United States Department of the Interior
U. S. FISH AND WILDLIFE SERVICE
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JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log. No. 41910-2007-F-0495

July 10, 2009

Mr. Bob Gleason
District Environmental Administrator
Florida Department of Transportation
719 South Woodland Boulevard, MS 501
DeLand, FL 32720

Dear Mr. Gleason:

This document is the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed State Road (SR) A1A Shoreline Stabilization from approximately 200-feet south of South 28th Street to 980-feet south of Osprey Point Drive located in Flagler Beach, Florida, and its effects on the threatened loggerhead sea turtle (*Caretta caretta*), endangered green sea turtle (*Chelonia mydas*), and endangered leatherback sea turtle (*Dermochelys coriacea*) per section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) The Service received your 14 May 2007 request for formal consultation from the Federal Highway Administration (Administration) on 17 May 2007.

This biological opinion is based on information provided in the SR A1A Biological Assessment (May 2007); 9 November 2007 and 28 April 2008 correspondences from Paulette Fiske of CH2M HILL; Dr. Robbin Trindell of the Florida Fish and Wildlife Conservation Commission (Commission); Tony McNeal of the Florida Department of Environmental Protection (State); Bob Gleason, Stephen Tonjes, and Richard Fowler of the Florida Department of Transportation (Department); Andrew Phillips of the U.S. Army Corps of Engineers (Corps); field investigations; and other sources of information. A complete administrative record of this consultation is on file at the Service's St. Petersburg Satellite Office.

Consultation History

This roadway facility, in the immediate vicinity of the City of Flagler Beach, has historically experienced and is currently experiencing severe erosion from natural causes. The consultation area has experienced extensive shoreline hardening actions (i.e. sand and

rock placement) dating back to Hurricane Dora in 1964. The initial granite rock placement between South 7th Street to South 19th Street was permitted by the Florida Department of Natural Resources in December 1981 (FL-14) and April 1985 (FL-44).

On 9 April 2003, the Commission determined the existing road stabilization structures are resulting in "take" of sea turtles through the interference with essential breeding behaviors pursuant to Florida Statute 370.12(1)(f).

On 20 December 2005, the Department, in accordance with F.S. Sections 287.055(3)(a) and 337.11(6), signed a Declaration of Emergency to construct a steel sheeting seawall with a concrete cap to protect and stabilize a portion of the northbound SR A1A travel lane roadway embankment. The roadway had been compromised by severe coastal erosion to such an extent that the health, safety, and welfare of the traveling public was in jeopardy. A detour allowing traffic to continue along SR A1A was established between South 16th Street and South 12th Street diverting traffic to Central Avenue. As a result of this facility failure, a 140-foot seawall was constructed in January 2006 between South 13th Street and South 12th Street (Corps No. SAJ-2005-11010-AWP).

Since that time, the Department's maintenance records indicate emergency and temporary repairs in most years averaging several occurrences per year. It should be noted that any unauthorized activities where the Service did not consult will not be covered in this biological opinion. In 2007 alone, the Department performed 15 emergency or temporary repairs to the facility within the consultation area.

On 14 May 2007, the Service received correspondence from the Administration requesting formal consultation to address scour from the wave action and the erosion of the roadway embankment resulting from stormwater runoff.

On 15 June 2007, the Service requested additional information in a letter to your office.

On 9 November 2007, correspondence was received from representatives of the Department providing additional information not addressed in the SR A1A Biological Assessment.

On 28 January 2008, additional updated information for clarification of high erosion areas was requested.

On 29 April 2008, the additional information requested was received.

On 30 April 2008, correspondence was sent to your office stating all the necessary information was adequate to begin formal consultation.

On 5 September 2008, the Service provided a draft biological opinion at the request of the Department.

On 10 September 2008, the Department requested a 90-day extension to allow their staff adequate time to review the terms and conditions in the draft biological opinion. The Department indicated they would arrange a meeting within the next 30 days to discuss specific recommendations on the terms and conditions with the Service. The Service granted the 90-day extension on this date.

On 2 December 2008, the Service notified the Department the granted 90-day extension would terminate on 11 December 2008 and the anticipated meeting was never scheduled.

On 22 December 2008, the Service met with the Department to explain the biological opinion and discuss the terms and conditions. No resolution occurred with the Department's revised terms and conditions during this meeting. At this point, the Service stated that it would conduct internal discussions on possible revisions to the terms and conditions and update the document to include the 2008 turtle nesting data. The Service stated that consultation would resume after the 2008 nesting data were verified in March of 2009 and incorporated into the biological opinion.

On 26 May 2009, the Service contacted the Department to discuss the unresolved terms and conditions. General agreement was reached. The Department requested a second draft to discuss the revised language internally. In addition, the Department was forwarded an email correspondence regarding a feasibility study the Corps is currently conducting for the area. The assessment will include current conditions, causes of erosion, alternatives for shoreline protection, modeling of the infrastructure, and modeling of waves and storms. The goal of the effort is to determine changes in the infrastructure and predict future outcomes if present conditions remain.

On 6 June 2009, the Service provided a revised draft biological opinion to the Department for their review.

On 30 June 2009, the Service and the Department discussed the latest revisions to the biological opinion. Resolution of all the reasonable and prudent measures and implementing terms and conditions were agreed upon.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The study limits extend from approximately 200 feet south of South 28th Street to 980 feet south of Osprey Point Drive, a distance of 5.2 miles. The study area is defined roughly as a 100-foot wide corridor waterward of the eastern edge of pavement of SR A1A roadway, consisting of the edge of roadway, narrow dune, foredune, and beach. The project is oriented from south to north adjacent to the Atlantic Ocean. The facility is within the City of Flagler Beach and continues into the City of Beverly Beach. The proposed project is located in Sections 35 and 36; Township 11 South; Range 31 East; Sections 1 and 12;

Township 12 South; Range 31 East; and Sections 7, 18 and 19; Township 12 South; Range 32 East in Flagler County, Florida.

The Department, in consultation with the Administration, proposes to study and evaluate erosion control systems to stabilize and protect SR A1A from wind and coastal forces, in order to maintain public access and safety while minimizing potential environmental impacts. The proposal requested incidental take for the entire 5.2 miles of the study area. The Department initially identified five areas totaling approximately 1,000 linear feet of shoreline for which erosion is recurring or has recently become problematic. Based on more recent field assessments requested by the Service, eleven areas totaling 4,950-feet of shoreline have been identified. The areas of concern and approximate linear feet are in the following vicinities: South 25th Street (1315 ft.), 2224 South A1A (100 ft.), South 21st Street (300 ft.), South 19th Street (1200 ft.), South 18th Street (100 ft.), South 16th Street (240 ft.), South 14th Street (560 ft.), North 20th Street (370 ft.), 2084 North A1A (385 ft.), North 23rd Street (200 ft.), and 2468 North A1A (180 ft.). These areas, as well as other areas within the proposed study limits, may be considered for future seawall construction should current maintenance efforts be unsuccessful or cost prohibitive.

Depending on the site-specific conditions during or after a severe storm event, one of three erosion control actions may be considered by the Department to stabilize the impacted areas. These proposed measures may be classified as long-term solutions, temporary actions, or emergency repairs:

- Buried Seawall with Sand (long-term solution) - A sheetpile wall with a concrete cap would be buried below the level of the dune crest. The top of the structure would have a suitable substrate conducive for native dune vegetation to proliferate. Sand would be placed in front of the armoring structure,
- Granite Rocks with Sand - Temporary or emergency maintenance of the shoreline through periodic replacement or placement of granite rocks, sand, and native dune vegetation, or
- Coquina Rocks with Sand - Temporary or emergency maintenance of the shoreline through periodic replacement or placement of coquina rocks, sand, and native dune vegetation.

In addition to the armoring of the dune face, stormwater runoff was identified as a recurring issue in 2007 affecting the dune crest and beach along the study corridor. Emergency consultation with the Corps, Department, and Service during the 2007 sea turtle nesting season was in response to erosion caused by stormwater runoff from the roadway. The Department fortifies the dune crests or roadway berms with compatible sand from an off-site source throughout the year, which has ultimately been transported by the roadway runoff and deposited onto the beach. The Service requested the Department address this situation as part of the proposed action. The Department proposed soft armoring with matting to control erosion in areas where roadway runoff threatens to undermine or has undermined the dune crest. Soft armoring is the process by which soft pliable biodegradable matting made of strong coarse fibers such as jute, coir, hemp or burlap is

placed onto the affected surface. The matting is covered with soil or sand compatible with the site material present to create an erosion resistant surface that will support native vegetation. Redirecting or containing the runoff away from the dune is also an option the Department will continue to evaluate.

The Department also proposes to convert the street lights and traffic lights under their jurisdiction within the project area to be in accordance with the Coastal Roadway Lighting Manual, Flagler County's Sea Turtle Lighting Ordinance, and to coordinate with the appropriate jurisdictions to convert other nonconforming lights.

"Take" of sea turtles is expected as a result of interactions sea turtles will have with the construction of emergency armoring structures and the modification or replacement of these temporary armoring structures with permanent armoring structures. The State recognizes the need to protect public infrastructure from damage or destruction caused by coastal erosion (Section 161 Florida Statute and Chapter 62B-33 Florida Administrative Code). In addition, the Corps has determined that it has jurisdiction pursuant to Section 404 of the Clean Water Act (33 U.S.C. §1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) when emergency armoring is being proposed for construction below the high tide line.

The Service has described the action area to include the Department's entire right-of-way (existing roadway, roadway shoulders), dune crest, beach, and nearshore for reasons that will be explained and discussed in the "Effects of the Action" section of this consultation. The affected area, which extends beyond the Department's jurisdiction, may require the involvement of other stakeholders: local municipalities, Flagler County, City of Flagler Beach, State of Florida, Corps, and National Marine Fisheries Service (NMFS). Areas within the action area, but not within the Department's right-of-way should be part of a multi-governmental approach for long-term beach erosion solutions.

STATUS OF SPECIES/CRITICAL HABITAT

Species/critical habitat description

Loggerhead Sea Turtle

The loggerhead sea turtle was listed as a threatened species on 28 July 1978 (43 FR 32800). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The species is widely distributed within its range. It may be found hundreds of miles out to sea, as well as inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Nesting occurs mainly on open beaches or along narrow bays having suitable sand, and often in association with other species of sea turtles.

Within the continental U.S., loggerheads nest from Texas to Virginia with major nesting concentrations found in South Florida. Additional nesting concentrations occur on coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (NMFS and Service 1991b). Within the western Atlantic, loggerheads also nest in Mexico and the Caribbean.

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

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed as a protected species on 28 July 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam.

Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991a). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Franklin County in northwest Florida and from Pinellas County through Collier County in southwest Florida (Commission Statewide Nesting Beach Survey [SNBS] program database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources statewide nesting database). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database; South Carolina Department of Natural Resources statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge nesting reports).

Green sea turtles are generally found in fairly shallow waters, except when migrating, inside reefs, bays, and inlets. The green turtle is attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the

bottom (NMFS 2002b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle listed as an endangered species on 2 June 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Leatherbacks have the widest distribution of sea turtles nesting on beaches in the tropics and sub-tropics with foraging excursions into higher-latitude sub-polar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (NMFS and Service 1992; National Research Council 1990a).

The leatherback regularly nests in the continental U.S., Puerto Rico, U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NMFS and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (North Carolina Wildlife Resources Commission; South Carolina Department of Natural Resources; and Georgia Department of Natural Resources statewide nesting databases). With the exception of a few isolated nests along the Gulf coast of Florida (Franklin and Gulf Counties); a single nest in Sarasota County; and a false crawl observed on Sanibel Island, leatherbacks nest almost exclusively on the east coast of Florida (Commission SNBS). In fact, about 50 percent of leatherback nesting occurs in Palm Beach County.

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

Adult females require sandy-nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

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

Life history

Loggerhead Sea Turtle

Loggerheads have a complex life history that 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 (200 meters). 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 (200 meters).

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet (200 meters).

The generalized life history of Atlantic loggerheads is shown in Figure 1 (from Bolten 2003). 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).

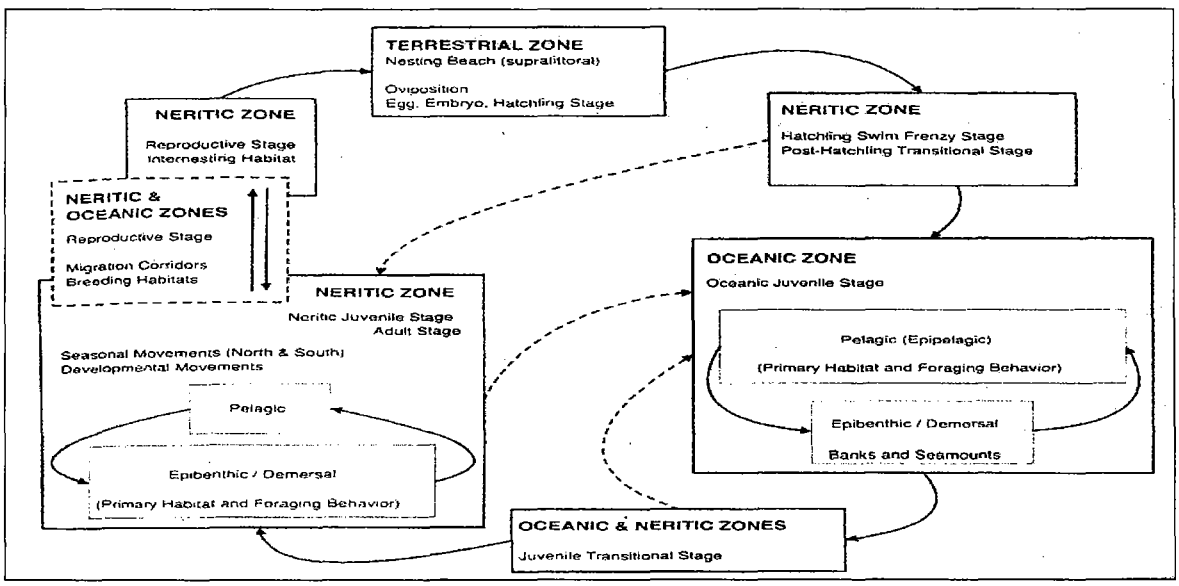

Figure 1. Generalized life history of North Atlantic loggerhead sea turtles (from Bolten 2003).

The numbers of nests and nesting females are often highly variable from year to year due to a variety of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, 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.

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)	29.0°C[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70%[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 (<87 cm CCL) sex ratio	65-70% 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 Blair Witherington, Commission, personal communication, 2006 (information based on nests monitored throughout Florida beaches in 2005, n=865).
4 NMFS (2001); Allen Foley, Commission, personal communication, 2005.
5 Mrosovsky (1988).
6 Blair Witherington, Commission, personal communication, 2006 (information based on nests monitored throughout Florida beaches in 2005, n=1,680).

[7] Murphy and Hopkins (1984); Frazer and Richardson (1985); Ehrhart, unpublished data; Hawkes *et al.* 2005; Scott 2006; Tony Tucker, Mote Marine Laboratory, personal communication, 2008.
[8] Caldwell (1962), Dodd (1988).
[9] Richardson *et al.* (1978); Bjorndal *et al.* (1983); Ehrhart, unpublished data.
[10] Melissa Snover, NMFS, personal communication, 2005.
[11] Dahlen *et al.* (2000).

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

Sea turtle eggs require a high-humidity substrate that allows for sufficient gas exchange for development (Miller 1997, Miller *et al.* 2003). Loggerhead nests incubate for variable periods of time. The length of the incubation period (commonly measured from the time of egg deposition to hatchling emergence) is inversely related to nest temperature, such that between 26°C and 32°C, a change of 1°C adds or subtracts approximately 5 days (Mrosovsky 1980).

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. The pivotal temperature (i.e., the incubation temperature that produces equal numbers of males and females) in loggerheads is approximately 29°C (Limpus *et al.* 1983, Mrosovsky 1988, Marcovaldi *et al.* 1997). However, clutches with the same average temperature may have different sex ratios depending on the fluctuation of temperature during incubation (Georges *et al.* 1994). Moisture conditions in the nest similarly influence incubation period, hatching success, and hatchling size (McGehee 1990, Carthy *et al.* 2003).

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).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two, three, four or more years intervene between breeding seasons (NMFS and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997). Green turtle nesting in Florida typically commences in late May and terminates in September; incubation for the hatchlings is between 45 to 75 days (Meylan 2006).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, and U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996). Florida leatherback turtle nesting usually initiates in March and concludes in June; hatchling emergence ranges from 55 days to 75 days (Meylan 2006).

Population dynamics

Loggerhead Sea Turtle

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 47,000 and 90,000 nests per year over the last decade (Commission, unpublished data; GDNR, unpublished data; SCDNR, unpublished data; NCWRC, unpublished data). 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 and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (E. Possardt, Service, personal communication 2005).

Green Sea Turtle

About 150 to 3,000 females are estimated to nest on beaches in the continental U.S. annually (Commission 2005). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998a). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

The most recent population size estimate for the North Atlantic alone is in a range of 34,000-94,000 adult leatherbacks (Turtle Expert Working Group 2007). Since 1989, a significant increase in the number of leatherback nests has been documented in Florida. The reasons for this increase are not known, but the trend is welcome because many of other leatherback nesting aggregations are in serious decline.

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between approximately 5,029 and 63,294 nests between 1967 and 2005 (Turtle Expert Working Group 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the

Caribbean Central American coast takes place between the Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero the number of nests laid annually between 1995 and 2006 was estimated to range from 199-1,623; modeling of these data indicated that the nesting population has decreased by 67.8 percent over this time period.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico with a minimum of 9 nests recorded in 1978 and a minimum of 469-882 nests recorded each year between 2000 and 2005. Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001. In the British Virgin Islands, annual nest numbers have increased in Tortola from 0-6 nests per year in the late 1980s to 35-65 nests per year in the 2000s.

Status and distribution

Loggerhead Sea turtle

Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatan Peninsula in Mexico (Sternberg 1981, Ehrhart 1989, Ehrhart *et al.* 2003, NMFS and Service 2008). Five recovery units (subpopulations) have been identified based on genetic differences and a combination of geographic distribution of nesting densities and geographic separation. These recovery units are: Northern Recovery Unit, Peninsular Florida Recovery Unit, Northern Gulf of Mexico Recovery Unit, Greater Caribbean Recovery Unit (including Quintana Roo, Mexico) and Dry Tortugas Recovery Unit (NMFS and Service 2008).

The Northern Recovery Unit (NRU) is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources, unpublished data; North Carolina Wildlife Resources Commission, unpublished data; South Carolina Department of Natural Resources, unpublished data), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually. Nest totals from aerial surveys conducted by South Carolina Department of Natural Resources showed a 1.9% annual decline in nesting in South Carolina since 1980. Overall, there is a strong statistical data to suggest the NRU has experienced a long-term decline.

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (Commission, unpublished data). 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 Index Nesting Beach Survey (INBS) sites surveyed with constant effort over time. An analysis of these data has shown a decline in nesting from 1989-2008 (Witherington *et al.* 2009). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 301 km) and 23 representative zones on Florida's southern Gulf coast (total length = 23 km). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70% of statewide loggerhead nesting activity between 1989 and 2008. Negative binomial regression models that fit restricted cubic spline curves to aggregated nest-counts were used in trend evaluations. Results of the analysis indicated that there had been a decrease of 26% over the 20-year period and a 41% decline since 1998. The mean annual rate of decline for the 20-year period was 1.6%.

The Northern Gulf of Mexico Recovery Unit (NGMRU) is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 300 km 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) (Commission, unpublished data). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (Commission, unpublished data). A log-linear regression showed a significant declining trend of 4.7% annually.

The Dry Tortugas Recovery Unit (DTRU), located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (9 years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (Commission, unpublished data). Surveys after 2004 did not include principal nesting beaches within the recovery unit (i.e., Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program but are part of the Statewide Nesting Beach Survey (SNBS) program. There are 9 years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend.

The Greater Caribbean Recovery Unit (GCRU) is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analysis 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, Yucatan, Mexico, where an increasing trend was reported over a 15-

year period from 1987-2001 (Zurita *et al.* 2003). However, nesting since 2001 has declined and the previously reported increasing trend appears not to have been sustained (Julio Zurita, personal communication, 2006). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria

Demographic Recovery Criteria:

1. Number of Nests and Number of Nesting Females

a. Northern Recovery Unit

(1) There is statistical confidence (95%) that the annual rate of increase over a generation time of 50 years is 2% or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is NC=14% [2,000], SC=66% [9,200], and GA=20% [2,800]).
(2) 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

(1) There is statistical confidence (95%) that the annual rate of increase over a generation time of 50 years is statistically detectable (1%) resulting in a total annual number of nests of 106,100 or greater for this recovery unit.
(2) 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

(1) There is statistical confidence (95%) that the annual rate of increase over a generation time of 50 years is 3% or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit.
(2) 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
(1) There is statistical confidence (95%) that the annual rate of increase over a generation time of 50 years is 3% 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 FL= 92% [3,700] and AL=8% [300]).

(2) 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

(1) 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, The Bahamas) has increased over a generation time of 50 years.

(2) 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, distributed across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95%) 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.

Listing Factor Recovery Criteria:

1. Present or Threatened Destruction, Modification, or Curtailment of a Species Habitat or Range

a. Terrestrial

(1) Beach armoring, shoreline stabilization structures, and all other barriers to nesting are categorized and inventoried for areas under U.S. jurisdiction. A peer-reviewed strategy is developed and implemented to ensure that the percentage of nesting beach free of barriers to nesting is stable or increasing relative to baseline levels.

(2) Beach sand placement projects conducted in areas under U.S. jurisdiction are in compliance with state and FWS criteria and are conducted in a manner that accommodates loggerhead needs and does not degrade or eliminate nesting habitat.

(3) At least 1,581 km of loggerhead nesting beaches and adjacent uplands (current amount as identified in Appendix 4) under U.S. jurisdiction are maintained within conservation lands in public (Federal, state, or local) or private (NGO and private conservation lands) ownership that are managed in a manner compatible with sea turtle nesting.

(4) A peer-reviewed model is developed that describes the effects of sea level rise on loggerhead nesting beaches, and steps have been taken to mitigate such effects.
(5) Nesting beaches outside U.S. jurisdiction are managed for compatibility with loggerhead nesting.

b. Marine (estuarine, neritic, and oceanic)

A peer-reviewed, comprehensive strategy is developed and implemented to identify, prioritize, and protect marine habitats (e.g., feeding, migratory, inter-nesting) important to loggerheads.

2. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

a. Legal harvest (both commercial and subsistence) in the Caribbean, Atlantic, and Mediterranean is identified and quantified. A strategy is developed and implemented to eliminate legal harvest through international agreements.

b. A scientifically based nest management plan outlining strategies for protecting nests (under U.S. jurisdiction) from natural and manmade impacts is developed and implemented.

3. Disease or Predation

a. Ecologically sound predator control programs are implemented to ensure that the annual rate of mammalian predation on nests (under U.S. jurisdiction) is 10% or below within each recovery unit based on standardized surveys.

b. A peer-reviewed strategy is developed to recognize, respond to, and investigate mass/unusual mortality or disease events.

4. Inadequacy of Existing Regulatory Mechanisms

a. Light management plans, which meet minimum standards identified in the Florida Model Lighting Ordinance (Florida Administrative Code Rule 62B-55), are developed, fully implemented, and effectively enforced on nesting beaches under U.S. jurisdiction. Annual percentage of total nests with hatchlings disoriented or misoriented by artificial lighting does not exceed 10% based on standardized surveys.

b. Specific and comprehensive Federal legislation is developed, promulgated, implemented, and enforced to ensure long-term (including post-delisting) protection of loggerheads and their terrestrial and marine habitats, including protection from fishery interactions.

c. State and local legislation is developed and/or maintained, promulgated, implemented, and enforced to ensure long-term (including post-delisting) protection of loggerheads and their terrestrial and marine habitats, including protection from fishery interactions.

d. Foreign nations with significant loggerhead foraging or migratory habitat have implemented national legislation and have acceded to international and multi-lateral agreements to ensure long-term protection of loggerheads and their habitats. Nations that have important foraging or migratory habitat include Canada, Mexico, Cuba, The Bahamas, Turks and Caicos Islands, Nicaragua, Panama, Colombia, Spain, Portugal, Morocco, and Cape Verde Islands.

e. Nations that conduct activities affecting loggerheads in foraging or migratory habitats in the North Atlantic Basin and the western Mediterranean have implemented national legislation and have acceded to international and multi-lateral agreements to ensure long-term protection of loggerheads and their habitats throughout the high seas and in foreign EEZs.

5. Other Natural or Manmade Factors Affecting Its Continued Existence

a. A peer-reviewed strategy is developed and fully implemented to minimize fishery interactions and mortality for each domestic commercial fishing gear type that has loggerhead bycatch.

b. A peer-reviewed strategy is developed and fully implemented in cooperation with relevant nations to minimize fishery interactions and mortality of loggerheads in foreign EEZs and on the high seas.

c. A peer-reviewed strategy is developed and fully implemented to quantify, monitor, and minimize effects of trophic changes on loggerheads (e.g., diet, growth rate, fecundity) from fishery harvests and habitat alterations.

d. A peer-reviewed strategy is developed and fully implemented to quantify, monitor, and minimize the effects of marine debris ingestion and entanglement in U.S. territorial waters, the U.S. EEZ, foreign EEZs, and the high seas.

e. A peer-reviewed strategy is developed and fully implemented to minimize vessel strike mortality in U.S. territorial waters and the U.S. EEZ.

The current "Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*)" was completed in 2008, and the "Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*)" was completed in 1998. The recovery criteria contained in the U.S. Pacific plan, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NMFS), are a viable measure of the species status.

Green Sea Turtle

Nesting data collected as part of the SNBS program (2000-2006) with the purpose of documenting total distribution, seasonality, and abundance of sea turtle nesting, show that a mean of approximately 5,600 nests are laid each year in Florida. Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. The green turtle nesting population of Florida is increasing based on 20 years (1989-2008) of INBS program data from throughout the state. Fewer nests were recorded in 2008 than in 2007, but this did not change the long-term increasing trend. In 2007, the number of green turtle nests on index beaches was the highest since the trend-monitoring program began in 1989.

The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida Statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the ESA in 1973, affording complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in state waters; (4) the likelihood that the majority of Florida adult green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of CITES, which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting when, over a period of 25 years the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data shall be based on standardized surveys.

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) are in public ownership and encompass at least 50 percent of the nesting activity.

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The current "Recovery Plan for the U.S. Population of Atlantic Green Turtle (*Chelonia mydas*)" was completed in 1991, the "Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*)" was completed in 1998, and the "Recovery Plan for U.S.

Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*)" was completed in 1998. The recovery criteria contained in the plans, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NMFS), are a viable measure of the species status.

Leatherback Sea Turtle

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

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program has documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (Commission SNBS; Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2008). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (Commission INBS; Turtle Expert Working Group 2007). Similar to the green sea turtles, fewer nests were recorded in 2008 than in 2007, but this did not change the long-term increasing trend. In 2007, the number of leatherback turtle nests on index beaches was the highest since the trend-monitoring program began in 1989.

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting when the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Island, and along the east coast of Florida.

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The current "Recovery Plan for the Leatherback Turtles (*Dermochelys coriacea*)" in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 and the "Recovery Plan for U.S. Pacific Populations of Leatherback Turtle (*Dermochelys coriacea*)" was signed in 1998. The recovery criteria contained in the plans, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NMFS), are a viable measure of the species status.

Common Threats to sea Turtles in Florida

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

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging, offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching and fishery interactions.

Disease

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Climate Change

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 2007). The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread 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 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).

Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007a, b). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise.

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases concerning 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.

Coastal Development

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

Hurricanes

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

Because of the limited remaining nesting habitat, 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 pre-development 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 re-established 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 major loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Erosion Control Funding Assistance Program. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of the shoreline where natural processes or human activity have caused or

contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects. It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources. The total of critically eroded beaches statewide in Florida for 2007 is 388 miles of the 497 miles of shoreline. Seventy-eight (78) percent of the State's shoreline is considered to be critically eroded.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976; Mann 1977). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). Table 2 summarizes the number of documented disorientations over the last 8 years. Light sources contributing to these events may be obtained from:
(http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm).

Table 2. Documented disorientations along the Florida coast.

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1,192	49,623	62

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* spp.) (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons my 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). As nesting habitat dwindles, it is essential that nest production be naturally maximized so the turtles may continue to exist in the wild. In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, in particular on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by: interrupting a female turtle approaching the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over hatchlings attempting to reach the ocean; and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, 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 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 re-establish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida's beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Analysis of the species/critical habitat likely to be affected

The loggerhead sea turtle, green sea turtle, and leatherback sea turtle are currently listed because of their low and declining population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings within the proposed area. The proposed action may occur throughout the calendar year (emergency repairs). However, temporary actions and long-term solutions will be constructed outside the peak sea turtle nesting season (May 1 through October 31). Regardless of the construction time, the action will adversely affect the aforementioned nesting female sea turtles, their nests, and hatchlings within the proposed project area.

Potential effects include behavior modification of nesting females due to the presence of armoring structures resulting in false crawls, displacement of nesting turtles into nesting habitat that is sub-optimal, an increase in the physiological cost of nesting, a possible decrease in nesting activity, entrapment or mortality of nesting turtles and hatchlings, and washout or inundation of eggs laid seaward of armoring structures.

Critical habitat has not been designated in the continental U.S.; therefore, the proposed action will not result in the destruction or adverse modification of critical habitat.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Loggerhead Sea Turtle

Reported loggerhead sea turtle nesting activity for Flagler County beaches from 1993 through 2008 has occurred as early as April 22 and as late as September 14 (Commission, Fish and Wildlife Research Institute [FWRI] 2009). Incubation ranges from about 45 days to 90 days, depending on incubation temperatures, but averages 55 days to 60 days for most clutches in Florida. Table 3 illustrates the loggerhead sea turtle nesting activity (false crawls, nests) in the action area over the last 10 nesting seasons.

Table 3. Loggerhead sea turtle nesting activity at Flagler Beach.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
False	12	46	32	110	29	45	58	87	61	111
Nests	45	61	48	76	112	79	62	62	58	90

Green Sea Turtle

Reported green turtle nesting activity for Flagler County beaches from 1993 through 2008 has occurred as early as May 25 and as late as September 30 (FWRI 2009). Incubation ranges from about 45 to 75 days, depending on incubation temperatures. Table 4 illustrates the green sea turtle nesting activity (false crawls, nests) in the action area over the last 10 nesting seasons.

Table 4. Green sea turtle nesting activity at Flagler Beach.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
False	0	5	0	7	2	0	4	1	25	4
Nests	0	4	0	8	0	0	8	2	14	1

Leatherback Sea Turtle

Reported leatherback nesting activity for Flagler County beaches from 1993 through 2008 has occurred as early as April 13 and as late as July 17 (FWRI 2009). Typically incubation takes from 55 to 75 days. Table 5 illustrates the leatherback sea turtle nesting activity (false crawls, nests) in the action area over the last 10 nesting seasons.

Table 5. Leatherback sea turtle nesting activity at Flagler Beach.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
False	0	2	0	0	0	0	0	0	0	0
Nests	0	1	0	0	1	0	3	0	0	0

Factors affecting species environment within the action area

The SR A1A study corridor is immediately adjacent to the Atlantic Ocean for this consultation. The average loss of shoreline, as noted in the SR A1A Biological Assessment, is approximately 1 foot per year. As a result, the mean high water line in some areas is within 50 feet of the roadway, which is in a zone marked by the Coastal Construction Control Line where construction is prohibited. As a result of this trend, previous armoring

has occurred throughout the study corridor. The first revetment on Flagler Beach was permitted in December 1981. The Department continues to repair the original shoreline hardening areas as well as additional areas within the action area.

Existing Coastal Armoring

Currently, granite and coquina rocks occur on the dune face (foredune) from just south of 23rd Street South to 7th Street South, an approximate distance of 1.90 miles. Within this section, between 13th Street South and 12th Street South, a sheet pile seawall with a concrete cap was constructed in January of 2006 totaling 140 linear feet (0.02 miles). Coquina rocks also are present between 7th Street North and 10th Street North (0.22 miles). In the vicinity of 21 Street North and 22nd Street North, coquina rocks occupy approximately 100 linear feet and 50 linear feet (0.02 miles) respectively. The total coverage along the 5.2 mile shoreline dune face within the consultation area is roughly 2.16 miles.

An after-the-fact permit request, in response to erosion caused by storms during the fall of 1999, resulted in the construction a new rock revetment and placement of additional rocks on the existing revetment between 19th Street South and 6th Street South. In the first full year of sea turtle monitoring in the immediate area after construction (2000), a total of 47 loggerhead turtle emergences were documented. Only 12 nests were deposited; sea turtles returned to the water after coming in contact with the rocks resulting in 32 false crawls. The rock revetment interfered with 68 percent of the loggerhead emergences onto the beach in this area. Additionally, three green sea turtles also emerged onto the beach during this monitoring. All three turtles returned to the water without nesting. At least one turtle had direct contact with the rock revetment.

The number of loggerhead turtle nests in front of the revetment in 2000, as compared to the number of emergences, was significantly lower than in other parts of Flagler Beach. The nesting success rate in front of the revetment was only 25 percent, compared to a nesting success rate of 65 percent for other Flagler Beach areas that year. Typically, nesting success rate lower than 50 percent indicate some type of interference with the ability for sea turtles to nest.

Studies outside the consultation area have documented identical trends. In a study, *The Impact of Coastal Armoring Structures on Sea Turtle Nesting Behavior* (Mosier 1998); seawalls were shown to have had detrimental effects on sea turtle nesting. Fewer turtles emerged onto beaches in front of seawalls than onto adjacent, non-walled beaches, and of those that did emerge in front of seawalls, more returned to the water without nesting. In this study, of the crawls recorded in front of the seawalls, 71 percent of them indicated that the turtles had come in contact with the walls. Of those turtles that contacted a wall, 86 percent returned to the water without nesting. Another Florida coastal armoring study compared the effects of different types of armoring structures (Mosier and Witherington 2002). The findings were similar with fewer successful nesting emergences in front of the various armoring structures than the non-walled "natural" areas. Sea turtles on armored

sections of beach tended to wander greater distances than those that emerged on adjacent non-armored beaches.

Armoring can eliminate a sea turtle's access to upper regions of the beach/dune system. Consequently, nests on armored beaches are generally found at lower elevations than those on non-armored beaches. Nests at lower elevations are subject to a greater risk of tidal inundation and can potentially alter thermal regimes, an important factor in determining the sex ratio of hatchlings (Mrosovsky and Provancha 1989, Ackerman 1997, Delpech and Foote 1998). Nests laid seaward of armoring structures are also vulnerable to washout. Thus, beaches in front of existing armoring structures represent sub-optimal nesting habitat and incubation environments for sea turtles.

Stormwater Runoff from the Roadway

The existing SR A1A roadway has no stormwater facilities (swales, ditches, collection ponds) incorporated into the design. Thus, no treatment or attenuation from rainfall events occur as the water exits the roadway surface. On the west side of the facility, the stormwater runoff flows onto adjacent properties. The stormwater runoff along the east side of the roadway collects between the edge of pavement and the existing dune crest (berm). The stormwater accumulates and if the water can not infiltrate fast enough, it ultimately ponds along the edge of the travel lane shoulders. As the water stages up, the force of the water washes out the berm and flows directly onto the beach. The Department has indicated that washouts occur more easily if the dune has been compromised by foot traffic. Depending on the severity of the rain event, the stormwater erodes the dune crest and dune face often transporting large amounts of sand onto the beach. The delta like deposition can result in additional material on top of turtle nests altering the depth of the eggs or emerging hatchlings. As the erosion continues, large trenches are formed that can wash out nests from the large volumes of water coming off the impervious surface.

In 2007, the Department's maintenance records indicate 15 emergency/temporary repairs to the roadside berms where additional sand was placed on the dune crest because of the scour caused by the roadway runoff. The Service consulted with the Corps to authorize emergency repairs to stabilize the roadway shoulder and berm for 5 of these events. Maintenance records provided to the Service for this consultation only included 2005 through 2008. During this period, 26 repair events occurred.

Lighting

Flagler County's Sea Turtle Lighting Ordinance (Appendix C, Article VI, 6.05.55) mandates that, "No light source from any part of your property shall be visible to a person standing on any part of the beach. No light from any part of your property shall illuminate any part of the beach, directly or indirectly. To achieve compliance, lights must be shielded, redirected, replaced, or extinguished. For interior lighting, close blinds/shades." The City of Flagler Beach (Appendix A: Article IV Sec. 4.04.01. Protection of Sea Turtles)

has adopted similar regulations as a matter of local policy with the intent to be consistent with, and in furtherance of, the provisions of the Act to prevent harm to sea turtles.

A night field reconnaissance of the lighting along SR A1A was conducted in August 2007. The street lights along SR A1A are the property of The City of Flagler Beach, The Florida Power and Light Company, and the Department. The City of Flagler Beach has a contract to maintain the public street lights for the Department. Results of the night survey revealed that the street lighting along SR A1A consists mainly of arm mounted, flat-face cobra fixtures with metal halide 50 watt bulbs. Rounded-bulb fixtures were present at 17th Street North, 16th Street North, 14th Street South, and 8th Street South.

Businesses along the corridor may have more of an impact on the disorientation of hatchlings than the street lights. Also, lights on businesses with two or more stories were visible from the beach. A1A Liquor Store and Flagler Motel (18th Street South to 19th Street South), Fisherman's Net Seafood (5th Street South), and in the vicinity of 2nd Street North to 7th Street North were noted in the survey with lights visible from the beach.

The SR A1A Biological Assessment noted the 2006 Sea Turtle Survey recorded two nests where disorientation of the hatchlings occurred; lighting was assumed to be the cause. These nests were at 580 South A1A and 2544 South A1A (FB 13801, FB 5719). Information provided by the Commission identified two disorientation events for the 2007 nesting season. The 15 September 2007 incident location was at 590 South A1A across from Mother's Bar. The second incident occurred at the same location on 16 September 2007.

Random Events

Tropical storms or interactions between low and high-pressure systems during late summer and fall on the east coast of the U.S. create conditions which often result in beach erosion and the subsequent loss of sea turtle nests. Nests may be washed out or inundated long enough to result in egg mortality. Due to nesting chronology, most of the nests lost to storm events will be loggerhead and green sea turtle nests. Leatherback sea turtles typically nest earlier in the season and most, if not all, nests have hatched prior to the initiation of the tropical storm season.

Climate Change

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

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species and critical habitat and its interrelated and interdependent activities. The action area is defined as the Department's entire right-of-way, adjacent beach, and nearshore area of the Atlantic Ocean. Areas named within the Action Area but outside the Department's right-of-way are recognized as non-jurisdictional for the Department, and should be part of a multi-governmental approach for long-term beach erosion solution. This determination was based on the influencing factors considered, analyses for effects of the action, and the species response to the proposed action that affects sea turtles.

Beneficial Effects

These effects are those that are wholly positive, without any adverse effects, on listed species or designated critical habitat. The Service has not identified any beneficial effects to sea turtles as a result of shoreline armoring construction.

Direct Effects

Direct effects of coastal armoring may result from the construction activities during the nesting season, the deposition of the materials (rocks, sand) onto the beach utilized during the shoreline hardening, and the presence of sheet piles from the seawall placement adjacent to the beach. This would include loss of nesting habitat and increased disruption of the nesting activities.

Construction of the armoring structures (seawalls, granite rocks, and coquina rocks) are expected to directly affect all areas where armoring of the shoreline occurs. Additionally, materials used for the armoring construction may become dislodged or transported from their original placement to the nesting habitat. Granite rocks, coquina rocks, and sand placed on the dune face and dune crest have continued to become dislodged from the revetment by means of wave action or stormwater transport from the roadway surface on to the beach. Depending on the timing (during the nesting season), maintenance frequency (how often maintenance is scheduled), or the duration (amount of time) the material is on the beach, take of sea turtles or their nests may occur. The maintenance activities associated with the removal of the material from the nesting area during the nesting season may also result in take of the species if equipment is required to be on the beach.

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, and/or tides) or misidentified as false crawls during daily patrols. 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). Along with the potential for missing nests

during a nest relocation program, there is a potential for eggs to be damaged by their movement, 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).

Comparisons of hatching success between relocated and *in situ* nests have noted significant variation ranging from a 21 percent decrease to a 9 percent increase for relocated nests (FWC statewide sea turtle nesting data). Comparisons of emergence success between relocated and *in situ* nests have also noted significant variation ranging from a 23 percent decrease to a 5 percent increase for relocated nests (SNBS). A 1994 State study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida found that hatching success was lower for relocated nests in five of seven cases with an average decrease for all seven sites of 5 percent (range = 7.2 percent increase to 16.3 percent decrease). Emergence success was lower for relocated nests in all seven cases by an average of 11.7 percent (range = 3.6 to 23.36 percent) (Meylan 1995). In addition, nest relocation often results in the concentration of eggs within the relocation site, making them more susceptible to predation.

Indirect Effects

Many of the direct effects of coastal armoring may persist over time and become indirect impacts. These indirect effects include changes in the physical characteristics of the beach seaward and in the vicinity of armoring structures.

The Service anticipates that emergency repairs as well as the temporary actions authorized by the State and the Corps will subsequently remain in place with modifications to meet State requirements. Consequently, any adverse effects to sea turtles due to the presence of an armoring structure are expected to occur throughout the life of the structure.

Due to the extreme erosion events that are necessary to require construction of emergency armoring, it is likely that most structures will be placed within the tidal zone of the sea. In addition to the fact that an armoring structure creates a physical obstacle to nesting sea turtles, the interaction between an armoring structure and the hydrodynamics of tide and current often results in the alteration of the beach profile seaward and in the immediate vicinity of the structure (Pilkey and Wright 1988, Terchunian 1988, Tait and Griggs 1990,

Plant and Griggs 1992) including increased erosion seaward of structures, increased longshore currents that move sand away from the area, loss of interaction between the dune and ocean, and concentration of wave energy at the ends of an armoring structure (Schroeder and Mosier 1996). These changes or combination of changes can have various detrimental effects on sea turtles and their nesting habitat.

Coastal armoring can hinder nesting females from reaching suitable nesting sites and result in increased false crawls where female turtles return to the water without nesting (Mosier 1998). Threats to nesting sea turtles posed by armoring may include a reduction of nesting habitat, displacement of turtles into nesting habitat that is sub-optimal (e.g., a lower beach elevation where eggs would drown; Murphy 1985), an increase in the physiological cost of nesting, a possible decrease in nesting activity (Mosier 1998), and potentially even entrapment of nesting turtles. Schroeder and Mosier (1996) indicate that sea turtle nests seaward of armoring are more prone to mortality due to inundation or exacerbated erosion. Also as armoring structures age and subsequently fail and break apart, they spread debris on the beach, which may further impede access to suitable nesting sites and trap hatchlings and nesting turtles.

Placements of the armoring structures are expected to result in behavior modification of nesting females due to the presence of the armoring structure, resulting in false crawls and their return to the water without nesting; displacement of female turtles into nesting habitat that is sub-optimal; an increase in the physiological cost of nesting; a possible decrease in nesting activity; potential entrapment and mortality of nesting turtles and hatchlings; and destruction of nests from washout or inundation due to the effects of the armoring structure and shoreline processes.

CUMULATIVE EFFECTS

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

As the extent of armoring on beaches increases, the probability of a nesting turtle encountering an armoring structure or depositing a nest in sub-optimal habitat increases. Additionally, the displacement of nests from armored locations may increase the density of nests in a dwindling number of suitable nesting sites thereby increasing the potential for density-dependent nest mortality (turtles digging up existing nests).

CONCLUSION

The continued existence of rock revetment and seawall structures along the nesting area will continue to result in take of sea turtles until they are removed or the beach substantially accretes to the point of providing ample nesting area. The initial correspondence identified

five areas totaling approximately 1,000 linear feet of shoreline for which erosion is recurring or has recently become problematic. During the consultation, eleven areas totaling 4,950-feet of shoreline have been identified. The Department indicated that funding for the entire action area is not currently attainable.

The Service anticipates that no more than 3,000 linear feet of available sea turtle nesting habitat within action area will be taken over an 8-year period (by July 1, 2017) for shoreline hardening. The areas included are for the dune crest and dune face stabilization. This threshold will allow the Service to evaluate over time the effectiveness of the activities and the nesting trends along this shoreline.

After reviewing the following information; current status of the loggerhead sea turtle, green sea turtle, and leatherback sea turtle, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the erosion control systems to stabilize and protect SR A1A, as proposed, are not likely to jeopardize the continued existence of the loggerhead sea turtle, green sea turtle, and leatherback sea turtle. Critical habitat has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys for the green sea turtle and at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands for the leatherback sea turtle; however, this action does not affect those areas and no destruction or adverse modification of those critical habitats are expected.

INCIDENTAL TAKE STATEMENT

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

The measures described below are non-discretionary, and must be undertaken by the Administration so that they become binding conditions of any grant or permit issued to the Department, as appropriate, for the exemption in section 7(o)(2) to apply. The Administration has a continuing duty to regulate the activity covered by this incidental take statement. If the Administration (1) fails to assume and implement the terms and conditions

or (2) fails to require the Department 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 Department 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 ANTICIPATED

The Service anticipates no more than 3,000 linear feet of sea turtle nesting habitat will be degraded as a result of construction of the armoring structures. The amount of linear feet is dependent on the projects being completed by July 1, 2017. Due to the current erosion of the beach, the nesting habitat will continue to be degraded or lost. The loss in habitat quality is expected to continue if the erosion continues. If the beach does not accrete, the presence of coastal armoring will result in take in the form of: (1) behavior modification of nesting females due to the presence of the armoring structure, resulting in false crawls and their return to the water without nesting; (2) prevention of westward movement of female turtles in search of beach with higher elevations, thus displacing female turtles into nesting habitat that is sub-optimal (e.g., a lower beach elevation where eggs would drown); (3) an increase in the physiological cost of nesting; (4) a possible decrease in nesting activity; (5) potential entrapment and mortality of nesting turtles and hatchlings; and (6) destruction of nests from washout or inundation due to the effects of the armoring structure and shoreline processes.

The Service expects incidental take of sea turtles due to project impacts will be difficult to detect for the following reasons: (1) sea 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 traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey program; (2) the total number of eggs or hatchlings per undiscovered nest is unknown; (3) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (4) the effects of increased energy expenditure of nesting females encountering armoring structures is unknown; and (5) the number of nests laid seaward of armoring structures cannot be predicted. However, the level of take of these species can be anticipated by the degradation of suitable turtle nesting beach habitat because: (1) sea turtles nest within the vicinity of the project area; (2) the placement of armoring structures will negatively affect nesting habitat seaward of and adjacent to the structures; and (3) the placement of armoring structures is known to decrease nesting female emergence to nesting sites and increase the distance female sea turtles travel to find nesting habitat.

EFFECT OF TAKE

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

REASONABLE AND PRUDENT MEASURES

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

1. Non-emergency armoring construction activities must not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching. This will minimize the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. An exemption to this may occur through coordination or emergency consultation with the Service.

2. If non-emergency armoring activities will be conducted during the period from April 15 through April 30 and/or November 1 through November 30 and if surveys indicate any nests are still incubating within the project area, construction activities must be conducted during daylight hours only to avoid encountering nesting and/or hatchling turtles.

3. If non-emergency armoring construction activities will be conducted during the period from April 15 through April 30 and/or November 1 through November 30 and if surveys indicate any nests are still incubating within the project area, construction may not proceed until surveys for early and late nesting sea turtles have been conducted and nests laid in the area of the armoring construction activities have been marked for avoidance to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

4. Emergency armoring construction activities may occur during any portion of the sea turtle nesting and hatching season (April 15 through November 30) as long as sea turtle protection measures are in place.

5. All rocks, derelict concrete, metal, coastal armoring geotextile material or other debris must be removed from the beach prior to any non-emergency armoring construction activities unless it is determined in coordination with the Service or Commission that removal would create an unacceptable disturbance.

6. Armoring structures will only be constructed of materials discussed in the proposed action section of the biological opinion. The armoring structure must be sited as far landward as possible and as close to the bluff line as possible.

7. A vegetated dune must be constructed in front of long-term armoring structures. The placement and design of the dune must emulate the natural dune system to the maximum extent practicable, including the dune configuration and shape. An exemption to this may occur through coordination with the Service and Commission if it is found that the constructed dune continually erodes away.

8. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used for the constructed dune.

TERMS AND CONDITIONS

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

The Service anticipates that the armoring authorized will subsequently remain in place as permanent armoring possibly with some modifications to meet State requirements. Any adverse effects to sea turtles due to the presence of armoring structures are expected to occur throughout the life of the structures. Therefore, the terms and conditions of this incidental take statement will remain in effect for the life of the structures.

1. Non-emergency armoring construction activities, operation of heavy equipment, or transportation or storage of equipment or materials will not be allowed on the beach from May 1 through October 31. An exemption to this may occur through coordination or emergency consultation with the Service. The Service will determine whether work (a) may proceed in accordance with the terms and conditions; or (b) proceed in accordance with the terms and conditions and other requirements as developed by the Service.

2. For the periods from April 15 through April 30 and November 1 through November 30, if nests are laid in areas where they may be affected by non-emergency construction activities, the Department must coordinate with the Service or Commission to ensure that eggs will be protected per the requirements listed below.

   2a. Nesting surveys and nest protection activities must 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 Commission, pursuant to FAC 68E-1. Contact the Commission's Marine Turtle Management Program in Tequesta at (561) 575-5408 for information on the Permit Holder in the project area. Nesting surveys must be conducted daily between sunrise and 9 a.m. The contractor must coordinate daily with the Permit Holder so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

   2b. Nests that may be affected by non-emergency construction activities will be left in place and marked in accordance with the requirements of the Commission for avoidance. No activities will occur within this marked area nor will any activities occur that could result in impacts to the nest. Nest sites must be inspected daily to

assure nest markers remain in place and the nest has not been disturbed by any construction activity.

2c. No nest relocation will occur as a result of non-emergency construction activities. Nest relocation may only occur if other non-construction related factors threaten the success of the nest and such relocation is in accordance with the Commission's Marine Turtle Conservation Guidelines.

2d. Nests deposited outside the armoring construction footprint but within the equipment access routes must be marked as described in 2b above and left in place unless other non-constructed related factors threaten the success of the nest and such relocation is in accordance with the Commission's Marine Turtle Conservation Guidelines. All mechanical equipment must avoid nests by at least 10 feet.

3. Emergency armoring construction activities may occur during any portion of the sea turtle nesting and hatching season (April 15 through November 30), as long as the following conditions are met:

3a. If any work is to be accomplished from the beach, an area of impact associated with the proposed construction, the project area, has been established and adequately marked/flagged. The area of impact shall be defined as that area seaward of SR A1A that will be affected by construction; the beach access point, if needed for heavy equipment to travel to the construction site; and the travel corridor from the beach access point to the construction site. The project area shall be conspicuously marked or flagged and all marking or flagging must be maintained throughout the construction period.

3b. A sea turtle monitoring and nest protection program (described above in item 2) has been in place since the beginning of the sea turtle nesting season (April 15) or 65 days prior to the initiation of emergency armoring construction activities within the project area, whichever is later.

3c. If there are existing marked sea turtle nests which can be determined in advance to be vulnerable to disturbance from impending emergency armoring construction or are determined after an emergency armoring project to be vulnerable, the Department shall coordinate with the Service or Commission to relocate them if possible. In the event sea turtle nests cannot be relocated in accordance with these guidelines, such nest(s) shall be avoided to the extent practical.

i. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid Commission permit. Nesting surveys must be conducted daily between sunrise and 9 a.m.

ii. Only those nests that may be affected by emergency armoring construction activities will be relocated. Nests determined to require relocation after an armoring project must be moved if possible no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with emergency armoring construction activities must cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where emergency armoring construction activities have ceased or will not occur for 65 days must be marked as required by the Commission and left *in situ* unless other factors threaten the success of the nest.

3d. If possible, the contractor must not initiate work until daily notice has been received from the sea turtle Permit Holder that the morning survey has been completed. If work must be done during darkness or prior to receiving notice from the Permit Holder, the Department will take all practicable measures to determine if a nest is present and to avoid it. Photographs will be taken of the project area immediately before and after armoring activities, and the Service or Commission will be notified as soon as practicable, and provided the photographs and a brief account of the activities

3e. Sea turtle nests laid in the project area following issuance of a building permit and determined not to be vulnerable to disturbance of impending emergency armoring construction shall be marked and avoided.

4. To the extent feasible, dune restoration or creation included in the profile design (or project) should have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (Figure 2). If another slope is more feasible in this high erosion area, the Department will meet with the Service to discuss this new slope. If it is found that the dune in front of the armoring structure is continually washed away, the Department must meet with the Service and the Commission to discuss other options.

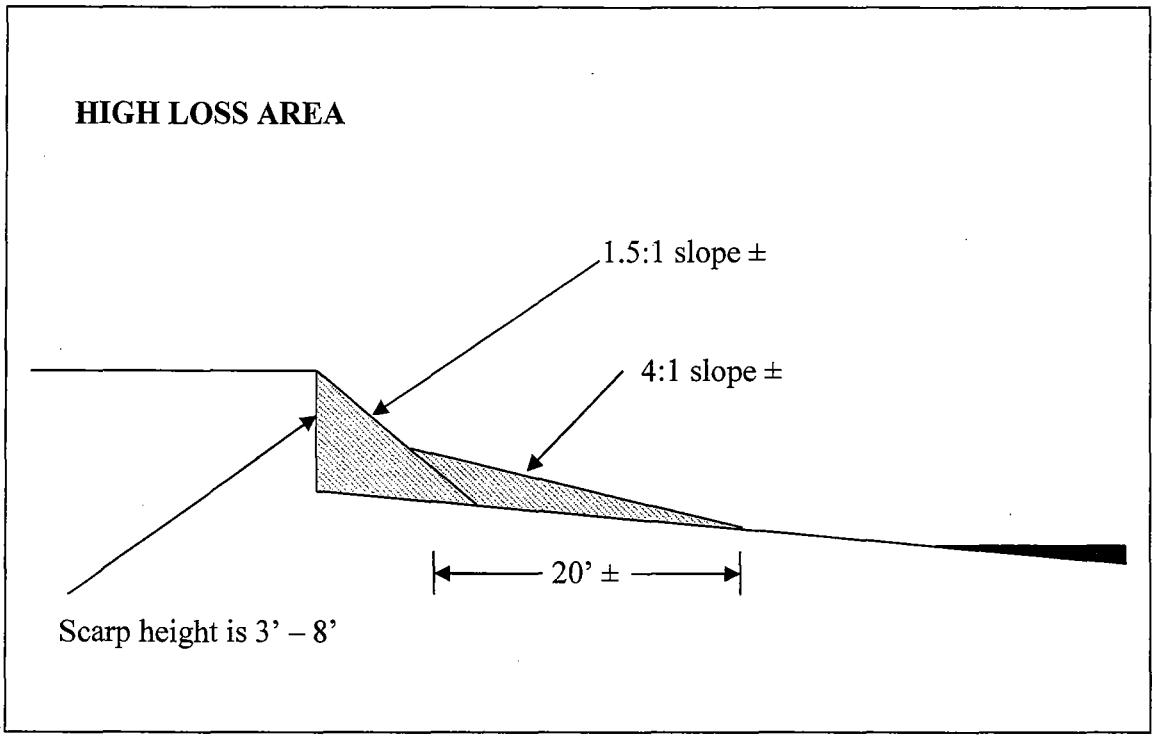

Figure 2. Recommended slope on a high erosion beach for sand placement activities that include the creation of a dune.

5. Beach compatible fill must be used in the construction of the dune system. 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. Such material must be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062mm (4.0Φ) and 4.76mm (-2.25Φ) (classified as sand by either the Unified Soils or the Wentworth classification), must be similar in color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the material in the historic beach sediment at the disposal site, and must not contain:

   5a. Greater than 5 percent, by weight, silt, clay or colloids passing the #230 sieve (4.0φ);

   5b. Greater than 5 percent, by weight, fine gravel retained on the #4 sieve (- 2.25φ);

   5c. Coarse gravel, cobbles or material retained on the 3/4-inch sieve in a percentage or size greater than found on the native beach;

   5d. Construction debris, toxic material or other foreign matter; and

   5e. Material that will result in cementation of the beach.

If rocks or other non-specified materials appear on the surface of the filled beach in excess of 50 percent of background in any 10,000 square foot area, then surface rock should be removed from those areas. These areas must also be tested for subsurface rock percentage and remediated as required. If the natural beach exceeds any of the limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter.

6. Dune vegetation planting may occur on the dune face and the dune toe during the sea turtle nesting and hatching season under the following conditions.

   6a. Daily early morning sea turtle nesting surveys must be conducted during the period from April 15 through November 30. Nest surveys must only be conducted by personnel with prior experience and training in nest surveys. Surveyors must have a valid Commission permit. Nest surveys must be conducted daily between sunrise and 9 a.m. No dune planting activity must occur until after the daily turtle survey and nest conservation and protection efforts have been completed.

   6b. Nesting surveys must be initiated 65 days prior to dune planting activities or by April 15, whichever is later. Nesting surveys must continue through the end of the project or through November 30, whichever is earlier. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys.

   6c. Any nests deposited in the dune planting area not requiring relocation for conservation purposes must be left *in situ.* and marked in accordance with the requirements of the Commission.

   6d. If a nest is disturbed or uncovered during planting activity, the contractor, must cease all work and immediately contact the responsible turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within the affected project site must be delayed until hatching and emerging success monitoring of the nest is completed.

   6e. All dune-planting activities must be conducted by hand and only during daylight hours.

   6f. All dune vegetation must consist of coastal dune species native to the local area; (i.e., native to coastal dunes in the respective county and grown from plant stock from that region of Florida).

   6g. No use of heavy equipment (including trucks) must occur on the dunes or seaward for planting purposes. A lightweight (ATV type) vehicle, with tire pressures of 10 psi or less may be operated on the beach.

7. All street and traffic lighting under the Department's jurisdiction along the road must not be directly visible from the nesting beach and must be in accordance with the Coastal Roadway Lighting Manual (http://research.myfwc.com/engine/download_redirection_process.asp?file=manual2_0138.pdf&objid=2156&dltype=article), the City of Flagler Beach and Flagler County's Sea Turtle Lighting Ordinance.

   The following table is a list of streetlights that have caused sea turtle disorientations in past years. All streetlights under the Department's jurisdiction must be in compliance with the above noted manual and ordinance within one year after issuance of this opinion. Street lights not under the jurisdiction of the Department must be reported to the City of Flagler Beach, Commission, and Service.

Table 6. Sea turtle disorientations in the action area.

LOCATION	LIGHT SOURCE
2208 South A1A	Parking lot, Streetlight, Rest/Bar
South of South 6th Street Walkover	Streetlight, Pier
North 4th Street at 30ft N of Walkover	Streetlight
1919 North A1A	Streetlight
2100 S A1A Nest ID# FB 14	Unknown
913 North A1A "Anchor Motel" Nest ID# FB 58	Streetlight (West side of SR A1A)
2500 South A1A - Nest ID# FB 61	Streetlight (West side of SR A1A), Hotel (Spot?)
2301 North A1A - Nest ID# FB 60	Streetlight (West side of SR A1A), Light on dune aimed at beach (Beverly Beach Beacon)
913 North A1A - Nest ID# FB 75	Streetlights (9th & 10th Streets, and Anchor Motel)
788 North A1A - Nest ID# FB 73	Streetlights (8th & SR A1A), Commercial Building north of 8th Street. (?)
2130 South A1A - Nest ID# FB 78	Streetlights (22nd Street & 2150 South A1A)

8. No temporary lighting of the beach is authorized, except during emergency construction. If required, hazard lighting on the adjacent roadway shall be positioned such that light is not directly visible from the beach. No additional permanent exterior lighting is authorized.

9. A meeting between representatives of the contractor, the Service, the Commission, and the permitted sea turtle surveyor, and other species surveyors as appropriate, must be held prior to the commencement of non-emergency work on this project. 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 non-emergency construction occurs during the early and/or late portions of the nesting season (April 15 through April 30 and November 1 through November 30) such as storing equipment, minimizing driving, and reporting within the work area, as well as follow-up meetings during construction.

10. The Department must submit an as-built drawing prior to the beginning of the first sea turtle nesting season that follows installation or within 30 days if construction is completed during the sea turtle nesting season. This submission will include sub-meter accuracy latitude and longitude coordinates that define the boundaries of the installed structure.

11. In the event the structure or its associated dune restoration fails, the Department must ensure all debris and structural material is removed from the nesting beach area. Removal of failed structures will take place outside the sea turtle nesting season (April 15 through November 30) unless it is determined by the Service to be less harmful to sea turtles to remove the structures and debris during the nesting season.

12. Upon completion of construction or removal of armoring, all construction materials and debris must be removed from the beach, including exposed fabric.

Emergency sand placement as a result of stormwater runoff from the road must include the following additional measures:

1. The drainage of the road must be diverted or contained to prevent stormwater runoff from transporting sand onto the beach. This includes areas along the road that have been previously identified and any new areas that have increased erosion on the beach due to the stormwater runoff.

2. Emergency sand placement as a result of the stormwater runoff must use beach quality sand, suitable for sea turtle nesting, successful incubation, and hatchling emergence. Placement of sand must be confined to the fullest extent possible to the upper dune and every effort must be made to prevent additional sand from being transported by water and deposited on the beach.

3. Following the emergency sand placement activities, the Department must meet with the Service and the Commission to discuss the time-period for fixing the road drainage issues prior to the following sea turtle nesting season.

4. If emergency sand placement activities will be conducted during the sea turtle nesting and hatching season (April 15 through November 30), surveys for nesting sea turtles must be conducted daily before work is conducted. In addition, sand placement

activities must be conducted only during daylight hours during the nesting season to avoid encountering nesting and hatchling turtles unless placement of sand higher on the dune would result in less deposition on the beach than allowing erosion to continue. After emergency sand placement activities occur, if nests are laid in areas where they may be affected by the activities, eggs must be relocated per the following requirements. Nests laid in the area of the sand placement activities must be relocated if possible prior to 9am on the morning following deposition, to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

4a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid Commission permit. Nesting surveys must be conducted daily between sunrise and 9 a.m.

4b. Only those nests that may be affected by emergency sand placement activities will be relocated. Nests requiring relocation must be moved if possible no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with emergency sand placement activities must cease when construction activities no longer threaten nests.

4c. Nests deposited within areas where emergency sand placement activities have ceased or will not occur for 65 days must be marked in accordance with the requirements of the Commission and left *in situ*.

5. If construction equipment and materials have been used on the beach, they will be removed off the beach at night when feasible or must be stored in a manner that will minimize impacts to nesting and hatching sea turtles during the sea turtle nesting and hatching season.

Post Monitoring and Reporting:

1. Once a long-term armoring structure is in place, the Commission's sea turtle monitoring program is required to be augmented in the project area, as provided below, which will include the segment of beach where the armoring structure is located and the sandy beach 100 feet on either side of the structure, for 5 years post-construction as follows:

1a. Sea turtle nesting activity of the nesting beach in the vicinity of the project shall be reported from April 15 until all nests in the vicinity of the project have hatched and nest fate surveys have been completed. All nests deposited within the project site shall be marked and left in place. Such nests will be marked and the actual location of the clutch determined. The exact methods for such marking shall be coordinated between the Department, Commission, and the Service.

1b. Monitoring will be conducted to determine nest fate of all sea turtle nests deposited within the project areas. Data collected to assess nest fate shall include, but not be limited to: (1) the number of nests and false crawls, (2) the total number of eggs in each nest, (3) the number of eggs successfully hatched in each nest, (4) number of hatchlings that emerged from each nest, (5) number of live and dead hatchlings in each nest, (6) number of nests depredated, (7) number of nests washed out, (8) number of nests inundated, and (9) number of nests vandalized.

1c. If a nest fate assessment concludes that a nest successfully hatched, the following information must also be obtained, as applicable: (1) date of first hatchling emergence, (2) whether hatchlings safely reached the ocean, (3) number of hatchling disorientations, (4) number of hatchlings impeded in reaching the ocean due to debris or other obstacles, (5) number of nests scavenged after hatching, and (6) all other sea turtle-related information required by Commission.

1d. It is the responsibility of the Department to coordinate with the Commission to ensure that the project area and adjacent beach are surveyed for sea turtle nesting activity in order to obtain the data above. All nesting surveys, nest relocations screening or caging activities, etc. must be conducted only 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 Commission.

2. The Department must complete a survey of all lighting visible from the beach using standard techniques for such a survey. The surveys shall document all lighting visible from the beach by May 15 of that nesting season. For each light source visible, it must be documented that the property owner(s) have been notified of the problem light with recommendations for correcting the light. Recommendations must be in accordance with the county's and city's specific lighting ordinance. A summary report of each survey including documentation of property owner notification must be submitted to the Service by December 15 of that year. After the final report is completed, a meeting must be held with the Department, Commission, and the Service to discuss the survey report and documented sea turtle disorientations.

3. Annual reports describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the Service by February 15th of the year following completion of the proposed work through the 2017 nesting season. This includes dates of actions, linear feet and volume of sand placement, linear feet and volume of rock revetment, and linear feet of seawall construction. These activities must be correlated to a milepost along SR A1A.

4. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site. Upon locating an injured sea turtle adult, hatchling, or egg that may have been harmed or destroyed as a direct or indirect result of the

project, the Department must notify the Commission's Wildlife Alert at 1-888-404-FWCC (3922) and the Service's Jacksonville Field Office (904) 731-3336. Care must be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

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 incidental take will be limited to no more than 3,000 linear feet of sea turtle nesting habitat that will be degraded as a result of construction of the emergency armoring structures and the subsequent replacement of these structures with permanent armoring. 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 Department must immediately provide an explanation of the causes of the taking and review with Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

1. The Administration and Department should provide funding or technical support for research to evaluate the effects of coastal armoring structures on sea turtles. Science-based monitoring is required to empirically evaluate the short-term and long-term impacts coastal armoring structures may have on nesting sea turtles, their eggs, and hatchlings.

2. The Administration and Department should work collaboratively with local and county governments and State and Federal agencies to develop and implement coastal dune restoration projects to stabilize and enhance sea turtle nesting habitat along their facilities adjacent to coastal resources.

3. The Administration and Department are encouraged to evaluate the feasibility study currently being conducted by the Corps, once completed, and implement or participate in the implementation of long-term solutions resulting from the study, if feasible.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal

agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this biological opinion, please contact Todd Mecklenborg at (727) 820-3705.

Sincerely,

for David L. Hankla
Field Supervisor