematic.**

8. Prior to the beginning of the project, the USACE shall submit a lighting plan for the dredge that will be used in the project. The plan shall include a description of each light source that will be visible from the beach and the measures implemented to minimize this lighting. The plan shall be reviewed and approved by the Service.

9. Predator-proof trash receptacles must be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles (**Appendix A**). The contractors conducting the work must provide predator-proof trash receptacles for the construction workers. All contractors and their employees must be briefed on the importance of not littering and keeping the project area trash and debris free.

10. A meeting between representatives of the contractor, the Service, the GADNR, the permitted sea turtle surveyor, and other species surveyors, as appropriate, must be held prior to the commencement of work. At least 10 business days advance notice must be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle protection measures, as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, and reporting within the work area, as well as follow-up meetings during construction. At that meeting the USACE must provide the Service with specific information on the actual project that is going to proceed (form on the following web link: http://www.fws.gov/northflorida/SeaTurtles/Docs/Corp%20of%20Engineers%20Sea%20Turtle%20Permit%20Information.pdf) and emailed to the Service at seaturtle@fws.gov.

11. Sand compaction must be monitored in the area of sand placement immediately after completion of the project and prior to April 15 for four subsequent years.

    If tilling is needed, the area must be tilled to a depth of 36 inches. Each pass of the tilling equipment must be overlapped to allow more thorough and even tilling. All tilling activity must be completed at least once prior to the nesting season which starts May 1. An electronic copy of the results of the compaction monitoring must be submitted to our Coastal Georgia ES Office prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach. (NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebird surveys prior to tilling are required per the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712).

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

    b. At each station, the cone penetrometer must 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 must be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth must be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled immediately prior to sea turtle nesting season (May1).

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 must occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

12. Visual surveys for escarpments along the project area must be made immediately after completion of the sand placement and within 30 days prior to May 1 for four subsequent years if sand in the project area still remains on the dry beach.

    Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled and the beach profile must be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal must be reported by location. If the project is completed during the early part of 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. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or the GADNR will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to our Coastal Georgia ES Office.

13. During the period May 1 to September 30, the contractor must not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline and must confine work activities within this area between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatchling sea turtles are present within the extended work area. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor will be allowed to proceed with the placement of fill and work activities during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation must apply. If a nesting turtle is sighted on the beach within the immediate construction area, activities must cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

14. A report with the information listed in the following table must be submitted to our Coastal Georgia ES Office within 3 months of the completion of construction.

| | |
|---|---|
| All projects | Project location (latitude and longitude coordinates) |
| | Project description (include linear feet of beach, actual fill template, access points, and borrow areas) |
| | Dates of actual construction activities |
| | Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nesting surveys for nourished and non-nourished areas) |
| | Descriptions and locations of self-release beach sites |
| | Sand compaction and escarpment formation survey results. |

15. Upon locating a dead or injured sea turtle adult, hatchling, or egg that may have been harmed or destroyed as a direct or indirect result of the project, the USACE or the Applicant must be responsible for notifying the GADNR at 912-264-7218 and our Coastal Georgia ES Office at 912-832-8739. Care must be taken in handling injured sea turtles or sea turtle eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

16. To assist in increasing our understanding of the scope of impacts of beach renourishment on piping plovers, shorebird monitoring will be conducted prior to, during, and after construction activities in the action area (Appendix E and F). Piping plover abundance and distribution within the project area will be determined through three surveys per month of suitable habitat along the entire island conducted ten days apart (weather and tide permitting, no surveys should be conducted if winds exceed 15 mph) during the survey window beginning August 1 through April 30. Surveys should be scheduled around the 5th, 15th, and 25th of each month. (One year of baseline data should be collected before project construction and surveys should continue for one year after construction.) This proposed monitoring would produce data that would integrate with currently collected data and could be used in broad studies of the piping plover and shorebirds. In addition to bird data, the amount of pedestrian traffic in Critical Habitat GA-1 should also be recorded. Also, unleashed pet occurrences should be recorded throughout the entire action area. The USACE will be responsible for monitoring shorebirds pre, during, and one year post-construction.

17. Because piping plovers and other shorebirds rely on the swash zone along the beach front for foraging, to assist in increasing our understanding of the scope of impacts of beach renourishment on piping plovers, macro benthic invertebrate community monitoring will

be conducted. Similar to monitoring for the 2008 renourishment and to include an external control/reference site, a historical data analysis, address the consequences of the sediment and/or biological changes detected in this and similar monitoring programs.

The Service believes that incidental take will be limited to the 3.1 miles of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action.

The Service believes that no more than the following types of incidental take for loggerhead sea turtles will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) misdirection of nesting sea turtles or hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of lights from beachfront development that reach the elevated berm post construction; (7) 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; (8) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service and (9) a reduction in nesting success for the first year or two following sand placement. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement, of sand on the 3.1 miles of beach proposed for renourishment.

The Service believes that no more than the following types of incidental take for piping plovers will result from the proposed action: (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.

If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The 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.

## CONSERVATION RECOMMENDATIONS

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

1. 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.

2. Artificial beachfront lighting in the beach renourished 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 renourished beach by May 15 following renourishment work, using standard techniques for such a survey (Appendix B). 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 Coastal Georgia ES office by the first of the following month; and a final summary report provided by December 15 of that year.

3. The City should 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 (Appendix A).

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

5. Educational signs should be placed where appropriate at major access points to the piping plover critical habitat (including along the beach) explaining the importance of the area to the plovers and the need to respect loafing and foraging birds. Areas of high shorebird use within the critical habitat may be similarly posted to reduce disturbance to loafing/foraging birds. Symbolic fencing may also be employed to reduce plover disturbance.

6. If practicable utilize graduate students and/or other qualified biologists seeking to conduct

research on beach renourishment ecosystem impacts. Inclusion of a reference site, such as Little Tybee Island, and statistical analysis may be incorporated.

7. To assist in increasing our understanding of the scope of impacts of beach renourishment on piping plovers, shorebird monitoring should be conducted for two additional years after construction activities in the action area (Appendix E and F). Piping plover abundance and distribution within the project area will be determined through three surveys per month of suitable habitat along the entire island conducted ten days apart (weather and tide permitting, no surveys should be conducted if winds exceed 15 mph) during the survey window beginning August 1 through April 30. Surveys should be scheduled around the 5th, 15th, and 25th of each month. This proposed monitoring would produce data that would integrate with currently collected data and could be used in broad studies of the piping plover and shorebirds. In addition to bird data, the amount of pedestrian traffic in Critical Habitat GA-1 should also be recorded. Also, unleashed pet occurrences should be recorded throughout the entire action area.

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

## REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the February 10, 2014, request for the initiation of formal consultation on the Tybee Island Shore Protection renourishment project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion or the project has not been completed within five years of the issuance of this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The above findings and recommendations constitute the report of the U. S. Department of the Interior. Contact Bill Wikoff, fish and wildlife biologist, at 912-832-8739 if you require additional information.

Sincerely,

Don Imm
Field Supervisor

cc: USFWS-RO, Atlanta, Georgia Attention: Jerry Ziewitz
GADNR-CRD, Brunswick, Georgia
USFWS, Jacksonville, Florida, Attention: Ann Marie Lauritsen
USFWS, Daphne, Alabama, Attention: Dianne Ingram
USFWS, Hadley, Massachusetts, Attention: Anne Hecht
USFWS, Charleston, South Carolina, Attention: Melissa Bimbi
NMFS, Charleston, South Carolina, Attention: Jaclyn Daly

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## Appendix A

# EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore.  Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.


Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.


Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

## Appendix B

# 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

## LIGHTING INSPECTIONS

## WHAT ARE LIGHTING INSPECTIONS?

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

## WHICH LIGHTS CAUSE PROBLEMS?

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

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

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

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

## HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently.  In either case, goals and methods should be similar.

## GATHER BACKGROUND INFORMATION

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

## PRELIMINARY DAYTIME INSPECTIONS

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

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

## NIGHTTIME INSPECTIONS

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

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

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any

object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

## WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

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

## WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

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

## WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

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

# Appendix C

## Five Year Report

# Five Year Report - Draft

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2008 | | | | Miami-Dade | BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual. | 4,000 feet | |
| 2008 | | | | Galveston | Beach nourishment | One nest from three undiscovered over the five year period | |
| 2008 | | | | Broward | Temporary beach nourishment | 0.08 mile (430 feet) | |
| 2008 | | | | Dare | Dredge and sand placement | 12 linear miles | |
| 2008 | | | | Dare | Temporary during bridge construction and artificial lighting | Bridge length 16.1 miles- during bridge construction | |
| 2008 | | | | Brevard | Dune restoration | 140,000 cy along 3,000 linear feet | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2008 | | | | Accomack | Beach management, plover, sea turtle, and sea beach amaranth monitoring and management, and recreati | Up to 3 loggerhead nests during the 5 years, with no more than one per year | |
| 2008 | | | | Charleston | Beach Nourishment | 2.7 miles | |
| 2008 | | | | Chatham | Sand placement and groin | 13,200 linear feet of beach between two terminal groins; construction of a groin field along 1,100 linear feet of shoreline | |
| 2008 | | | | Walton | Beach nourishment (new) | 13.5 miles, 3,390 feet | |
| 2008 | | | | Broward | Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement materi | 333 feet | |
| 2008 | | | | Okaloosa, Santa Rosa | Storm protection at air force facilities, Santa Rosa island | 0.57 miles | |
| 2008 | | | | Santa Rosa | Bulkheads around test sites A-3, A-6, and A-13B | 0.57 mile | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2008 | | | | Okaloosa, Santa Rosa | Beach nourishment including dune restoration (new) | 5.0 miles | |
| 2008 | | | | Palm Beach | Biannual Inlet dredging and sand placement events. | 3,450 feet | |
| 2008 | | | | St. Lucie | Beach nourishment, berm expansion, and six t-head groins | 1.3 miles | |
| 2008 | | | | Palm Beach | Sand placement | 2.45 miles | |
| 2008 | | | | Broward | Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 1 | 500 feet | |
| 2008 | | | | Miami-Dade | Beach nourishment | 1.78 miles | |
| 2008 | | | | Gulf | Beach nourishment – change from work in 2 to 1 season. | 7.5 miles; no increase in IT. | |
| 2008 | | | | Palm Beach | Dune restoration | 2.17 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2008 | | | | Sarasota | Construction of two permeable adjustable groins. | 0.09 mile project area, 0.43 mile action area | |
| 2008 | | | | Brevard | Dune restoration | 6,000 linear feet | |
| 2008 | | | | Indian River | Dune restoration/enhanceme nt | 0.38 mile | |
| 2008 | | | | Lee | Reopening Blind Pass and then nourishing the shoreline. | 0.95 mile | |
| 2008 | | | | Bay | Navigation channel maintenance dredging and beach placement of dredged material. | 500 ft of beachfront at St. Andrew State Park | |
| 2008 | | | | Collier | Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the s | 0.25 mile | |
| 2009 | | | | Escambia | Beach nourishment | 6.5 miles | |
| 2009 | | | | Okaloosa | Navigational channel maintenance | 1.7 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2009 | | | | Bay | Maintenance navigation channel dredging and dredged material placement | 0.85 mile | |
| 2009 | | | | St. Johns | Beach berm repair | 7,000 linear feet | |
| 2009 | | | | Brevard | Dune restoration | Periodically on no more than 22 miles. | |
| 2009 | | | | Pinellas | Sand placement | 11,375 linear feet | |
| 2009 | | | | Cameron | Beach Nourishment | 6.25 miles | |
| 2009 | | | | City of Port Aransas | Beach maintenance/cleaning | 7 miles | |
| 2009 | | | | Okaloosa, Santa Rosa | Maintenance navigation channel dredging and dredged material placement | 1.6 miles | |
| 2009 | | | | Miami-Dade | Sand placement | 2.14 miles | |
| 2009 | | | | Collier | Sand placement and construction of six T-head groins. | 0.47 mile | |
| 2009 | | | | Lee | Channel dredging | 0.14 mile | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2009 | | | | Brevard | Sand placement | 7.7 linear miles | |
| 2009 | | | | Indian River | Beach and dune nourishment | Phase 1 = ~4.4 miles, Phase 2 = ~2.3 miles | |
| 2009 | | | | Lee | Beach nourishment | 0.25 mile | |
| 2009 | | | | Okaloosa, Santa Rosa | Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13. | A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet | |
| 2009 | | | | Indian River | Outfall pipe installation | 0.22 mile | |
| 2009 | | | | Brevard | Beach berm repair (permanent) | 70,385 linear feet | |
| 2009 | | | | Brevard | Beach berm repair (permanent) | 40,748 linear feet | |
| 2009 | | | | Monroe | Beach repair (emergency) | 1,380 linear feet | |
| 2009 | | | | Manatee | Sand placement | 8,000 linear feet | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2009 | | | | Flager | Sand placement, revetments, and seawalls | 5.2 miles = length of take; 3,000 linear feet of anticipated incidental take | |
| 2009 | | | | Santa Rosa | Emergency beach restoration | 1,800 feet | |
| 2009 | | | | Palm Beach | Beach berm repair (permanent work) | 6,880 linear feet | |
| 2009 | | | | Okaloosa, Santa Rosa | Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13. | A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet | |
| 2009 | | | | Sarasota | Beach restoration | 700 linear feet | |
| 2009 | | | | Palm Beach | Beach berm repair (permanent work) | 3,590 linear feet | |
| 2009 | | | | Gulf | Beach berm repair (emergency) | 10,300 linear feet | |
| 2009 | | | | Okaloosa | Beach berm repair (emergency) | 1,260 linear feet | |
| 2009 | | | | Brevard | Dune restoration | 22 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2009 | | | | Brevard | Sand placement | 8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment. | |
| 2009 | | | | Martin | Beach nourishment | 0.24 mile | |
| 2009 | | | | Brevard | Sand bypass | 18,600 linear no more than every 2 years | |
| 2009 | | | | Volusia | Sand placement | 8,000 linear feet | |
| 2009 | | | | Miami-Dade | Beach nourishment | 0.19 mile | |
| 2009 | | | | Monroe | Sand placement and cleaning | 1,462 linear feet | |
| 2009 | | | | Bay | Beach berm repair (emergency) | 9,393 linear feet | |
| 2009 | | | | St. Johns | Sand placement | 15,280 linear feet | |
| 2009 | | | | Monroe | Beach repair (emergency) | 640 linear feet | |
| 2009 | | | | Brevard | | 7.8 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2009 | | | | Brevard | | 3% of all hatchling disorientation events | |
| 2009 | | | | Monroe | Beach repair (emergency) | 235 linear feet | |
| 2009 | | | | Sarasota | Beach berm repair | 951, 1,197, and 1,142 linear feet, respectively | |
| 2009 | | | | Palm Beach | Beach berm repair (emergency) | 125 linear feet | |
| 2009 | | | | St. Johns | Sand placement | 8,000 linear feet | |
| 2010 | | | | Monroe | Emergency beach repair | 95 linear feet | |
| 2010 | | | | Monroe | Emergency beach repair | 35 linear feet | |
| 2010 | | | | Bay | Emergency opening of the outlet to the Gulf of Mexico | 2,400 feet | |
| 2010 | | | | Miami-Dade | Sand placement | 0.38 mile | |
| 2010 | | | | Beaufort | Sand placement and construction of leaky groin | 5,400 linear feet of beach | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2010 | | | | Martin | Beach nourishment | ~ 4 miles | |
| 2010 | | | | Accomack | Beach berm restoration and armored dune | Up to 4 nests per year for the first three years in the form of harm, and one nest per year for three years in the form of harassment, plus injury or death of one nesting female during construction. No incidental take authorized for renourishment pending | |
| 2010 | | | | Lee | Beach nourishment and groin construction | 0.47 mile | |
| 2010 | | | | Duval | Sand placement | 10 miles | |
| 2010 | | | | Broward | Repair of the south jetty. | 0.15 mile | |
| 2010 | | | | Escambia | Navigation channel maintenance and dredge material disposal | 6.3 miles | |
| 2010 | | | | Miami-Dade | Sand placement | 0.34 mile | |
| 2010 | | | | Palm Beach | Sand Placement | 3.4 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2010 | | | | Palm Beach | Beach nourishment | 0.95 mile | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.38 mile | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.95 mile | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.26 mile | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.78 mile | |
| 2010 | | | | Escambia | Post Tropical Storm Gustav berm | 2.0 miles | |
| 2010 | | | | Palm Beach | Segmented, submerged breakwater | 1.1 miles | |
| 2010 | | | | Monroe | Sand placement | 0.57 mile | |
| 2010 | | | | Manatee | | 4,015 linear feet of beach | |
| 2010 | | | | Nassau | Beach nourishment | 17,900 linear feet | |
| 2010 | | | | St. Johns | | 20,000 linear feet | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2010 | | | | Broward | Beach nourishment | 1.35 miles | |
| 2010 | | | | Charlotte | Stump Pass dredging and sand placement | 3.5 miles | |
| 2010 | | | | Collier | Construction of two T-head groins. | 0.19 mile | |
| 2010 | | | | Georgetown | Sand placement | 9,500 linear feet of beach | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.60 mile | |
| 2010 | | | | Dare and Hyde | ORV use on the beach | 67 miles; 4 sea turtle nests and 1 false crawl per nesting season | |
| 2010 | | | | Nueces, San Patricio, Aransas, Calhoun, Matagorda, Brazoria, Harris, Galves | | 15 undiscovered nests | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2010 | | | | Accomack | Expansion of NASA launch facilities, new facility construction, and ongoing and increased launch and | Up to one nest or equivalent number of young per year | |
| 2010 | | | | Miami-Dade | Sand Placement – truck haul | 0.58 mile | |
| 2010 | | | | Collier | A truck haul sand placement project | 0.37 mile | |
| 2010 | Loggerhead (Caretta caretta) | Northern Recovery Unit | North Carolina | | Other | | 0 |
| 2010 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea) | Peninsular Florida Recovery Un | Florida | | Sand placement | | 52800 |
| 2011 | | | | Pinellas | Navigation maintenance dredging with swash zone placement | 4000 linear feet | |
| 2011 | | | | Martin | ICW maintenance dredging, beach nourishment, dune restoration | 3.5 miles | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2011 | | | | Lee | Reopening Blind Pass and then nourishing the shoreline. | 1.29 miles | |
| 2011 | | | | Palm Beach | Beach nourishment | 1.9 miles | |
| 2011 | | | | Hillsborough | Navigation maintenance dredging with swash zone placement | | |
| 2011 | | | | Virginia Beach | Sea turtle nest survey, monitoring, and management | All nests that are relocated, up to all nests that occur within the action area. | |
| 2011 | | | | Martin | Beach nourishment | ~ 0.10 mile | |
| 2011 | | | | Charleston | Inlet relocation | 3000 linear feet | |
| 2011 | | | | Kenedy | Construction of structure | 5,000 square feet | |
| 2011 | | | | Nueces | Beach cleaning | 3 miles, maximum of 7 nests taken | |
| 2011 | | | | Georgetown | Sand placement and single groin installation | Approximately 1,820 linear feet of beach | |
| 2011 | | | | Collier | Sand placement | 0.19 mile | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2011 | | | | Broward | Beach nourishment | 0.82 mile | |
| 2011 | | | | Pinellas | Sand placement | 8.7 miles | |
| 2011 | | | | St. Lucie | Beach nourishment | 0.32 mile | |
| 2011 | | | | Martin | Beach nourishment | 6.1 miles | |
| 2011 | | | | Miami-Dade | Construction of a new pier and restaurant | 0.026 mile | |
| 2011 | | | | Broward | Beach nourishment | 1.45 miles | |
| 2011 | Loggerhead (Caretta caretta)Green (Chelonia mydas) | Peninsular Florida Recovery Un | Florida | | Sand placement | | 10000 |
| 2011 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Un | Florida | | Sand placement | | 7128 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2011 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretm | Peninsular Florida Recovery Un | Florida | | Other | | 9200 |
| 2011 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (L | Not Applicable | Florida | | Sand placement | | 19008 |
| 2011 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (L | Peninsular Florida Recovery Un | Florida | | Sand placement | | 6653 |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea) | Peninsular Florida Recovery Unit | Florida | | Armoring | Linear feet of beach | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea) | Peninsular Florida Recovery Un | Florida | | Berm construction (above MHW) | | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea) | Northern Recovery Unit | Florida | St Lucie | Berm construction (above MHW) | Linear feet of beach | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea) | Northern Recovery Unit | Florida | | Berm construction (above MHW) | Linear feet of beach | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretm | Peninsular Florida Recovery Un | Florida | | Berm construction (above MHW) | | 0 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretm | Peninsular Florida Recovery Un | Florida | | Sand placement | | 2000 |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Nearshore sand placement | | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredging | | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredging | | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (L | Peninsular Florida Recovery Un | Florida | | Sand placement | | 335831 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (Lepidochelys kempii)Hawksbill (Eretmochelys imbricata) | Northern Recovery Unit | Florida | Palm Beach | Berm construction (above MHW) | Linear feet of beach | |
| 2012 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (Lepidochelys kempii)Hawksbill (Eretmochelys imbricata) | Peninsular Florida Recovery Unit | Florida | | Maintenance Dredging | Linear feet of beach | |
| 2012 | Loggerhead (Caretta caretta)Kemp's ridley (Lepidochelys kempii) | Northern Gulf of Mexico Recove | Alabama | | Sand placement | | 22440 |
| 2012 | Loggerhead (Caretta caretta)Kemp's ridley (Lepidochelys kempii) | Northern Gulf of Mexico Recove | Alabama | | Sand placement | | 87120 |
| 2013 | Loggerhead (Caretta caretta) | Northern Recovery Unit | South Carolina | | Other | | 9500 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW)Maintenance dredging | | 26083 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 5808 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 5808 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 7392 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 7392 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredging | | 7392 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredgingArmoringInwater (groin, breakwater)Nearshore sand placement | | 800 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 1848 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 15418 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 650 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 13200 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 14784 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 26928 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 39600 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 3010 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredgingArmoringInwater (groin, breakwater)Nearshore sand placement | | 800 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 10032 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Maintenance dredging | | 5491.2 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW)Inwater (groin, breakwater) | | 1003.2 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW)Inwater (groin, breakwater) | | 13992 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Inlet relocation/channel realignment | | 3168 |

| Year | Species Impacted | Loggerhead Recovery Unit | State | COUNTY | PROJECT TYPE | ANTICIPATED INCIDENTAL TAKE | LINEAR FEET OF BEACH |
|---|---|---|---|---|---|---|---|
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW)Maintenance dredging | | 13833 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Hawksbill (Eretmochelys imbricata)Kemp's ridley (Lepidochelys kempii) | Peninsular Florida Recovery Unit | Florida | | Berm construction (above MHW) | | 4224 |
| 2013 | Loggerhead (Caretta caretta)Green (Chelonia mydas)Leatherback (Dermochelys coriacea)Kemp's ridley (Lepidochelys kempii) | Northern Gulf of Mexico Recovery Unit | Florida | | Sand placementBerm construction (above MHW) | | 0 |

# Appendix D

## NMFS Authorized Sea Turtle Incidental Take

## Southeast Regional Office Consultations - South Atlantic and Gulf of Mexico

| CONSULTATION ACTIVITY | TYPE OF ACTION | DATE SIGNED | LEAD REGION | ACTION AREA | PCTS TRACKING # | INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE) | | | | | | | | | | ITS NOTES | ADDITIONAL INFORMATION | DOCUMENTED AND/OR ESTIMATED TAKE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Loggerhead (NWA DPS) | | Green | | Leatherback | | Hawksbill | | Kemp's Ridley | | | | Loggerhead (NWA DPS) | | Green | | Leatherback | | Hawksbill | | Kemp's Ridley | |
| | | | | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead |
| NMFS Fishery Management Plan Consultations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FMP for Dolphin-Wahoo | Fishery | 8/27/2003 | SER | U.S. Atlantic EEZ | | 1-yr Estimate<br>16(10)* | 16(2)* | 16(2)* | 16(1)* | 16(11)* | 16(1)* | 16(2)* | 16(1)* | 16(2)* | 16(1)* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates no more than 16 sea turtles of any species in combination may be taken in a given year. Numbers in () represent that maximum number of takes for each species annually. | | Unknown | | | | | | | | | |
| Atlantic Pelagic Long line Fishery for HMS | Fishery | 6/1/2004 | SER | U.S. EEZ in Atlantic, Gulf of Mexico, and Caribbean Sea | | 3-yr Estimates (2007-2009, 2010-2012)<br>1905 total (429 lethal) | | *105 total (21 lethal) | | 1764 total (594 lethal) | | *105 total (21 lethal) | | *105 total (21 lethal) | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 105 total takes of green, hawksbill and Kemp's, with 21 of those lethal in any combination every 3 years. | Pelagic Observer Program (POP) - Approximately 8% coverage. **One (1) Olive Ridley's was also taken | Documented PLL Longline Takes Q1 & Q2 2007**<br>14<br>Extrapolated Actual Take Estimate for Entire Fishery 2006<br>561 | 0<br><br>0 | 0<br><br>0 | 0<br><br>0 | 31<br><br>398 | 1<br><br>17 | 0<br><br>0 | 0<br><br>0 | 0<br><br>11 | 0<br><br>0 |
| Caribbean SFA Amendment | Fishery | 8/19/2005 | SER | U.S. EEZ Caribbean Sea | | 1-yr Estimate<br>0 | 0 | 4 | 4 | 1 | 6 | 4 | 4 | 0 | 0 | | No NMFS observer program in place. CRP Project to place observers on-board completed with no protected resource interactions recorded. | Unknown | | | | | | | | | |
| DOI - New Management Plan for Dry Tortugas National Park (continued authorization of recreational fishing) | Fishery | 7/7/2006 | SER | Dry Tortugas National Park | | 1-yr Estimate<br>1* | | 1* | | 1* | | 1* | | 1* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of any species. | | Unknown | | | | | | | | | |
| South Atlantic Snapper-Grouper Fishery | Fishery | 6/7/2006 | SER | U.S. EEZ in South Atlantic (VA/NC to E. Coast FL) | | 3-yr Estimate<br>202 total (67 lethal) | | 39 total (14 lethal) | | 25 total (15 lethal) | | 4 total (3 lethal) | | 19 total (8 lethal) | | | No NMFS observer program in place. CRP Project to place observers on-board these vessels initiated, project to begin July 2006; NMFS bycatch self-reporting program in place - 20% of fishers required to participate. | Unknown | | | | | | | | | |
| South Atlantic and Gulf of Mexico Coastal Migratory Pelagic Fishery | Fishery | 8/13/2007 | SER | U.S. EEZ Mid- and South Atlantic (NY/NJ border to E. Coast FL) and Gulf of Mexico (W. FL to TX) | | 3-yr Estimate<br>33 (lethal or non-lethal) | | 14 (lethal or non-lethal) | | 2* (lethal or non-lethal) | | 2* (lethal or non-lethal) | | 2* (lethal or non-lethal) | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 2 non-lethal or lethal take of leatherback, hawksbill or Kemp's. | | Unknown | | | | | | | | | |
| South Atlantic and Gulf of Mexico Stone Crab FMP | Fishery | 9/28/2009 | SER | U.S. EEZ South Atlantic and Gulf of Mexico | | 3-yr Estimate<br>12 | 4 | 3 | 1 | 1 (lethal or non-lethal) | | 1 (lethal or non-lethal) | | 2 | 1 | Estimate is for the entire fishery and is based on an extrapolation of observed takes across total effort levels | | Unknown | | | | | | | | | |
| South Atlantic and Gulf of Mexico Spiny Lobster FMP | Fishery | 8/27/2009 | SER | U.S. EEZ South Atlantic and Gulf of Mexico | | 3-yr Estimate<br>3 (lethal or non-lethal) | | 3 (lethal or non-lethal) | | 1* | | 1* | | 1* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of leatherback, hawksbill or Kemp's. | | Unknown | | | | | | | | | |
| Fishery Management Plan for the Reef Fish Resources in the GOM (reinitiation) | Fishery | 9/30/2011 | SER | U.S. EEZ in Gulf of Mexico (W. Coast FL to TX) | F/SER/2011/03584 | 3-yr Estimate<br>1065 interactions (585 mortalites) 3-year period 2010-2012; 1044 interactions (572 mortalities) for all other 3-year periods. | | 116 interactions (75 mortalities | | 11 interactions (11 mortalities) | | 9 interactions (8 mortalities | | 108 interactions (41 mortalities) | | Take is for entire fishery. | | Unknown | | | | | | | | | |
| Reef Fish Fishery of Puerto | Fishery | 10/4/2011 | SER | Federal waters off USVI and | F/SER/2010/ | 3-year | | | | | | | | | | Take is for entire fishery. | | Unknown | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rico and U.S. VI | | | | PR | 06680 | 0 | 0 | 75 interactions (75 mortalities | | 18 interactions (18 mortalities) | | 51 interactions (48 mortalities | | 0 | 0 | | | | | | | | | | | | |
| Shrimp Fishery - Reinitiation on the continued implementation of the sea turtle conservation regulations and the continued authorization of the SE US shrimp fisheries in Federal waters | Fishery | 5/8/2012 | SER | SE US waters | | 1-yr Estimate<br>*81,620 interactions annually, including 7,701 mortalities | | *13,876 interactions annually, including 1,382 mortalities | | *1,393 interactions annually, including 144 mortalities | | * Unknown interactions, maximum 71 mortalities | | *437,833 interactions annually, including 43,307 mortalities | | * The numbers listed are estimated interactions in the fishery. The fishery will be monitored for effort and compliance rates to determine if take levels have been exceeded. | | Unknown | | | | | | | | | |
| Atlantic Shark Fishery - Continued Authorization of the Atlantic Shark Fisheries via the Consolidated HMS Fishery Management Plan as Amended by Amendments 3 and 4 and the Federal Authorization of a Smoothhound Fishery | Fishery | 12/12/2012 | SER | U.S. EEZ in Atlantic, Gulf of Mexico, and Caribbean Sea | F/SER/2011/06520 | 3-yr Estimate<br>48 | 78 | 24 | 33 | 9 | 9 | 9 | 9 | 15 | 21 | Previous BiOp's signed 10/29/2003 and 5/20/2008. ITS Expiration Date: Ongoing | Atlantic Shark Bottom Long line Observer Program - Approximately 5% coverage; Shark Gillnet Observer Programs - Approximately 33.8% coverage (100% coverage required during RW season) | Documented BLL/Gillnet Takes 2007<br>CC Alive 2 BLL; 3 GN | CC Dead 2 BLL; 1 GN | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 |
| Non-Fishery Consultations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reconstruction of Clermont Harbor Fishing Pier in Hancock County, MS, Army Permit No. SAM-2009-473 | Fishery | 1/4/2010 | SER | MS Sound, near Waveland, Hancock County, MS.; | F/SER/2009/03886 | 1-yr Estimate<br>1* | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 1* | 1* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal and 1 non-lethal take each year (either Kemp's or loggerhead). | | Unknown | | | | | | | | | |
| Biological Assessment - Barataria Barrier Shoreline Complex Restoration Project (Pelican Island) | Fishery | 1/11/2010 | SER | Barataria Barrier Shoreline (Pelican Island), LA; | F/SER/2009/03616 | 1-yr Estimate<br>40(34)* | 2** | 40(1)* | 2** | 0 | 0 | 0 | 0 | 40(5)* | 2** | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. *NMFS anticipates 40 non-lethal takes, numbers in () represent that maximum number of takes for each species annually. **NMFS anticipates 2 lethal takes (any combination of loggerhead, Kemp's, or green). | | Unknown | | | | | | | | | |
| USAF CSAR (Combat Search and Rescue) Training in Gulf of Mexico WTA (Water Training Area) | Fishery | 4/22/2010 | SER | Northeastern Gulf of Mexico, St. Marks NWR on eastern edge of Panhandle in Water Training Area | F/SER/2009/02629 | 10-yr Estimate<br>2* | | 2* | | 2* | | 2* | | 2* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 2 lethal or non-lethal takes of sea turtles (any combination of Kemp's, green, loggerhead, leatherback, or hawksbill) over a 10-year period. | | Unknown | | | | | | | | | |
| USCOE - Continued Hopper Dredging of Channels and Borrow Areas in the SE U.S. | Dredging | 9/25/1997 | SER | NC/VA Border to Key West Florida | | 1-yr Estimate (FY)<br>24 | | 7 | | 0 | | 2 | | 7 | | ITS Expiration Date = None/Ongoing | | FY07 - 4 dead loggerheads, 3 dead Kemp's ridleys.<br>FY08: 6 loggerheads, 2 Kemp's, 3 greens. FY09: 11 loggerheads<br>FY10: 1 loggerhead, 1 Kemp's, 4 greens. | | | | | | | | | |
| DOT - Port Pelican LLC Deepwater Port | Dredging | 4/14/2004 | SER | Gulf of Mexico | | 40-year Estimate<br>2* | | 2* | | 2* | | 2* | | 2* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 turtle maybe taken over the life of the project as a result of entanglement with marine debris, and 1 maybe taken by the use of explosives during decommission of the LNG platform. ITS Expiration Date = 4/14/2044 | | No reported takes. | | | | | | | | | |
| USCOE - Revision, Amendment 2 to the Gulf of Mexico | Dredging | 1/9/2007 | SER | TX/Mexico Border to W. Coast of FL | | 1-yr Estimate (FY)<br>Anticipated Takes from COE *Conducted* Dredge Operations | | | | | | | | | | *Take numbers for these species are in combination and do not represent take | | Documented takes CY2007 COE Conducted Dredge - 6 dead loggerheads, 1 live/6 dead greens, 1 live Kemp's ridley. COE Permitted Dredge - 2 dead loggerheads, 1 live green. Relocation Trawl | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Regional Biological BiOp on Hopper Dredging | | | | | | 0 | 32 | 0 | 11 | 0 | | 0 | 3 | 0 | 16 | for each species individually. NMFS anticipates 300 non-lethal takes of any hard-shell species and 2 lethal takes of any hard-shell species during relocation trawling. ITS Expiration Date = None/Ongoing. | | Operations - 68 live loggerheads, 67 live greens, 2 live leatherbacks, 42 live Kemp's ridleys. FY10 takes: 4 loggerheads. 3 Kemp's, 1 green. 276 turtles relocated: 222 loggerheads, 51 Kemp's, 3 greens, with 3 trawling mortalities. |
| | | | | | | Anticipated Takes from COE *Permitted* Dredge Operations | | | | | | | | | | | | |
| | | | | | | 0 | 8 | 0 | 3 | 0 | | 0 | 1 | 0 | 4 | | | |
| | | | | | | Anticipated Takes from Relocation Trawl Operations | | | | | | | | | | | | |
| | | | | | | 300* | 2* | 300* | 2* | 0 | | 300* | 2* | 300* | 2* | | | |
| USCOE - Dredging and Beach Renourishment, Palm Beach County, FL | Dredging and Beach Renourishment | 12/22/2008 | SER | Palm Beach County, FL | | Total Anticipated Take for the Entire Project | | | | | | | | | | Take expected to be juvenile green turtles. | | No reported takes. |
| | | | | | | 0 | 0 | 18 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| USCOE - Construction and Dredging at Naval Station Mayport, FL | Dredging | 1/7/2009 | SER | Naval Station Mayport, Duval County, FL | | Total Anticipated Take for the Entire Project | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 17 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | | | |
| USCOE - Juno Beach Nourishment, FL | Beach Renourishment | 1/9/2009 | SER | Juno Beach, Palm Beach County, FL | | Total Anticipated Take for the Entire Project | | | | | | | | | | | | 1 Kemp's ridley 1-8-2010 |
| | | | | | | 0 | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Beach nourishment/shoreline protection project using a hopper dredge, Canaveral Shoals borrow area | Beach Renourishment | 4/30/2010 | SER | Canaveral Shoals borrow area, Patrick Air Force Base beaches | F/SER/2009/03376 | 2 dredging events, over 10 years | | | | | | | | | | *Take numbers for these species are in combination and do not represent take for each species individually. NMFS anticipates 2 lethal takes of any combination of (loggerhead, green or Kemp's) species during dredging. ITS Expiration Date = 4/30/2020 | | No reported takes. |
| | | | | | | 0 | 2* | 0 | 2* | 0 | 0 | 0 | 0 | 0 | 2* | | | |
| | | | | | | Anticipated Takes from Relocation Trawl Operations | | | | | | | | | | | | |
| | | | | | | 116 | 0 | 44 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | | | |
| Savannah Harbor Navigation Project (dredging) | Dredging | 11/4/2011 | SER | Savannah Harbor | F/SER/2010/05579 | Total Anticipated Take for the Entire Project | | | | | | | | | | *Take numbers for these species are in combination and do not represent take for each species individually. NMFS anticipates 17 non-lethal takes (either loggerhead or Kemp's) in relocation trawling. | | No reported takes. |
| | | | | | | 17* | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 17* | 11 | | | |
| Longboat Key Beach Renourishment (incl. dredging/sand mining and relocation trawling) | Dredging and Beach Renourishment | 4/24/2012 | SER | Longboat Key, Florida | F/SER/2012/00110 | Total Anticipated Take for the Entire Project | | | | | | | | | | | | No reported takes. |
| | | | | | | 14 | 1 | 12 | 1 | 1 | 0 | 1 | 0 | 3 | 0 | | | |
| Bogue Post-Irene Renourishment Project | Beach Renourishment | 5/18/2012 | SER | Carteret County, NC | F/SER/2012/01054 | Total Anticipated Take for the Entire Project | | | | | | | | | | Take numbers for these species are in combination and do not represent take for each species individually. **NMFS anticipates 4 lethal takes (either loggerhead or green), 2 from relocation trawling and 2 from hopper dredging. *NMFS anticipates 8 non-lethal turtle takes (either loggerhead or green) in relocation trawling. | | No reported takes. |
| | | | | | | 8* | 4** | 8* | 4** | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| NRC - Operation of the Cooling Water Intake System at the Brunswick Steam Electric Plant NC | Power Plant | 1/20/2000 | SER | Intake/Discharge canals associated with plant | | 1-yr Estimate | | | | | | | | | | *Take numbers for these species are in combination and do not represent take for each species individually. NMFS anticipates 6 loggerhead, 3 green and one each of leatherback, Kemp's and hawksbill sea turtles, plus an additional 50 turtles in any combination may be captured, relocated, and released alive without injury, annually. ITS Expiration Date = 1/20/2025 | | CY10: 3 live Kemp's, 1 dead Kemp's. Documented takes CY2006 - 10 live loggerheads, 1 live Kemp's ridley. Documented takes in CY2005 -Unknown. Documented takes in CY2004 - 4 live/2 dead loggerheads, 3 live Kemp's ridley. |
| | | | | | | 6 + 50* | 0 | 3 + 50* | 0 | 1 + 50* | 0 | 1 + 50* | 0 | 1 + 50* | 0 | | | |
| NRC - Continued Operation of | Power Plant | 5/4/2001 | SER | St. Lucie Power Plant, Unit 1 | | 1-yr Estimate | | | | | | | | | | Take number for these species are in | | Documented captures CY FY2010 - 704 (7 dead: 4 causal, 3 non-causal). Documented takes |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| the St. Lucie Power Plant | | | | & 2 and the piping canals, making up the circulating seawater cooling system. | | 1000* | 1% of Total Annual Capture** | 1000* | 1% of Total Annual Capture** | 1000* | 1 (bi-annually)*** | 1000* | 1 (bi-annually)*** | 1000* | 2 | combination and do not represent authorized takes for each species individually. *NMFS anticipates 1000 non lethal takes of any species annually; **NMFS anticipates 1% of the total number of these species taken annually will be killed (i.e., if 100 greens are taken in a given year, 1 take will be lethal). ***Lethal take number for these species are in combination for every two years, and do not represent authorized takes for each species individually. ITS Expiration Date - 5/4/2011 | | CY2006 394 live/1 dead loggerhead, 265 live/2 dead green, 1 live leatherback, 2 live hawksbill, 3 live Kemp's ridley. Documented takes CY2005 486 live/2 dead loggerhead, 426 live/2 dead green, 2 live hawksbill, 3 live Kemp's ridley. Documented takes CY2004 - 624 live/2 dead loggerheads, 285 live/1 dead green, 2 live leatherbacks, 2 live hawksbills, 1 live Kemp's ridley. |
| NRC - Cooling water intake system at the Crystal River Energy Complex | Power Plant | 8/8/2002 | SER | Crystal River Energy Complex, Unit 1,2, & 3 and discharge canal, and the intake canal and intake structures, which includes the bar racks, traveling screens, and sea water pump components | | 1-yr Estimate<br>75* | 3* | 75* | 3* | 75* | 3* | 75* | 3* | 75* | 3* | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 75 non-lethal and 3 lethal takes may occur in any combination. ITS Expiration Date - None/Ongoing. | | CY10: 6 non-lethal (1 Kemp's, 5 greens). Documented takes CY2006 - 2 live/3 dead loggerheads; 4 live/1 dead greens; 3 live/2 dead Kemp's ridley. Documented takes CY2005 - 1 live loggerhead, 2 live/1 dead green, 2 live Kemp's ridley. Documented takes CY2004 - 1 live loggerhead, 2 live/1 dead green, 2 live Kemp's ridley. |
| MMS - Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sales of Areas 169, 172, 175, 178, 182, 171, 174, 177 & 180 | Oil & Gas | 1/6/1998 | SER | Gulf of Mexico Central Planning Area (Waters off AL, MS, and LA) & Gulf of Mexico Western Planning Area (Waters off LA, TX) | | 1-yr Estimate<br>25(10)* | | 25(5)* | | 25(5)* | | 25(5)* | | 25(5)* | | *Take for all these species are in combination, not to exceed 25 sea turtles in a given year. Numbers in () represent that maximum number of takes for each species annually. Estimated ITS Expiration Date = 3/1/2033. | | No reported takes. |
| MMS - Eastern Gulf of Mexico Oil and Gas Lease Sale 181 | Oil & Gas | 6/15/2001 | SER | Eastern Gulf of Mexico | | 30-yr Estimate<br>1* | | 1* | | 1* | | 1* | | 1* | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of any species may occur. NMFS also anticipates the lethal take of two sea turtles of any species from spilled oil. These takes do no appear in the ITS because the spilling of oil is not considered an otherwise legal activity. Estimated ITS Expiration Date = 6/15/2031 | | No reported takes. |
| MMS - Gulf of Mexico Outer Continental Shelf Lease Sale 184 | Oil & Gas | 7/11/2002 | SER | Western Gulf of Mexico | | 30-year Estimate<br>1* | | 1* | | 1* | | 1* | | 1* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of any species may occur. ITS Expiration Date = 7/11/2032 | | No reported takes. |
| MMS - Gulf of Mexico Outer Continental Shelf Multi-Lease Sale (185, 187, 190, 192, 194, 196, 198, 200, 201) | Oil & Gas | 11/29/2002 | SER | U.S. EEZ in the Gulf of Mexico | | 1-yr Estimate<br>1* | | 1* | | 1* | | 1* | | 1* | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. ITS Expiration Date = 11/29/2037 | | No reported takes. |
| MMS - Freeport McMoran Injection Well of E&P Waste into Salt Caverns and Caprock at Main Pass, Block 229 | Oil & Gas | 4/1/2004 | SER | Gulf of Mexico | | 26-year Estimate<br>2*(26) | | 2*(26) | | 2*(26) | | 2*(26) | | 2*(26) | | *2 non-lethal or lethal takes may occur in total year of any combination of species, and do not represent authorized takes for each species individually. NMFS anticipates an additional 26 sea turtles will be taken annually, of any species, over the course of the 26-year project. | | No reported takes. |
| MMS - OCS Oil and Gas Leasing | Oil & Gas | 6/29/2007 | SER | Gulf of Mexico | | 40-yr Estimate | | | | | | | | | | ITS Expiration Date = 6/29/2047 | | Unknown take estimates from Deepwater Horizon Oil Spill and associated oil recovery and |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program 2007-2012 | | | | | | 238 | 119 | 76 | 38 | 21 | 10 | 1 | 1 | 26 | 13 | | | cleanup efforts. |
| USN - Navy Activities off the Southeastern U.S. along the Atlantic Coast | Military | 5/15/1997 | SER | Charleston, SC to approximately, Sebastian Inlet, FL; from the coast out to approx. 80 nm | | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates that 12 green or Kemp's will be taken, either lethal or non-lethal annually. ITS Expiration Date = None/Ongoing. | | No reported takes. |
| | | | | | | 84 | | 12* | | 12 | | 0 | | 12* | | | | |
| USAF - Air-to-Surface Gunnery Testing - Detonation of High Explosive Gunnery Munitions in EGTR | Military | 12/17/1998 | SER | 123,00 sq. miles in NE Gulf of Mexico @ Eglin Gulf Test Range | | 1-yr Estimate | | | | | | | | | | *Take numbers for these species are in combination and do not represent take for each species individually. NMFS anticipates 1 green, hawksbill or Kemp's maybe taken annually. ITS Expiration Date = None/Ongoing. | | No reported takes. |
| | | | | | | 3 | | 1* | | 2 | | 1* | | 1* | | | | |
| USN - Establishment of the Mine Warfare Center of Excellence (MWCE) at the Navy's existing complex at Ingleside/Corpus Christi, Texas | Military | 10/26/1999 | SER | Naval Air Station Corpus Christi and Naval Station Ingleside, and areas within MMS Lease Blocks 732, 733, 734, 793, 799, and 816 | | 1-yr Estimate | | | | | | | | | | *Take for all these species in combination is not to exceed 5 sea turtles in a given year. Numbers in () represent that maximum number of takes for each species annually. ITS Expiration Date = 10/26/2019. | | No reported takes. |
| | | | | | | 5*(5) | | 5*(2) | | 5*(2) | | 5*(2) | | 5*(2) | | | | |
| USAF - Search and Rescue Training in the GOM | Military | 12/22/1999 | SER | 175 sq. nm area of GOM off N. Florida | | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 2 lethal or non-lethal takes may occur in any combination of species. ITS Expiration Date = 12/22/2019. | | No reported takes. |
| | | | | | | 2* | | 2* | | 2* | | 2* | | 2* | | | | |
| USMC - Marine Corps Air Station | Military | 9/27/2002 | SER | 2 target bombings, target ranges, BT-9 and BT-11, Located of off the Neuse River and Pamlico Sound in NC | | 10-year Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 21 non-lethal and 7 lethal takes of any combination of species. ITS Expiration Date = 9/27/2012. | | No reported takes. |
| | | | | | | 21* | 7* | 21* | 7* | 21* | 7* | 21* | 7* | 21* | 7* | | | |
| USN - Mine Warfare Exercises (MINEX) and Explosive Ordnance Disposal (EOD) Unit Level Training at Several Locations Along the East Coast of the U.S. | Military | 10/9/2002 | SER | Onslow Bay, NC (an irregular shaped area extending from [the shoreline] approximately 6-48 km offshore); Charleston, SC (an boxed area extending approximately 5-30 km offshore) | | 5-yr Estimate | | | | | | | | | | *Take, lethal or non-lethal, is authorized for up to 3 turtles over the 5 year period with no more than 1 being an endangered species. These three turtle takes may be all loggerheads, or a combination of two loggerheads and one Kemp's ridley, green, leatherback or hawksbill. ITS coverage expired on 10/9/2007. | | No reported takes. |
| | | | | | | 3* | | 1* | | 1* | | 1* | | 1* | | | | |
| USAF - Eglin Air Force Base and Training Range Mission Activities | Military | 10/20/2004 | SER | Warning Areas (W-151, W-168, and W-470) as well as Eglin Water Test Areas(EWTA 1 Through EWTA-6) | | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of a green, hawksbill or Kemp's. ITS Expiration Date = 10/20/2009. | | No reported takes. |
| | | | | | | 3 | | 1* | | 1* | | 0 | | 1* | | | | |
| USAF - Eglin Gulf Test and Training Range, Naval Explosive Ordnance Disposal School (NEODS) Training | Military | 10/25/2004 | SER | Three NEODS test locations located approximately 1-3 NM from shore in 18.3 m of water (10 fathoms) | | 5-yr Estimate | | | | | | | | | | Estimated ITS Expiration Date = 10/25/2009. | | No reported takes. |
| | | | | | | 4 | | 1 | | 0 | | 0 | | 1 | | | | |
| USAF - Eglin Gulf Test and | Military | 3/14/2005 | SER | Gulf of Mexico, Eglin Air | | 5-yr Estimate | | | | | | | | | | Estimated ITS Expiration Date = | | No reported takes. |

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| Training Range, Precision Strike Weapons (PSW) Test | | | | Force Base; The two test locations located within W-151 at a distance of approximately 15-24 NM from shore in 45.7 m of water. | | 10 | | 3 | | 1 | | 0 | | 1 | | 3/14/2010. | | |
| USAF - Santa Rosa Island Mission Utilization Plan | Military | 10/25/2005 | SER | Santa Rosa Island, Eglin Air force Base & Associated Surf Zones extending 0.5 miles off the west coast of the island and 1.5 miles off the east coast of the island | | 1-yr Estimate<br>13 | | 4 | | 0 | | 0 | | 0 | | ITS Expiration Date = None/Ongoing. | | No reported takes. |
| USAF - Advanced Littoral Reconnaissance Technologies Testing | Military | 5/20/2008 | SER | Santa Rosa Island, Eglin Air force Base | | Life of Project Estimate AND 1-yr Estimate<br>Adult Entanglement: 2 lethal, 3 non-lethal *- life of project* | | Adult Entanglement: 1 lethal, 1 non-lethal *- life of project* | | 0 | | 0 | | 0 | | ITS Expiration Date = 2020 | | No reported takes. |
| | | | | | | Adult Entrapment 3 | | Adult Entrapment 1 | | 0 | | 0 | | 0 | | | | |
| | | | | | | Hatchling Disorientation: 42 lethal, 42 non-lethal *each year.* | | Hatchling Disorientation: 23 lethal, 23 non-lethal *each year.* | | 0 | | 0 | | 0 | | | | |
| USCOE - Construction of Fishing Pier in Wakulla County, Florida | Construction | 1/4/2002 | SER | Wooly Park, Dickerson Bay, Panacea, Florida | | 1-yr Estimate<br>1* | | 1* | | 0 | | 0 | | 3 | 2 | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of a loggerhead or green turtle. | | Unknown |
| USCOE - Construction of a Fishing Pier, Jacksonville Florida | Construction | 5/8/2003 | SER | Atlantic Ocean, Oceanward, Terminal end of 4th Ave, in Section 22, Township 2 South, Range 29 east, Jacksonville Beach FL | | 1-yr Estimate<br>12 | 2* | 3 | 1* | 0 | 0 | 0 | 0 | 2 | 1* | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates no more than 2 lethal takes made up of either 2 loggerheads, or 1 loggerhead and 1 Green or 1 Kemps. ITS Expiration Date = 5/8/2008. | | No reported takes. |
| USCG - Hurricane Katrina Coastal Debris Removal Trawling | Construction | 1/23/2006 | SER | Mississippi Sound | | ~1.25-yr Estimate (10,820 Trawl Hours)<br>133 | 1 | 27 | 1 | 1 | 0 | 0 | 0 | 399 | 2 | ITS Expiration Date = None/Ongoing. | | No reported takes. |
| USCOE - Demolition and Construction of Navarre Beach Fishing Pier, Santa Rosa County, FL | Construction | 11/17/2008 | SER | Navarre Beach, Santa Rosa County, FL | | 1-yr Estimate<br>4 | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1* | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal take of either loggerhead or Kemp's. | | No reported takes. |
| USCOE - Construction/Extension and Operation of City of Mexico Beach Fishing Pier | Construction | 3/23/2009 | SER | City of Mexico Beach Pier, Bay County, FL | | 1-yr Estimate<br>4 | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1* | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal take of either species. ake reflects the number of turtles expected to be hooked/entangled/snagged by recreational anglers on pier. | | No reported takes. |
| USCOE - | Construction | 5/1/2009 | SER | MB Miller Fishing Pier, Bay | | 1-yr Estimate | | | | | | | | | | *Take number for these species are in | | No reported takes. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Replacement/Extension and Operation of MB Miller Fishing Pier, Bay County, FL | | | | County, FL | | 4 | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1* | combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal take of either species. Take reflects the number of turtles expected to be hooked/entangled/snagged by recreational anglers on pier. | | |
| Renovation of Existing Docking Facility in Riviera Beach, Palm Beach County, FL, Army Permit No. SAJ-2007-3571 | Construction | 6/11/2010 | SER | Riviera Beach, Palm Beach County, FL.; | F/SER/2009/ 07190 | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates non-lethal take of 6 turtles annually (green or loggerhead), and 1 lethal take annually (green or loggerhead). | | No reported takes. |
| | | | | | | *6 | *1 | *6 | *1 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Construction of Submerged Breakwater System - Singer Island, Palm Beach County, FL, Army Permit No. SAJ-2006-5344 | Construction | 9/16/2010 | SER | Palm Beach County, FL. | F/SER/2010/ 03792 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 12,477 hatchling | 6 juvenile | 1 juvenile, 3,345 hatchling | 0 | 0 | 0 | 28 hatchling | 0 | 0 | | | |
| Rutherford Fishing Pier reconstruction | Construction | 1/18/2011 | SER | Bay St. Louis, MS | F/SER/2010/ 01441 | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 non-lethal and 1 lethal take annually (either loggerhead or Kemp's). | | No reported takes. |
| | | | | | | 3* | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 3* | 1* | | | |
| Point Peter LLLP Cumberland Harbor (2 marinas and 3 day-use docks) | Construction | 3/23/2011 | SER | St. Mary's, Georgia | F/SER/2010/ 01809 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | | | |
| Sunny Isles Beach Fishing Pier | Construction | 8/15/2011 | SER | Sunny Isles Beach, FL | F/SER/2010/ 04571 | 1-yr Estimate | | | | | | | | | | Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 7 non-lethal and 1 lethal take annually. *Non-lethal will consist of 5 green and 2 loggerhead or 5 green, 1 loggerhead, and 1 of either Kemps or Hawksbill. **Lethal take will be either 1 green or 1 loggerhead. | | No reported takes. |
| | | | | | | 2* | 1** | 5* | 1** | 0 | 0 | 1* | 0 | 1* | 0 | | | |
| Biloxi fishing pier | Construction | 1/11/2011 | SER | Biloxi, MS | F/SER/2011/ 03589 | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates the non-lethal take of 8 sea turtles, of 7 Kemp's or 6 Kemp's and 1 green or 1 loggerhead. NMFS anticipates 1 lethal take of a Kemp's | | No reported takes. |
| | | | | | | 1* | 0 | 1* | 0 | 0 | 0 | 0 | 0 | 7* | 1 | | | |
| South Pointe Park Fishing Pier | Construction | 9/4/2012 | SER | Miami Beach, FL | F/SER/2012/ | 1-yr Estimate | | | | | | | | | | *Take number for these species are in | | No reported takes. |

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| | | | | | 01804 | 2* | 0 | 6* | 2 | 0 | 0 | 1* | 0 | 1* | 0 | combination and do not represent authorized takes for each species individually. NMFS anticipates non-lethal take of 6 green, and either 2 loggerheads or 1 loggerhead and 1 hawksbill or Kemp's. | | |
| Lantana Fishing Pier | Construction | 6/8/2012 | SER | Lantana, Palm Beach County, FL | F/SER/2011/01933 | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates the non-lethal take of 5 green, and either 2 loggerheads or 1 loggerhead and 1 hawksbill or Kemps. **NMFS anticipates the lethal take of 1 turtle annually (green or loggerhead). | | No reported takes. |
| | | | | | | 2* | 1** | 5* | 1** | 0 | 0 | 1* | 0 | 1* | 0 | | | |
| Flagler Beach Pier Project | Construction | 6/26/2012 | SER | Flagler Beach, FL | F/SER/2011/03247 | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates the non-lethal take of 2 greens and either 2 loggerhead or 1 loggerhead and 1 Kemp's. **NMFS anticipates the lethal take of 1 turtle annually (green or loggerhead). | | No reported takes. |
| | | | | | | 2* | 1** | 2* | 1** | 0 | 0 | 0 | 0 | 1* | 0 | | | |
| NASA - Evaluation of EFH for Sharks and Selected Sport fishes in an MPA off Cape Canaveral | Research | 2/21/2006 | SER | Atlantic Ocean between Lat. 28°15'N & 28°45'N; 16-24 km from shore | | 1-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 6 non-lethal and 2 lethal takes annually, in any combination of species. ITS Expiration Date = 2/21/2011 | | No reported takes. |
| | | | | | | 6* | 2* | 6* | 2* | 6* | 2* | 0 | 0 | 6* | 2* | | | |
| NMFS - NER Funding for the grant proposal to use long lines to sample for Red Drum off NC, SC, and GA | Research | 10/11/2006 | SER | Sampling areas off NC, SC, GA, FL (maps of areas available upon request) | | 3-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 non-lethal and 1 lethal take of either leatherback, green or hawksbill turtles. ITS Expiration Date = 10/11/2009 | | No reported takes. |
| | | | | | | 15 | 5 | 3* | 1* | 3* | 1* | 3* | 1* | 3 | 1 | | | |
| NMFS - NER Funding for the grant proposal to use long lines to sample for Red Drum off NC, SC, and GA | Research | 10/11/2006 | SER | Sampling areas off NC, SC, GA, FL (maps of areas available upon request) | | 3-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 non-lethal and 1 lethal take of either leatherback, green or hawksbill turtles. | | No reported takes. |
| | | | | | | 15 | 5 | 3* | 1* | 3* | 1* | 3* | 1* | 3 | 1 | | | |
| NMFS - NER Funding for the grant proposal to use long lines to sample for Red Drum off NC, SC, and GA | Research | 10/11/2006 | SER | Sampling areas off NC, SC, GA, FL (maps of areas available upon request) | | 3-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 non-lethal and 1 lethal take of either leatherback, green or hawksbill turtles. | | No reported takes. |
| | | | | | | 15 | 5 | 3* | 1* | 3* | 1* | 3* | 1* | 3 | 1 | | | |
| DOI - New Management Plan for Dry Tortugas National Park (continued authorization of recreational fishing) | Research | 7/7/2006 | SER | Dry Tortugas National Park | | 1-yr Estimate | | | | | | | | | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of any species. | | No reported takes. |
| | | | | | | 1* | | 1* | | 1* | | 1* | | 1* | | | | |

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| NMFS Funding - Biological Survey of Trident Submarine Basin and Adjacent Marine Waters of Port Canaveral, FL | Research | 1/25/2008 | SER | Port Canaveral, FL | | 2-yr Estimate | | | | | | | | | | Total anticipated take in research activities involving fish traps, otter trawls, bottom long line and gillnets:<br>- 20 green turtles (1 lethal)<br>- 4 loggerhead turtles (1 lethal)<br>- 4 Kemp's ridley turtles (1 lethal)<br>ITS Expiration date = 6/30/14 | | No reported takes. |
| | | | | | | 4 (1 lethal) | | 20 (1 lethal) | | 0 | | 0 | | 4 (1 lethal) | | | | |
| NMFS Funding - Texas Parks and Wildlife Department, Independent Sampling Program for 2008-2012 | Research | 4/10/2008 | SER | Sampling areas off TX | | 5-yr Estimate | | | | | | | | | | Total anticipated take in research activities involving fish traps, otter trawls, bottom long line and gillnets:<br>- 20 green turtles (1 lethal)<br>- 4 loggerhead turtles (1 lethal)<br>- 4 Kemp's ridley turtles (1 lethal)<br>ITS Expiration date = 6/30/14 | | No reported takes. |
| | | | | | | 4 (1 lethal) | | 20 (1 lethal) | | 0 | | 0 | | 4 (1 lethal) | | | | |
| NMFS Funding - Cooperative State-Fed Program - Long line Study of Adult Red Drum in NC, SC, GA | Research | 8/18/2008 | SER | Sampling areas off NC, SC, GA | | Total Anticipated Take for the Entire Project | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of leatherback, green or hawksbill. | | No reported takes. |
| | | | | | | 5 (1 lethal) | | 1* (lethal or non-lethal) | | 1* (lethal or non-lethal) | | 1* (lethal or non-lethal) | | 1 (lethal or non-lethal) | | | | |
| NMFS Funding - Biological Survey of Trident Submarine Basin and Adjacent Marine Waters of Port Canaveral, FL | Research | 1/25/2008 | SER | Port Canaveral, FL | | 2-yr Estimate | | | | | | | | | | Total anticipated take<br>- 20 green turtles (1 lethal)<br>- 4 loggerhead turtles (1 lethal)<br>- 4 Kemp's ridley turtles (1 lethal)<br>ITS Expiration date = 6/30/14 | | No reported takes. |
| | | | | | | 4 (1 lethal) | | 20 (1 lethal) | | 0 | | 0 | | 4 (1 lethal) | | | | |
| NMFS Funding - Texas Parks and Wildlife Department, Independent Sampling Program for 2008-2012 | Research | 4/10/2008 | SER | Sampling areas off TX | | 5-yr Estimate | | | | | | | | | | Total anticipated take<br>- 20 green turtles (1 lethal)<br>- 4 loggerhead turtles (1 lethal)<br>- 4 Kemp's ridley turtles (1 lethal)<br>ITS Expiration date = 6/30/14 | | No reported takes. |
| | | | | | | 4 (1 lethal) | | 20 (1 lethal) | | 0 | | 0 | | 4 (1 lethal) | | | | |
| NMFS Funding - Texas Parks and Wildlife Department, Independent Sampling Program for 2008-2012 | Research | 4/10/2008 | SER | Sampling areas off TX | | 5-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal take in a gillnet of either loggerhead or hawksbill.<br>** NMFS anticipates 10 non-lethal takes in otter trawls (greens, hawksbills, Kemp's ridley, or loggerheads, in combination). | | Reported Takes: 1 green (lethal), 5-7-2009; 1 green (lethal), 11-11-2009 |
| | | | | | | Anticipated Takes from Gillnets | | | | | | | | | | | | |
| | | | | | | 1 | 1* | 12 | 6 | 0 | 0 | 1 | 1* | 3 | 2 | | | |
| | | | | | | Anticipated Takes from Otter Trawl | | | | | | | | | | | | |
| | | | | | | 10** | 0 | 10** | 0 | 0 | 0 | 10** | 0 | 10** | 0 | | | |
| DOI - FWS/NCDENR Pamlico Sound Independent Gillnet Survey | Research | 7/1/2009 | SER | Pamlico Sound, NC | | 5-yr Estimate | | | | | | | | | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates take up to 15 sea turtles over the 5 years, expected 50% mortality.<br>ITS Expiration date = 6/30/14 | | Reported Takes: 1 Kemp's ridley (lethal), 8-25-2009; 1 green (non-lethal), 10-9-2009. |
| | | | | | | 1 (dead or alive)* | | 7 (4 dead)* | | 0 | | 0 | | 7 (4 dead)* | | | | |
| TX Parks and Wildlife Dept. 5-year fishery independent sampling (2008-2012). | Research | 8/1/2011 | SER | Chambers, Galveston, and Harris Counties, Galveston Bay, TX | F/SER/2011/ 00079 | Total Anticipated Take for the Entire Project | | | | | | | | | | | | No reported takes. |
| | | | | | | 1 | 1 | 14 | 19 | 0 | 0 | 0 | 1 | 4 | 3 | | | |
| USFWS-NCDENR 5-yr proposal for FWS research funding under the Sport Fish Restoration Act | Research | 7/21/2011 | SER | Pamlico Sound, NC | F/SER/2010 | Total for project | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | | | |
| Reinitiation on 5-year project | Research | 9/9/2011 | SER | Pamlico Sound, NC | F/SER/2010/ | Total for project | | | | | | | | | | *Take numbers for these species are in | | No reported takes. |

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| proposal for Pamlico Sound Independent Gillnet Survey | | | | | 06460 | 5* | 5* | 5* | 5* | 0 | 0 | 0 | 0 | 5* | 5* | combination and do not represent authorized takes for each species individually. NMFS anticipates up to 10 total takes of all species combined, with up to 5 mortalities of loggerheads, green or Kemp's. | | |
| Cape Canaveral Near shore Waters Marine Resources Survey | Research | 9/18/2012 | SER | Cape Canaveral, Florida area | F/SER/2011/ 05647 | Total Anticipated Take for the Entire Project<br>6 | 5 | 4 | 4 | 1* | 1* | 1* | 1* | 1 (lethal or non-lethal) | | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 non-lethal or lethal take of leatherback and hawksbill combined. | | No reported takes. |
| Bahia Icacos Waterway Barrier System | Research | 8/20/2012 | SER | Bahia Icacos, north coast of Vieques, former Vieques Training Range. | F/SER/2011/ 05676 | Per year for the 5-year life of the project<br>0 | 0 | 152 | 12 | 0 | 0 | 146 | 12 | 0 | 0 | | | No reported takes. |

## Northeast Regional Office Consultations - Mid-Atlantic and New England

| CONSULTATION ACTIVITY | TYPE OF ACTION | DATE SIGNED | LEAD REGION | ACTION AREA | PCTS TRACKING # | INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE): Loggerhead (NWA DPS) Alive | Loggerhead (NWA DPS) Dead | Green Alive | Green Dead | Leatherback Alive | Leatherback Dead | Hawksbill Alive | Hawksbill Dead | Kemp's Ridley Alive | Kemp's Ridley Dead | ITS NOTES | ADDITIONAL INFORMATION | DOCUMENTED AND/OR ESTIMATED TAKE (Loggerhead (NWA DPS), Green, Leatherback, Hawksbill, Kemp's Ridley: Alive / Dead) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NMFS Fishery Management Plan Consultations | | | | | | | | | | | | | | | | | | |
| Tilefish FMP | Fishery | 3/13/2001 | NER | All waters under U.S. jurisdiction in the Atlantic Ocean north of the VA/NC border | none | Annual 1-yr Estimate<br>6 annually, up to 3 lethal | | 0 | | 1 (lethal or non-lethal) | | 0 | | 0 | | ITS Expiration Date: None/Ongoing | | No estimates of actual take. There were no observed takes in 2011. |
| Deep-Sea Red Crab FMP | Fishery | 2/6/2002 | NER | U.S. EEZ from ME to Cape Hatteras, NC | F/NER/2001 /01245 | 1-yr Estimate<br>1 (lethal or non-lethal) | | 0 | | 1 (lethal or non-lethal) | | 0 | | 0 | | ITS Expiration Date: None/Ongoing | | No estimates of actual take. There were no observed takes in 2011. |
| Conservation Measures for the VA Pound Net Fishery | Fishery | 4/16/2004 | NER | VA waters as described in the BiOp (no federal waters) | F/NER/2003 /01596 | 1-yr Estimate<br>Pound net leaders from July 16-May 5: 1 loggerhead, 1 Kemp's ridley, 1 green, or 1 leatherback sea turtle. *Take assumed lethal.*<br>Pound net leaders (<12") from May 6-July 15: 1 loggerhead, 1 Kemp's ridley, 1 green, or 1 leatherback sea turtle. Take assumed lethal.<br>Pound: 505 live/uninjured loggerhead sea turtles, 101 live/uninjured Kemp's ridley sea turtles, and 1 live/uninjured green sea turtle. *No lethal takes authorized for pound interactions.* | | | | | | | | | | ITS Expiration Date: None/Ongoing | | Unknown |
| Skate FMP | Fishery | 10/29/2010 | NER | U.S. EEZ from ME to Cape Hatteras, NC | F/NER/2008 /01756 | 1-yr Estimate (over 5 year average for loggerheads only)<br>TRAWL: 24, up to 11 lethal annually over 5-year average; GILLNET: 15, up to 6 lethal annually over 5-year average | | TRAWL and GILLNET (combined): 5 (lethal or non lethal) | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | 0 | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013 | Observed takes in 2011: One leatherback in bottom trawl gear, one loggerhead and one unknown hard-shelled sea turtle in gillnet gear. Murray 2009 estimates a mean annual bycatch of 9 loggerheads (95% CI: 5-15) in the skate sink gillnet fishery for the 2002-2006 time period. Warden 2011 estimates an average annual bycatch of 7 loggerheads (95% CI: 4-11) in the skate bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, green, and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: separate NEFSC bycatch estimates for trawl and gillnet gear. Trawl estimate is an annual point estimate calculated from a 5-year average. Gillnet estimate is the upper end of a 95% CI used over a 5-year period. |
| Monkfish FMP | Fishery | 10/29/2010 | NER | U.S. EEZ from ME to the NC/SC border | F/NER/2008 /01754 | 1-yr Estimate (over 5 year average for loggerheads only)<br>TRAWL: 2, up to 1 lethal annually over a 5 year average; GILLNET: 171, up to 69 lethal annually over a 5 year average | | TRAWL and GILLNET (combined): 5 (lethal or non lethal) | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | 0 | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013. | Observed takes in 2011: One leatherback in gillnet gear. Murray 2009 estimates a mean annual bycatch of 118 loggerheads (95% CI: 68-171) in the monkfish sink gillnet fishery for the 2002-2006 time period. Warden 2011 estimates an average annual bycatch of 2 loggerheads (95% CI: 1-3) in the monkfish bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, Green and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: NEFSC separate bycatch estimate for trawl and gillnet component. Trawl estimate is an annual estimate calculated from a five year average. |
| Summer Flounder, Scup, Black | Fishery | 10/29/2010 | NER | U.S. EEZ from ME to the | F/NER/2002 | 1-yr Estimate (over 5 year average for loggerheads only) | | | | | | | | | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to | Observed takes in 2011: 5 loggerheads and 2 unknown hard-shelled sea turtles in bottom trawl |

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| Sea Bass FMP | | | | NC/SC border | /01879 | TRAWL: 192, up to 79 lethal annually over a 5 year average; GILLNET: 12, up to 5 lethal over 5 year period | | TRAWL: 2 (lethal or non lethal); GILLNET: 3 (lethal or non lethal) | | TRAWL: 2 (lethal or non lethal); GILLNET: 2 (lethal or non lethal); POT/TRAP: 2 (lethal or non lethal) | | 0 | | TRAWL: 2 (lethal or non lethal); GILLNET: 2 (lethal or non lethal). | | | Atlantic sturgeon listing - to be completed in Spring 2013 | gear. Murray 2009 estimates a mean annual bycatch of 6 loggerheads (95% CI: 2-11) in the summer flounder sink gillnet fishery for the 2002-2006 time period. Murray 2009 includes the gillnet fisheries for scup and black sea bass in the "other" category, which has a total mean average annual bycatch of 3 loggerheads. Warden 2011 estimates an average annual bycatch of 110 loggerheads (95% CI: 83-139) in the summer flounder/scup/black sea bass bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, Green and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: NEFSC separate bycatch estimate for trawl and gillnet component. Trawl estimate is an annual estimate calculated from a five year average. Gillnet upper range of CI used over a 5 year period. |
| Spiny Dogfish FMP | Fishery | 10/29/2010 | NER | U.S. EEZ from ME thru FL | F/NER/2008 /01757 | 1-yr Estimate (over 5 year average for loggerheads only) | | | | | | | | | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013 | Observed takes in 2011: One loggerhead in gillnet gear. Warden 2011 estimates an average annual bycatch of 0 loggerhead sea turtles in the spiny dogfish bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, Green and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: NEFSC separate bycatch estimate for trawl and gillnet component. Trawl estimate is an annual estimate calculated from a five year average. Gillnet upper range of CI used over a 5 year period. |
| | | | | | | TRAWL: 1 (lethal or non-lethal) annually over a 5 year average; GILLNET: 1 (lethal or non-lethal) annually over | | TRAWL and GILLNET (combined): 5 (lethal or non lethal) | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | 0 | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | | | |
| Multispecies FMP | Fishery | 10/29/2010 | NER | U.S. EEZ waters from ME thru the range of the species covered by the FMP (~Cape Hatteras, NC) | F/NER/2008 /01755 | 1-yr Estimate (over 5 year average for loggerheads only) | | | | | | | | | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013 | Observed takes for 2011: 2 loggerheads in bottom trawl gear. Murray 2009 includes the fisheries for several species under the NE Multispecies FMP in the "other" category, which has a total mean average annual bycatch of 3 loggerheads. Warden 2011 estimates an average annual bycatch of 5 loggerheads (95% CI: 3-9) in the multispecies bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, Green and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: NEFSC separate bycatch estimate for trawl and gillnet component. Trawl estimate is an annual estimate calculated from a five year average. Gillnet upper range of CI used over a 5 year period. |
| | | | | | | TRAWL: 43, up to 19 lethal annually over a 5 year average; GILLNET: 3, up to 2 lethal annually over a 5 year average. | | TRAWL and GILLNET (combined): 5 (lethal or non lethal) | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | 0 | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | | | |
| Atlantic Bluefish FMP | Fishery | 10/29/2010 | NER | U.S. EEZ from ME thru FL | F/NER/2007 /09036 | 1-yr Estimate (over 5 year average for loggerheads only) | | | | | | | | | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013 | No observed takes for 2011. Murray 2009 estimates a mean annual bycatch of 48 loggerheads (95% CI: 23-79) in the bluefish gillnet fishery for the 2002-2006 time period. Warden 2011 estimates an average annual bycatch of 4 loggerheads (95% CI: 3-5) for the bluefish bottom otter trawl fishery for the 2005-2008 time period. ESTIMATES: Leatherback, green, and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: separate NEFSC bycatch estimates for trawl and gillnet gear. Trawl estimate is an annual point estimate calculated from a 5-year average. Gillnet estimate is the upper end of a 95% CI used over a 5-year period. |
| | | | | | | TRAWL: 3, up to 2 lethal annually over 5-year average; GILLNET: 79, up to 32 lethal annually over 5-year average | | TRAWL and GILLNET (combined): 5 (lethal or non lethal) | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | 0 | | TRAWL and GILLNET (combined): 4 (lethal or non lethal) | | | | |
| Atlantic Mackerel, Squid, Butterfish FMP | Fishery | 10/29/2010 | NER | U.S. EEZ from ME to the NC/SC border | F/NER/2008 /09091 | 1-yr Estimate (over 5 year average for loggerheads only) | | | | | | | | | | ITS Expiration Date: None/Ongoing | Consultation has been reinitiated due to Atlantic sturgeon listing - to be completed in Spring 2013 | Observed takes in 2011: 4 loggerheads in bottom trawl gear. Murray 2009 includes the fisheries for squid, mackerel, and butterfish in the "other" category, which has a total mean average annual bycatch of 3 loggerheads. Warden 2011 estimates an average annual bycatch of 25 loggerheads (95% CI: 13-37) in the squid/mackerel/butterfish bottom otter trawl fisheries for the 2005-2008 time period. ESTIMATES: Leatherback, Green and Kemp's ridley have no bycatch estimate, takes are on an annual basis. Loggerheads: NEFSC separate bycatch estimate for trawl and gillnet component. Trawl estimate is an annual estimate calculated from a five year average. Gillnet upper range of CI used over a 5 year period. |
| | | | | | | 62, up to 27 lethal annually over 5-year average | | 2 (lethal or non lethal) | | 2 (lethal or non lethal) | | 0 | | 2 (lethal or non lethal) | | | | |
| Atlantic Sea Scallop FMP | Fishery | 7/12/2012 | NER | U.S. EEZ from ME to 35°N latitude | F/NER/2012 /01461 | 1-yr Estimate - Dredge | | | | | | | | | | ITS Expiration Date: None/Ongoing | Replaced a 2008 Opinion | No take estimates yet for 2009-2012. There was one observed loggerhead take in 2011. Murray 2011 estimates an average annual bycatch of 125 hard-shelled sea turtles (95% CI: 88-163) for the scallop dredge fishery for the 26 Sept 2006-2008 (post-chain mat) time period. This estimate includes observed as well as unobserved, quantifiable interactions. |
| | | | | | | 161, up to 129 lethal in 2012, up to 46 lethal in 2013 and beyond | | 1 (lethal or non-lethal) | | 1 (lethal or non-lethal) | | 0 | | 2 (lethal or non-lethal) | | | | |
| | | | | | | 1-yr Estimate - Trawl | | | | | | | | | | ITS Expiration Date: None/Ongoing | | No take estimates yet for 2009-2012. There were no observed sea turtle takes in 2011. Warden 2011 estimates an average annual bycatch of 95 loggerheads (95% CI: 60-140) for the scallop bottom otter trawl fishery for the 2005-2008 time period. |
| | | | | | | 140, up to 66 lethal | | 1 (lethal or non-lethal) | | 1 (lethal or non-lethal) | | 0 | | 1 (lethal or non-lethal) | | | | |
| American Lobster - Federal Lobster Management | Fishery | 8/3/2012 | NER | U.S. EEZ waters from ME to Cape Hatteras, NC & adjoining state waters to the extent affected by federal permit holders | F/NER/2012 /01456 | 1-yr Estimate | | | | | | | | | | ITS Expiration Date: None/Ongoing | Replaced a 2010 Opinion | No estimates of actual take; NER STDN data indicate 8 leatherback entanglements in confirmed lobster pot/trap gear in 2011 (Federal vs. state waters breakdown is not known) |
| | | | | | | 1 (lethal or non lethal) | | 0 | | 5 (lethal or non lethal) | | 0 | | 0 | | | | |
| Non-Fishery Consultations | | | | | | | | | | | | | | | | | | |
| Long Island NY to Manasquan NJ Beach Nourishment | Dredging | 12/15/1995 | NER | South shore of Long Island, Sandy Hook to Manasquan, NJ and New York Bight area for borrow sites | none | 1-yr Estimate | | | | | | | | | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 5 lethal takes of loggerhead OR green sea turtles (any combination of the two species). Dredge takes are assumed to be lethal. | Observer coverage less than 100% - no recorded takes. | 1 loggerhead killed in 1997 |
| | | | | | | 0 | 5* | 0 | 5* | 0 | 4 | 0 | 0 | 0 | 1 | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sandy Hook Channel Dredging | Dredging | 6/10/1996 | NER | Sandy Hook Channel (in NY Bight) as described and identified in the BiOp | none | 1-yr Estimate | | | | | | | | | | | | |
| | | | | | | 0 | 2* | 0 | 2* | 0 | 1* | 0 | 0 | 0 | 1* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 2 lethal takes of loggerhead or green sea turtles and 1 lethal take of a leatherback OR Kemp's ridley. Dredge takes are assumed to be lethal. | | No reported takes. |
| ACOE Philadelphia District Dredging - includes maintenance of DE River channel | Dredging | 11/26/1996 | NER | Delaware River Basin and the Atlantic coast of NJ from the Manasquan Inlet to Cape May and the entire coast of Delaware | none | 1-yr Estimate | | | | | | | | | | | | |
| | | | | | | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | ITS is based on a revision to the BiOp on 5/25/99. ITS was revised without reinitiating BiOp. | Consultation was reinitiated in 2012 | From 1993-2005, six loggerhead entrainments were observed. Observer coverage ranged from 25-50% |
| MD Coastal Beach Protection Project (includes several projects with different ITSs) | Dredging | 4/6/1998 | NER | Waters in the vicinity of Ocean City, MD as described in the BiOp | none | Anticipated take for the entire project period (25 years) | | | | | | | | | | | | |
| | | | | | | 0 | 10 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | Dredge takes are assumed to be lethal. | | No reported takes. |
| | | | | | | Anticipated take for each dredge cycle | | | | | | | | | | | | |
| | | | | | | 0 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | Dredge takes are assumed to be lethal. | | No reported takes. |
| Ambrose Channel, NJ Sand Mining | Dredging | 10/11/2002 | NER | 4.63 km section of Ambrose Channel located outside of the entrance to Lower NY Bay between Rockaway Pt., NY and Sandy Hook, NJ and the area between the Channel and the processing facility at South Amboy | F/NER/2002/00794 | Anticipated take for the entire project period (10 years) | | | | | | | | | | | | |
| | | | | | | 0 | 2 | 0 | 1 | 0 | 1* | 0 | 0 | 0 | 1* | Dredge takes are assumed to be lethal. Dredge takes are assumed to be lethal. *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 lethal take of a leatherback OR Kemp's ridley. | | No reported takes. |
| Navy-JEB/Fort Story Beach Dredging and Beach Nourishment | Dredging | 7/13/2012 | NER | JEB/Fort Story Beach, Sandbridge Shoals offshore borrow site, and waters between and immediately adjacent to these areas for transit between the borrow site and the beach. | F/NER/2012/02020 | 1-yr Estimate | | | | | | | | | | | | |
| | | | | | | 0 | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 sea turtle will be taken, either loggerhead or Kemp's ridley. Dredge takes are assumed to be lethal. | | Project has not been undertaken |
| Dam Neck Naval Facility Beach Dredging and Beach Nourishment | Dredging | 7/20/2012 | NER | Dam Neck Annex Beach, Sandbridge Shoals offshore borrow site, and waters between and immediately adjacent to these areas for transit between the borrow site and the beach. | F/NER/2012/02021 | 1-yr Estimate | | | | | | | | | | | | |
| | | | | | | 0 | 1* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 1 sea turtle will be taken, either loggerhead or Kemp's ridley. Dredge takes are assumed to be lethal. | Replaces the 2003 Opinion | Project has not been undertaken |
| Dredging of Sandbridge Shoals, VA | Dredging | 9/7/2012 | NER | Borrow area ~ 3 mi offshore of VA Beach and waters used for the transport vessel between the borrow site and Sandbridge Beach, VA | F/NER/2012/01587 | 1-yr Estimate | | | | | | | | | | | | |
| | | | | | | 0 | 6 | 0 | 1* | 0 | 0 | 0 | 0 | 0 | 1* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates up to 6 loggerheads and 1 green or Kemp's ridley. Opinion considers only the use of this borrow area for one project 2012-2013. Dredge takes are assumed to be lethal. | Replaced 1993 Opinion | Project has not been undertaken |
| Deepening of Delaware River Federal Navigation Project | Dredging | 7/11/2012 | NER | Delaware River navigation channel from lower Bay to Philadelphia ("Philadelphia to the Sea") | F/NER/2011/00754 | Anticipated take for the entire project period (15 years) | | | | | | | | | | | | |
| | | | | | | 0 | 20* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2* | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 20 total turtles taken over 15-year project life with no more than 2 being Kemp's (and the remainder loggerheads). Dredge takes are assumed to be lethal. | Replaced a 2009 Opinion | Dredging began in 2010 and continued through 2012, but in upriver areas where no sea turtles are likely to occur |
| NASA's Wallops Island Shoreline Restoration and Infrastructure Protection Program | Dredging | 8/3/2012 | NER | Wallops Island and offshore borrow sites off the Atlantic coast of Virginia | F/NER/2012/01118 | Anticipated take for the entire project period (50 years) | | | | | | | | | | | | |
| | | | | | | 0 | 9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1** | Dredge takes are assumed to be lethal. ** NMFS expects that a total of 9 sea turtles will be killed, with no more than 1 being a Kemp's ridley and the remainder being loggerheads. | Replaced a 2010 Opinion | Initial dredging began in April 2012 and was completed in August 2012 with no incidences of sea turtle take. Maintenance dredging will be undertaken sometime in 2017. |
| Atlantic Coast of Maryland | Shoreline | 11/30/2006 | NER | Four borrow areas (Weaver | F/NER/2006 | Based on cubic yards of material dredged as noted below (loggerheads) or for entire project period (for | | | | | | | | | | Dredge takes are assumed to be lethal. | | Project has not been undertaken to date |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shoreline Protection Project | Protection | | | Shoals, Isle of Wight Shoals, Shoal A, and Shoal B) located 7-11 miles offshore Ocean City, MD. Disposal of dredged material will occur on Ocean City. | /03915 | 1 (≤0.5 million cy ); 2 (>0.5 to ≤1 million cy); 3 (>1 to ≤1.5 million cy); 4 (>1.5 to ≤1.6 million cy) | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2** | ** Over life of project (through 2044), ~ 10-12 million cy will be dredged with an anticipated total of 24 turtles killed (2 Kemp's ridleys and the rest loggerheads). Dredging scheduled to start in 2008 and occur every 4 yrs. ITS Expiration Date - 2044 | | |
| Sconset Beach Dredge and Nourishment Project | Beach Nourishment | 10/5/2007 | NER | Sconset Beach in Nantucket, MA. Borrow site is located approximately 2.9 miles east of Nantucket Island. | F/NER/2006 /03910 | Anticipated take for entire project period (dredging 2.6 million cy) | | | | | | | | | | Dredge takes are assumed to be lethal. | | Project has not been undertaken to date |
| | | | | | | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Salem Nuclear Generating Station | Power Plant | 5/14/1993 | NER | Delaware River off of Artificial Island, NJ including the Delaware estuary | none | 1-yr Estimate | | | | | | | | | | ITS is based on a revision to the BiOp on 12/29/98. ITS was revised without reinitiating BiOp. | 100% observer coverage. CONSULTATION HAS BEEN REINITIATED DUE TO ATLANTIC STURGEON LISTING | With 100% observer coverage there has been one Kemp's ridley take (non-lethal) from 2004-present. |
| | | | | | | 30 | 5 | 5 | 2 | 0 | 0 | 0 | 0 | 5 | 1 | | | |
| Oyster Creek Nuclear Generating Station (OCNGS) | Power Plant | 11/21/2011 | NER | DWS and CWS intake areas of the OCNGS, the south fork of the Forked River, Oyster Creek, and the region of the thermal plume into Barnegat Bay | F/NER/2010 /01855 | Over life of operating license (through April 2029) | | | | | | | | | | | Replaced a 2006 Opinion | BiOp considers effects of operation through the expiration of the extended operating license (April 2009). With 100% observer coverage, 11 total takes (10 Kemp's ridleys (3 lethal) and 1 green) were recorded in 2009; 9 total takes (1 loggerhead, 5 Kemp's ridleys (1 lethal), and 3 greens) were recorded in 2010; 8 total takes (1 green, 1 loggerhead, and 6 Kemp's ridleys (2 lethal)) were recorded in 2011; and 4 takes (all Kemp's ridleys (1 lethal)) have been recorded to date in 2012. |
| | | | | | | 6 total (1 lethal) | | 11 total (2 lethal) | | 0 | 0 | 0 | 0 | 71 total (26 lethal) | | | | |
| USFWS Funding to State of NJ for 4 marine surveys | Marine Survey | 5/11/2012 | NER | New Jersey state waters | F/NER/2012 /01151 | Over remainder of 5 year grant period (through May 31, 2014) | | | | | | | | | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates capture of 2 total turtles with no more than 1 Kemp's ridley, green, OR leatherback | | no reported interactions during 2012 |
| | | | | | | 2* | 0 | 1* | 0 | 1* | 0 | 0 | 0 | 1* | 0 | | | |
| USFWS Funding to State of CT for marine surveys | Marine Survey | 6/4/2012 | NER | Long Island Sound | F/NER/2012 /01175 | Over remainder of 5 year grant period (through May 31, 2014) | | | | | | | | | | ITS is based on a revision to the BiOp on 12/29/98. ITS was revised without reinitiating BiOp. | | No reported take. |
| | | | | | | 30 | 5 | 5 | 2 | 0 | 0 | 0 | 0 | 5 | 1 | | | |
| Cape Wind | Alternative Energy Development | 12/30/2010 | NER | Nantucket Sound, Massachusetts | F/NER/2010 /03866 | Anticipated take for the entire project period | | | | | | | | | | *Take numbers for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3-7 sea turtles (loggerhead, Kemp's ridley, green, or leatherback) exposed to harassing noise levels during the driving of each of 130 piles - take is by harassment (no injury or mortality); ** NMFS anticipates 13-28 sea turtles (loggerhead, green, Kemp's ridley, or leatherback) exposed to harassing levels of noise (no injury or mortality) during the geophysical survey will be a combination of these species. | Replaced a 2008 Opinion | Project has not yet begun. |
| | | | | | | 3-7*, 13-28** | 0 | 3-7*, 13-28** | 0 | 3-7*, 13-28** | 0 | 0 | 0 | 3-7*, 13-28** | 0 | | | |
| NEAMAP Spring and Fall Surveys 2010-2012 (Grant issued by NEFSC) | Research Survey | 4/13/2012 | NER | Coastal waters from Montauk, NY to Cape Hatteras, NC including Block Island and Rhode Island Sounds | F/NER/2012 /01152 | 1-yr Estimate | | | | | | | | | | Project and ITS is for 2012 only. | Replaced a 2010 Opinion | 3 loggerhead takes were recorded by VIMS staff during the Spring 2012 surveys; all 3 turtles were released alive and uninjured. The Fall 2012 surveys are ongoing and there has been one Kemp's ridley take (released alive, uninjured) recorded thus far. |
| | | | | | | 6 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | | | |
| NEFSC Research Vessel Surveys and Cooperative Gear Research Projects | Research Survey | 11/30/2012 | NER | U.S. EEZ from Gulf of Maine to Cape Hatteras, NC | NER-2012-9241 | 1-yr Estimate | | | | | | | | | | Project and ITS is for 2013 and 2014, or until the NEFSC programmtic Opinion is completed. | Replaced the June 2012 Opinion | 3 loggerheads takes have been recorded during the 2012 fall bottom trawl surveys; both turtles were released alive and uninjured. No loggerhead takes were recorded during the 2012 spring bottom trawl, sea scallop, surf clam/ocean quahog, and northern shrimp surveys. |
| | | | | | | 14 total, up to 3 lethal | | 3 total, up to 2 lethal | | 3 total, up to 2 lethal | | 0 | | 4 total, up to 3 lethal | | | | |
| New York and New Jersey Harbor Deepening | Dredging | 10/25/2012 | NER | New York/New Jersey Harbor Complex | F/NER/2012 /02358 | Anticipated take for the entire project period | | | | | | | | | | Dredge takes are assumed to be lethal. | Replaced the October 2000 Opinion | No reported takes. |
| | | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | |
| Chesapeake Bay Entrance Channels Batch | Dredging | 10/16/2012 | NER | Cape Henry Channel, York Spit Channel, Rappahannock Shoal, York River Entrance | F/NER/2012 /01586 | Anticipated take for the entire project period (50 years) | | | | | | | | | | The ITS exempts lethal take from hopper dredging and non-lethal take from capture in relocation trawling | This Opinion replaces the following four Opinions: Thimble Shoals and Atlantic Ocean Channel (April 25, 2002), Virginia | Project to begin in 2013, no reported takes at this point. |
| | | | | | | 937 | 452 | 38 | 11 | 0 | 0 | 0 | 0 | 275 | 48 | | | |

## Southwest Regional Office Consultations - Pacific Coast/California

| CONSULTATION ACTIVITY | TYPE OF ACTION | DATE SIGNED | LEAD REGION | ACTION AREA | PCTS TRACKING # | INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE) Loggerhead (NP DPS) Alive | Loggerhead (NP DPS) Dead | Green Alive | Green Dead | Leatherback Alive | Leatherback Dead | Hawksbill Alive | Hawksbill Dead | Olive Ridley Alive | Olive Ridley Dead | ITS NOTES | ADDITIONAL INFORMATION | DOCUMENTED AND/OR ESTIMATED TAKE (Loggerhead (NP DPS) Alive/Dead; Green Alive/Dead; Leatherback Alive/Dead; Hawksbill Alive/Dead; Olive Ridley Alive/Dead) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NMFS Fishery Management Plan Consultations | | | | | | | | | | | | | | | | | | |
| Highly Migratory Species Fishery Management Plan (CA/OR drift gillnet fishery) | Fishery | 2/4/2004 | SWR | West coast EEZ | SWR - 2004/574 | 1-yr Estimate | | | | | | | | | | Conditions resulting in take of loggerheads includes El Nino years only. | Takes are only anticipated for the CA/OR drift gillnet fishery, with rare takes anticipated in the albacore surface hook and line fishery. Approximately 20% coverage in the CA/OR drift gillnet fishery. | One loggerhead was observed taken and released unharmed in 2001; One loggerhead observed taken and released unharmed in 2006. One leatherback observed taken and released unharmed in October, 2009. No turtle takes in 2010 or 2011. |
| | | | | | | 5 | 2 | 4 | 1 | 3 | 2 | 0 | 0 | 4 | 1 | | | |
| ETP purse seine fishery (large vessels only) | Fishery | 12/8/1999, ITS amended 1/8/01 and then 7/7/04 | SWR | Eastern Tropical Pacific Ocean | | 10-yr Estimate | | | | | | | | | | | 100 % coverage in this fishery. Fishery had 5-6 large vessels active in the 1990s, and now only 1-2 large vessels fish. | 2000: 2 green turtles taken, both released unharmed; 5 loggerheads taken and released unharmed; 6 olive ridleys taken - 2 released unharmed, 2 with light injuries, 1 escaped/evaded net; 4 unidentified turtles - 3 released unharmed, 1 escaped/evaded net. 2001: 2 green turtles taken, both released unharmed; 1 hawksbill taken, released unharmed; 19 olive ridleys taken - 16 released unharmed and 3 had grave injuries; 7 unidentified turtles taken - 6 released unharmed and 1 released with light injuries. 2002: 1 green turtle taken, released unharmed; 1 hawksbill taken, released unharmed; 10 olive ridleys taken, all released unharmed; 1 unidentified turtle taken and released unharmed. 2003: 5 green turtle taken, all released unharmed; 42 olive ridleys taken - 34 released unharmed, 7 released with light injuries and 1 killed; 11 unidentified turtles taken - 10 released unharmed and 1 unknown fate. 2004: 24 olive ridleys taken - 23 released unharmed, 1 released with light injuries; 5 unidentified turtles taken, all released unharmed. 2005: 1 green turtle taken, released unharmed; 7 olive ridleys taken, all released unharmed; 2 unidentified turtles taken - 1 released unharmed and 1 killed. 2006: 3 green turtles taken, all released unharmed; 16 olive ridleys taken - 15 released unharmed, 1 released with grave injuries; 1 unidentified turtle taken and released unharmed. 2007: 2 green turtles taken, both released unharmed; 8 olive ridleys taken, all released unharmed. 2008: no turtles taken. 2009: 1 olive ridley taken and released unharmed; 1 unidentified turtle taken and released unharmed. 201: no turtles taken. 2011: 7 olive ridleys taken - 6 released unharmed and 1 released with light injuries; 1 unidentified turtle taken but escaped out of the net. |
| | | | | | | 30 | 1 every 7 years | 350 | 20 | 20 | 1 | 20 | 1 | 1330 | 70 | | | |
| Non-Fishery Consultations | | | | | | | | | | | | | | | | | | |
| Nuclear Regulatory Commission - Diablo Canyon | Power Plant | 9/18/2006 | SWR | Diablo Cove, San Luis Obispo County, CA | SWR - 2005/07421 | 1-yr Estimate | | | | | | | | | | *SI = serious injury. Both serious injuries and mortalities are subsets of the total anticipated take by entrainment | | In 2007, 1 green turtle was entrained and released alive with light injuries (abrasions on flippers). No turtles documented taken in 2008. In 2009, 1 green turtle was taken and released alive and unharmed. In 2010, 1 green turtle was taken released alive and unharmed. No turtles were taken in 2011. |
| | | | | | | 3 (1 SI)* | 1 | 15 (1 SI)* | 3 | 3 (1 SI)* | 1 | 0 | 0 | 3 (1 SI)* | 1 | | | |
| Nuclear Regulatory Commission - San Onofre Nuclear Generating Station | Power Plant | 9/18/2006 | SWR | Near San Clemente, CA | SWR - 2005/07421 | 1-yr Estimate | | | | | | | | | | *SI = serious injury. Both serious injuries and mortalities are subsets of the total anticipated take by entrainment | | In 2006, 3 green turtles were taken, released alive and unharmed. In 2007, 2 green turtles were taken, released alive. No turtles documented taken in 2008. In 2009, 1 green turtle was taken and released alive and unharmed; 1 olive ridley taken and released alive and unharmed. In 2010, 2 green turtles were taken and released alive and unharmed. In 2011 1 green turtle was taken and released alive and unharmed. |
| | | | | | | 3 (1 SI)* | 1 | 34 (2 SI) | 4 | 3 (1 SI)* | 1 | 0 | 0 | 3 (1 SI)* | 1 | | | |

## Pacific Islands Regional Office Consultations - Hawaii and Territories

| CONSULTATION ACTIVITY | TYPE OF ACTION | DATE SIGNED | LEAD REGION | ACTION AREA | PCTS TRACKING # | INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE) | | | | | | | | | | ITS NOTES | ADDITIONAL INFORMATION | DOCUMENTED AND/OR ESTIMATED TAKE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Loggerhead (NP DPS) | | Green Turtle | | Leatherback | | Hawksbill | | Olive Ridley | | | | Loggerhead (NP DPS) | | Green | | Leatherback | | Hawksbill | | Olive Ridley | |
| | | | | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead |
| NMFS Fishery Management Plan Consultations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Western Pacific Pelagics FMP handline, troll, pole and line and America Samoa Long line | Fishery | 2/23/2004 | PIR | Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific | | 1-yr Estimate | | | | | | | | | | *Take numbers for these species are in combination and do not represent take for each species individually. NMFS anticipates 6 takes total, up to 1 lethal for all hard-shell species; for leatherback turtles one interaction and no mortalities are authorized | | Unknown | | | | | | | | | |
| | | | | | | 6* | 1* | 6* | 1* | 1 | 0 | 6* | 1* | 6* | 1* | | | | | | | | | | | | |
| Hawaii Based Deep-Set (Tuna) Long line Fishery | Fishery | 10/4/2005 | PIR | Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific | F/PIR/2004/ 02184 | 3-yr Estimate | | | | | | | | | | | 20% observer coverage mandated | 2005:Observed- 1 Leatherback, 4 olive Ridleys (dead); 2006: Observed- 10 Leatherbacks (2 dead), 11 Olive Ridleys (10 dead), 2 Greens (dead). 2007: Observed: 2 leatherbacks, 1 Loggerhead (dead), 7 Olive Ridleys (dead). 2008: Observed 1 Leatherback, 3 Olive Ridleys (dead). 2009: Observed- 1 Leatherback, 4 Olive Ridleys (dead). ESTIMATED TOTAL- 4 Leatherbacks (1.59 Estimated Mortalities), 18 Olive Ridleys (17.1 Estimated Mortalities). 2010: Observed- 1 Leatherback(dead), 1 Loggerhead (dead), 4 olive Ridleys (3 dead), 1 Green (dead). ESTIMATED TOTAL- 6 Loggerhead (3.76 Estimated Mortalities), 6 Leatherbacks (2.39 ESTIMATED MORTALITIES), 10 Olive Ridleys ( 9.45 ESTIMATED MORTALITIES), 1 Green. 2011: Observed- 2 Leatherbacks (Injured), 6 Olive Ridleys (5 dead), 1 Green (Injured). ESTIMATED TOTAL - 14 Leatherbacks (5.57 estimated mortalities), 36 Olive Ridleys (34.02 Estimated mortalities), 5 Greens (4.57 Estimated Mortalities). 2012: OBSERVED- 1 Leatherback (dead), 2 Olive ridleys (dead). | | | | | | | | | |
| | | | | | | 18 | 9 | 21 | 18 | 39 | 18 | 0 | 0 | 123 | 117 | | | | | | | | | | | | |
| U.S. WCPO Purse Seine Fishery | Fishery | 11/1/2006 | PIR | EEZs of 16 Pacific Island Countries party to the South Pacific Tuna Treaty and High Seas | F/PIR/2006/ 01760 | 1-yr Estimate | | | | | | | | | | | Approximately 20% observer coverage through 2009. Coverage was increased to 100% in 2010. | 2007: Observed- 1 Green, 2008: Observed- 5 Green, 2 Hawksbill, 1 Leatherback. 2009: Observed- 2 Green, 4 Hawksbill, 9 Loggerhead, 1 Olive Ridley. 2010: 1 Flatback, 7 Greens, 3 Hawksbills, 1 Leatherback, 1 Loggerhead (dead), 7 Olive Ridleys, 3 Unidentified. 2011: 1 Green, 6 Hawksbills, 1 Loggerhead, 9 Olive Ridleys, 1 Unidentified. | | | | | | | | | |
| | | | | | | 11 | 0 | 14 | 0 | 11 | 0 | 14 | 0 | 11 | 0 | | | | | | | | | | | | |
| Hawaii Bottomfish Fishery | Fishery | 3/18/2008 | PIR | Main Hawaiian Islands | F/PIR/2007/ 05762 | 1-yr Estimate | | | | | | | | | | | No coverage | Unknown | | | | | | | | | |
| | | | | | | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | |
| Western Pacific Pelagics FMP troll and handline | Fishery | 9/1/2009 | PIR | EEZs of 16 Pacific Island Countries party to the South Pacific Tuna Treaty and High Seas | F/PIR/2008/ 02430 | 1-yr Estimate | | | | | | | | | | | No coverage | Unknown | | | | | | | | | |
| | | | | | | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | |
| Measures to Reduce Interactions between Green Sea Turtles and the American Samoa-based Long line Fishery-Implementation of an Amendment to the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region | Fishery | 9/16/2010 | PIR | American Samoa EEZ, waters around it, EEZs of some other foreign countries (e.g., Samoa). | F/PIR/2007/ 05760 | 3-yr Estimate | | | | | | | | | | Adult female equivalents included in the ITS, every three years, are 10 green, 1 hawksbill, 1 leatherback, and 1 olive ridley. This opinion was completed in 2010 but the fishery did not implement the changes to the gear that was analyzed in this opinion until Fall of 2011. | 2006-2009 coverage was about 7%. As of 9/17/2012 the coverage level is 16.87% | 2006: 3 Green (dead). 2007: 1 Green (dead). 2008: 1 Green (dead). 2009: 2 Green (dead). 2010: 8 Green (7 dead). 2011: 7 Greens (dead), 2 leatherbacks (1 dead), 1 olive ridley returned injured. No interactions observed in 2012 or since the change in gear since fall 2011. TOTAL ESTIMATES are not available at this time, they are currently being worked on by the science center. | | | | | | | | | |
| | | | | | | 0 | 0 | 45 | 41 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | |
| Hawaii Based Shallow-Set (Swordfish) Long line Fishery | Fishery | 1/30/2012 | PIR | Central, Western, and Northern Pacific Ocean, including inside the EEZ around U.S. Islands in the Pacific | F/PIR/2011/ 04465 | 2-yr Estimate | | | | | | | | | | ITS is for 2 year periods, but fishery operates under 1 year hard cap rule. | 100% observer coverage | 2012: 4 Loggerheads all caught alive and released injured, but one was caught twice so there were 5 interactions (Estimated mortalities = 0.06). 6 Leatherbacks; 5 caught alive and 1 unknown (Estimated mortality= 1.60). All estimated mortalities were derived using the Ryder et al 2004 NOAA tech memo and observer data. | | | | | | | | | |
| | | | | | | 68 | 14 | 6 | 2 | 52 | 12 | 0 | 0 | 4 | 2 | | | | | | | | | | | | |
| Non-Fishery Consultations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FEMA Funding for Post 2009 Tsunami Repairs on Tutuila | Construction | 3/19/2010 | PIR | Tutuila | 2010/00153 | 1-yr Estimate | | | | | | | | | | | | No reported takes. | | | | | | | | | |
| | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Guam n Commonwealth of the Northern Marianas Islands Military Relocation | Military | 8/25/2010 | PIR | Guam | 2008/07326 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Route 4 Ylig Bridge Replacement Guam | Construction | 10/12/2010 | PIR | Guam | 2010/02921 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Rehabilitate DMWR Shoreline Facilities at Pago Pago Bay, American Samoa | Shoreline | 8/2/2011 | PIR | American Samoa | 2010/03251 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Repair and Modernize Waterfront Facilities at Sumay Cove | Construction | 9/1/2011 | PIR | Sumay Cove | 2010/05209 | 1-yr Estimate | | | | | | | | | | | | No reported takes. |
| | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |

## Office of Protected Resources Consultations - National Scope and Permits

| CONSULTATION ACTIVITY | TYPE OF ACTION | DATE SIGNED | LEAD REGION | ACTION AREA | PCTS TRACKING # | INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE) | | | | | | | | | | ITS NOTES | ADDITIONAL INFORMATION | DOCUMENTED AND/OR ESTIMATED TAKE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Loggerhead (NWA & NP DPS) | | Green Turtle | | Leatherback | | Hawksbill | | Kemp's Ridley Olive Ridley | | | | Loggerhead (NWA & NP DPS) | | Green Turtle | | Leatherback | | Hawksbill | | Kemp's Ridley Olive Ridley | |
| | | | | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | | | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead | Alive | Dead |
| Non-Fishery Consultations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| North Carolina DENR Pamlico Sound Gillnet Fishery - Incidental Take Permit | Section 10(a)(1)(B) | 8/26/2005 | F/PR2 | Pamlico Sound, NC | | 1-yr Estimate<br>38 | 3 | 120 | 48 | 2 | | 2 | | 24 | 14 | Expiration - 12/13/2010 (expiration has been extended pending new permit application process) | | No reported takes. | | | | | | | | | |
| Hata, Virginia Tech - Incidental Take Permit (Horseshoe crab abundance surveys) | Section 10(a)(1)(B) | 8/17/2005 | F/PR2 | waters 3 miles offshore Cape Cod, MA south to the GA/FL border | | 1-yr Estimate<br>34 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 15 | 1 | Expiration - 12/15/2011 (expiration has been extended pending new permit application process) | | 1 Loggerhead in 2008, released alive | | | | | | | | | |
| Rudloe, Gulf Specimen Marine Laboratories - Incidental Take Permit (Aquarium collections) | Section 10(a)(1)(B) | 5/15/2003 | F/PR2 | Florida Panhandle | | 1-yr Estimate<br>3* | 0 | 3* | 0 | 3* | 0 | 3* | 0 | 3* | 0 | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 non-lethal takes may occur in any combination of species. Expiration - 5/1/2012 | | No reported takes. | | | | | | | | | |
| Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf | Oil & Gas | 8/28/2006 | F/PR3 | Gulf of Mexico | | 6-yr Estimate<br>15* | 0 | 3* | 0 | 3* | 0 | 3* | 0 | 3* | 0 | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 3 turtles per year over a period of 6 years, for a total of 18 turtles. Up to 15 loggerheads and a total of 3 of any combination of Kemp's, greens, hawksbill, or leatherback. | | No reported takes. | | | | | | | | | |
| Sinking Exercises (SINKEX) in the Western North Atlantic Ocean | Military | 9/22/2006 | F/PR3 | Western North Atlantic Ocean | | 1-yr Estimate<br>ITS - We do not have information to determine an amount of take. Survey data for the SINKEX location is extremely limited and the densities or abundance of sea turtles within the area is not known. Therefore, we anticipate the extent of take would be within the water column that would be affected by the shock and pressure waves above levels of 12 psi and 182 dB re 1 μ Pa2-sec in the greatest 1/3 octave band. For the largest underwater detonations, the extent includes the volume within 2 nmi of the detonation. Thus, the extent of take includes the "exclusion zone" of the SINKEX. | | | | | | | | | | | | No reported takes. | | | | | | | | | |
| Issuance of multiple permits to conduct scientific research on Atlantic sturgeon pursuant to section 10 (a)(1) of the Endangered Species Act of 1973 | Section 10(a)(1)(A) for Sturgeon Research | 4/2/2012 | F/PR5 | U.S. Atlantic Coast (from ME to FL) | | Anticipated take for the entire research permit (5 years)<br>4* | 0 | 4* | 0 | 4* | 0 | 4* | 0 | 4* | 0 | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 4 total non lethal takes of any sea turtle species. ITS Expiration Date: 4/2/2017 | | No reported takes. | | | | | | | | | |
| National Science Foundation - Marine Seismic Survey in the Central Pacific Ocean | Seismic | 11/23/2011 | F/PR5 | Central Pacific Ocean | | Anticipated take for the entire project period<br>ITS - We do not have information to determine an amount of take. Harassment of these sea turtles is expected to occur at received levels of seismic sounds above 166 dB re 1 μPa. Because density estimates of sea turtles in the survey area are unknown, we estimate take as the number of turtles exposed to seismic operations above 166 dB re 1 μPa during the proposed activities. These turtles could be of all ages and life stages in the survey area. | | | | | | | | | | Seismic Survey expected to occur through January 2012. | | No reported takes. | | | | | | | | | |
| Navy - Conduct of training in the Virginia Capes, Cherry Point and Jacksonville Range Complexes June 2011 to June 2012 | Navy Activities | 6/1/2011 | F/PR5 | Central Pacific Ocean | | Anticipated take for the entire project period<br>485 | 9 | 311* | 3* | 20 | 1 | 311* | 3* | 557 | 5 | *Take number for these species are in combination and do not represent authorized takes for each species individually. NMFS anticipates 311 non-lethal and 3 lethal green and hawksbill. Take is estimated for the Virginia Capes and Jacksonville Areas, with estimates for harassment and harm to sea turtle species. | | No reported takes. | | | | | | | | | |

# Appendix E

## Piping Plover Monitoring Methodology

## *Piping Plover and Red Knot Monitoring Methodology*

*Required skills, training, and equipment*

1. Piping plover and red knot monitors must be capable of detecting and recording locations of roosting and foraging birds, and documenting observations in legible, complete field notes. Aptitude for monitoring includes keen powers of observation, familiarity with avian biology and behavior, experience observing birds or other wildlife for sustained periods, tolerance for adverse weather, experience in data collection and management, and patience. Monitors must also be able to captain a boat (if applicable) and walk long distances carrying field gear.

2. A training workshop on piping plover and red knot band identification must be completed prior to the start of the first monitoring season if the applicant is unfamiliar with bird/banding identification.

3. Binoculars, a GPS unit (set to record in decimal degrees in the WGS datum), a 10-60x spotting scope with a tripod, boat access (if applicable), and the Service's datasheet must be used to conduct the surveys.

*Abundance and distribution*

1. Piping plover abundance and distribution within the project area will be determined through three surveys per month of suitable habitat along the entire island conducted ten days apart (weather and tide permitting, no surveys should be conducted if winds exceed 15 mph) during the survey window beginning August 1 through April 30. Surveys should be scheduled around the 5$^{th}$, 15$^{th}$, and 25$^{th}$ of each month. (**At least one year of baseline data should be collected before project construction and surveys should continue for a minimum of three years after construction.**)

    a. Surveys must be conducted within a six hour window surrounding high tide (three hours before high tide (mid rising) and three hours after high tide (mid falling) make up the six hour window) when piping plovers are more concentrated. Re-sighting bands will be easier a few hours before or after high tide when birds are no longer roosting. All observations must be confirmed through a spotting scope.

    b. One foraging survey (**only if benthic monitoring is being done, this survey would count as 1 of the 3**) must be conducted within a four hour window surrounding low tide (two hours before and two hours after low tide make up the four hour window), which will determine where the macroinvertebrate sampling will occur. All observations must be confirmed through a spotting scope.

2. Band combinations will be noted in the following order: Upper Left (UL), Lower Left (LL): Upper Right (UR), and Lower Right (LR) using the following abbreviations:

| | | |
|---|---|---|
| X: metal | b: light blue | C: Atlantic Canada color metal |
| f: flag | G: dark green | T: other (describe) |
| R: red | g: light green | /: split band |
| Y: yellow | L: black | //: triple split |
| O: orange | W: white | N: no band seen (area not visible) |
| B: dark blue | A: gray | –: no band |
| P: pink | U: purple | |

Example: A piping plover with: UL orange flag band, LL light blue band over a black over orange over black triple split band, UR metal band, LR light green band would be noted Of,bL/O/L:X,g. A comma separates the upper and lower leg and a colon separates the legs from each other.

3. GPS coordinates must be collected in decimal degrees as close to the location of the bird as possible without causing a change in behavior (the bird is spending most of its time watching the monitor instead of continuing the behavior it was exhibiting when it was first spotted). Band combinations (if applicable), habitat type, and behavior will also be recorded on the Service datasheet for each individual piping plover sighting.

4. Red knots (other shorebird species are optional) will also be recorded during the surveys. Band combinations, flag color and alphanumeric codes, and geolocators will be noted on the datasheet if applicable. All band resightings will be reported on www.bandedbirds.org.

5. Recreational disturbance will be documented during the surveys. Any activity causing a disturbance (change in behavior, particularly if the disturbance flushes the birds) to roosting or foraging birds will be noted on the datasheet. Additionally, noncompliance of any habitat protection requirements will be documented.

*Data Collection and Reporting*

1. Shorebird surveys will be recorded and filled out on the Service datasheet in the field and transcribed into an Excel spreadsheet (provided by the Service). Electronic hard copies of the datasheets and the spreadsheet will be provided annually by July 15 to the Service.

# Appendix F

## Shorebird Survey Datasheet

**DRAFT**

**USFWS SC Field Office Shorebird Survey and Band Resighting Data Sheet** **Page___of___**

Date:________Location: ____________________________________________Observer(s): __________________________________________________

Start Time:______AM/PM End Time:______AM/PM **General weather** (circle one): Sunny Partly cloudy Cloudy Rain Fog Other (describe)

**Temp**:____°F/°C **Wind Direction** (circle one): N NE E SE S SW W NW **Wind Speed** (circle one): 0-5 6-10 11-15 16-20 >21 MPH

**Tidal stage at start of survey** (circle one): Low Mid High (Rising/Falling)

**Disturbance (#)**: Pedestrian(s)________Boat(s)________Bicycle(s)________ATV(s)________ORV(s)________Dog(s) On________Dog(s) Off__________

| Species | Flock # | # Banded | Total # | Behavior (F/R) | Band Position, Color, and Code | | | | | | | | | Latitude | Longitude | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ULU | ULL | LLU | LLL | URU | URL | LRU | LRL | Flag Code | | | |
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**Band Color Abbreviation Key:**

X: metal band
L: black
R: red
Y: yellow
O: orange
B: dark blue
b: light blue
W: white
A: gray
U: purple
G: dark green
g: light green
p: pink
T: other (describe in notes section)
f: flag
-: no band (no band on that leg position)
N: no band seen (leg position not visible)
/: split band (single band with 2 colors)
//: triple split band (single band with 3 colors)

**Species Abbreviation Key:**

American Oystercatcher: AMOY
Black-bellied plover: BBPL
Dunlin: DUNL
Least Sandpiper: LESA
Lesser yellowlegs: LEYE
Marbled godwit: MAGO
Piping plover: PIPL
Red knot: REKN
Ruddy Turnstone: RUTU
Sanderling: SAND
Semipalmated plover: SEPL
Semipalmated sandpiper: SESA
Short-billed dowitcher: SBDO
Western sandpiper: WESA
Whimbrel: WHIM
Willet: WILL
Wilson's plover: WIPL