APPENDIX C

BIOLOGICAL ASSESSMENT OF THREATENED AND ENDANGERED SPECIES (BATES)

TYBEE ISLAND SHORE PROTECTION PROJECT, GEORGIA 2015 RENOURISHMENT

U.S. ARMY CORPS OF ENGINEERS SAVANNAH DISTRICT

DECEMBER 2013

Biological Assessment of Threatened and Endangered Species
for the
Tybee Island Shore Protection Project
Georgia
2015 Renourishment

A.1.00 Project Description. Tybee Island is located 17 miles east of Savannah at the mouth of the Savannah River on the Atlantic Ocean. The highly developed island is bordered on the north by the South Channel of the Savannah River, on the east by the Atlantic Ocean, and on the south and west by the Back River and other tidal creeks. Tybee Island has an average width of 0.5 miles and the ground elevation varies from 10 to 18 feet above mean low water (MLW) and slopes westward to the salt marshes. Figure 1 is a map of the project area.

This authorized 3.5 mile long project was initially constructed in 1974 with a 50-year project life and periodic renourishments to occur every 7 years. The beach was last renourished in 2008. With 9 years left in the project life, the Savannah District, with the non-Federal sponsor's concurrence, selected to perform one last renourishment for the remaining 9 years of project life. Because this renourishment is for 9 years instead of the usual 7 years, there will be an increase of approximately 312,000 cubic yards in the volume placed. The beach template will be slightly modified to include placement of the additional material by extending the berm up to the north terminal groin of the template. This area has been nourished during previous renourishment cycles, but not during the 2008 renourishment. In addition, the berm will be extended seaward up to 50 feet beyond the previously constructed template to account for erosion during the additional 2 years for a 9 year cycle.

The USACE 1994 Section 934 report evaluated 26 combinations of alternate berm widths (40 to 70 feet), berm heights (+11.0 to +17.0 feet), and beach slopes. This provided a variety of potentially feasible widths and heights. Five alternate berm widths and heights were selected for detailed evaluation, and costs and benefits were computed for each of the alternatives. The analysis concluded a 40-foot wide berm at elevation +11.0 feet with 1V:20H slope was the most desirable beach template.

In the 1998 Environmental Assessment for South Tip Beach/Tybee Creek, it was concluded that in order to maintain the integrity of the restored beach at Back River between periodic renourishment, advance nourishment would be provided by placing fill material one foot above the beach template, up to elevation 12 feet MLW and providing additional material on the beach slope. A berm elevation of +12 feet MLW and 1V:15H slope was proposed for the Back River/Tybee Creek segment of the proposed renourishment project.

As proposed, the project will be constructed using a hydraulic cutterhead pipeline dredge and support equipment. A submerged pipeline will extend from the borrow site to the southerly tip of Tybee Island. Shore pipe will be progressively added to perform fill placement along the shorefront areas to be renourished. The contractor will not impinge on beach dunes during construction as work will be conducted from the existing beach and newly placed material.

Temporary toe dikes will be utilized in a shore parallel direction to control the hydraulic effluent and reduce turbidity. The sand will be placed in the form of varying design templates based upon alongshore volumetric fill requirements which reflect beach conditions at the time of construction. Additional beach fill will be strategically placed in areas of documented highest erosional stress such as the 2nd Street "hot spot". Figure 2 shows the proposed fill limits and locations. For the current project template design is based on project performance and erosion rates since the last renourishment project in 2008. Beach fill will primarily be placed in areas included in the previous renourishment in 2008. These areas include the North Beach (North End Groin to Oceanview Court), Second Street area (Oceanview Court to Center Street), Middle Beach (Center Street to 11th Street), South Beach (11th Street to South End Groin), and Back River/Tybee Creek (South Tip Groin Field to Inlet Avenue). The same borrow area that was used for the 2008 renourishment, Borrow Area 4, will be used for this final renourishment. Figure 3 shows the proposed borrow area. The proposed project is expected to commence by November 2015, and be completed by April 2016.

For the current project template design is based on project performance and erosion rates since the last renourishment project in 2008. Beach fill will primarily be placed in areas included in the previous renourishment in 2008. These areas include the Oceanfront North Beach from the north terminal groin to Center Street, the Oceanfront South Beach from 11th Street to the South End Terminal (Federal) Groin, and the Back River Beach from Inlet Avenue to Southernmost end of Groin G-1 in the South Tip Groin Field. Additional fill will be placed between these areas to provide a more stable beach profile and to avoid some of the excessive losses in the 2nd Street "hot spot" from project end losses and offshore losses that resulted from the wide beach constructed at this location during the last renourishment. Constructed beach widths on the Back River Beach vary from 30 feet to 110 feet at +11.22 Mean Lower Low Water (MLLW). Beach widths on the Front Beach will vary from a 25 foot width berm, to a berm approximately 350 feet wide at the elevation of +11.22 MLLW. Based on natural angle of repose on the existing beach, and experience with previous placement, a beach slope of 1 vertical on 25 horizontal will be required on the front beach. The Back River will have an 11.2 foot elevation MLLW and a 1V:15H slope.

Proposed staging areas include Inlet Avenue, 19th Street, and North Beach Parking Lot (Figures 7, 8, 9, and 10). These are the same areas utilized during previous Tybee beach construction activities.

Beach fill final placement will be based on funds available at the time of construction. Alternative bid schedules will be used to optimize the quantity of beach fill placed for the funds available. The proposed project is expected to commence by November 2015, and be completed by April 30, 2016. The Project Cooperation Agreement expires in 2024, 9 years after the time of the proposed construction. If the City of Tybee wishes to extend Federal participation in the beach renourishment program a new authorization would have to be obtained.

Figure 1: Location Map, Tybee Island, Georgia

Figure 2: Proposed Fill Limits For 2015 Tybee Beach Renourishment

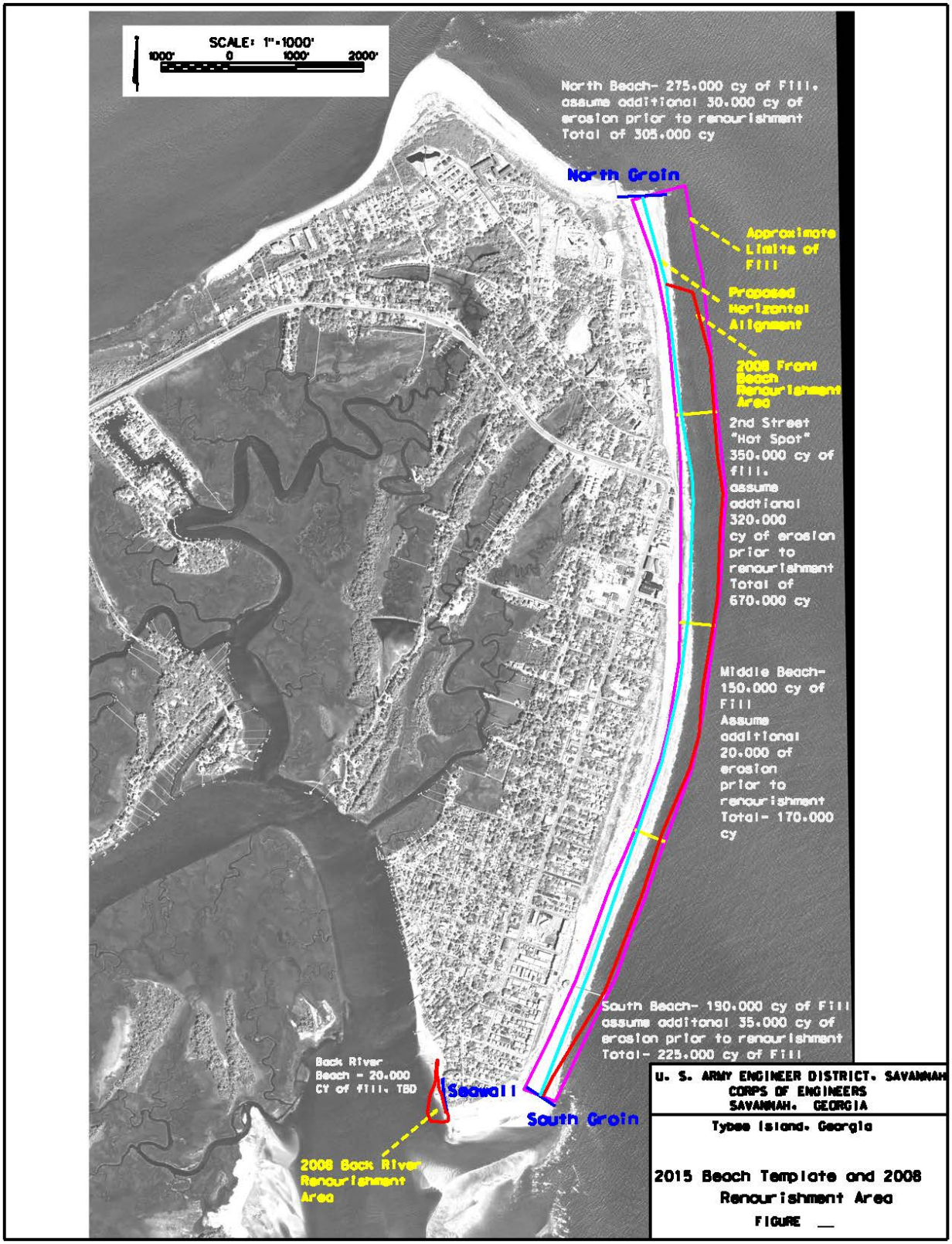
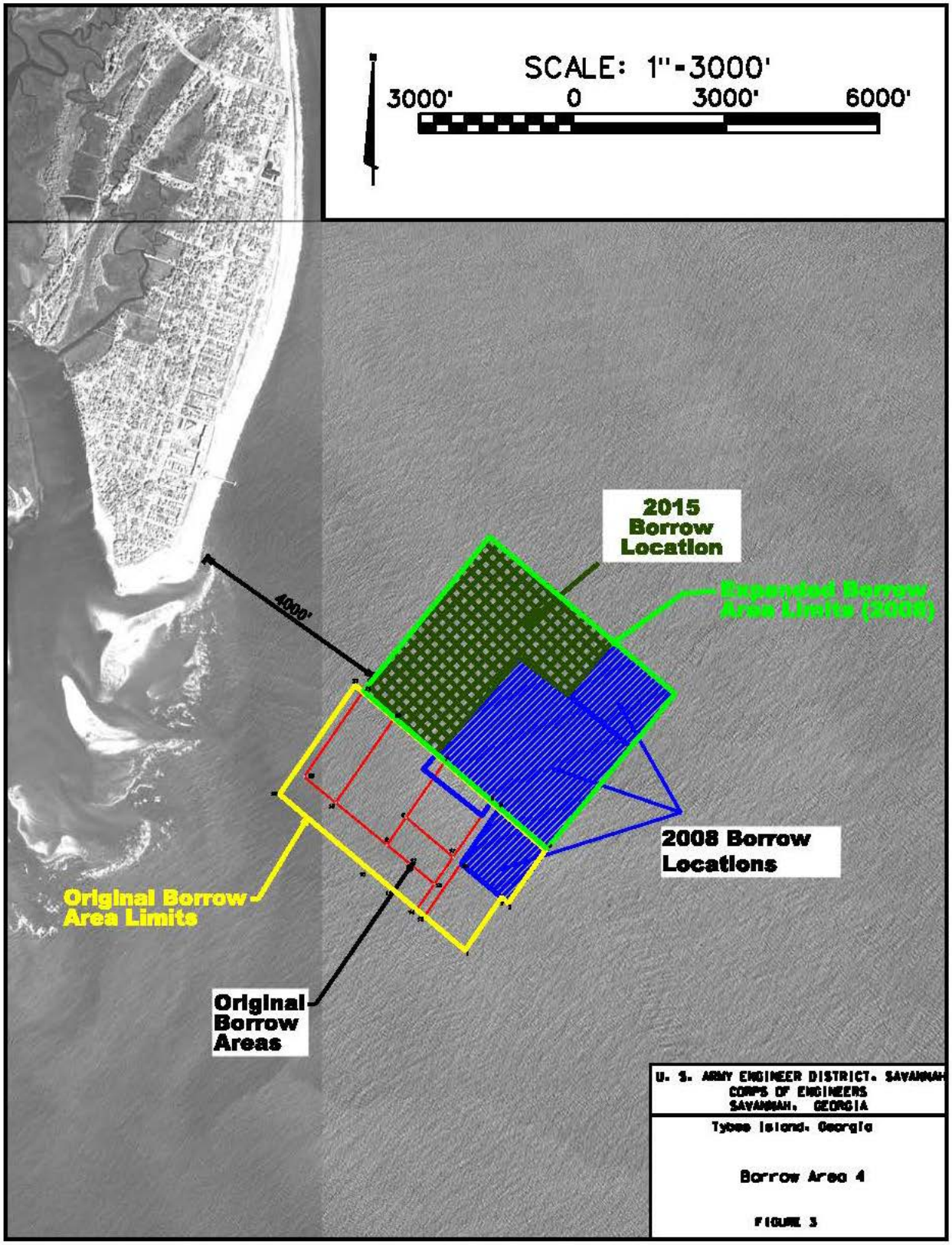


Figure 3: Proposed Borrow Area



A1.01. History of the project. Various erosion and storm damage control measures have been constructed on Tybee Island over the years. The initial construction of the North Terminal Groin and initial nourishment of the ocean front beach was in July 1975 through March 1976. The quantity placed for this initial nourishment was 2,262,100 cubic yards (yd^3) of sand placed on the beach between the North Terminal Groin and 18th Street. Borrow area #3, which is located south of Tybee Island, was used. Dimensions of the North Terminal Groin are 225 feet long on land and it extends out into the ocean 800 feet with the elevation varying from 11 feet on land to 3.4 feet in the ocean. The top width varies from 10 feet wide to 15 feet wide.

The initial monitoring began in June 1976 and was completed in March 1980. The results of this monitoring showed that the North Beach had 40,630 yd^3 of accretion just south of the North Terminal Groin. There was 605,450 yd^3 of erosion between the North Terminal Groin and 7th Street. Between 7th Street and 14th Street there was 266,940 yd^3 of accretion. From 14th Street until the end of the oceanfront beach there was 168,600 yd^3 of erosion. The net erosion was a total of 466,480 yd^3.

The first renourishment, rehabilitation of the North Terminal Groin, and addition of the South Tip Terminal Groin was conducted in 1987. Placement of 1,200,000 yd^3 of sand occurred from the North Terminal Groin to the South Tip Terminal Groin. Also, 157,000 yd^3 of sand was placed on 1,400 feet of shoreline south of the South Terminal Groin. The South Tip Terminal Groin was added between 18th and 19th Streets, extending from the sea wall a length of 600 feet. Where the north groin had settled, the elevation of the last 400 feet was raised from 3.4 feet to 4.5 feet, adding 1,310 tons of armor stone.

Monitoring was performed from August 1987 through May 1989. This monitoring showed that by 1989 the beach had a loss of 28 percent from the placed sand during the renourishment. This monitoring also informed the project team that the authorized project beach between the north terminal groin and the south terminal groin lost 134,000 yd^3 (78,000 cubic yards per year (yd^3/yr)). South Tip beach lost 25,000 yd^3/yr.
The 1993 placement of beach material was in conjunction with the 1993-1994 deepening of the Savannah Harbor Entrance Channel. It was estimated that 918,000 yd^3 of material was placed on the north beach (north terminal groin to 2nd Street) from the channel deepening. Originally destined to be placed on the beach, the materials were of insufficient quality and thus had to be deposited in the nearshore zone instead. This 1993 placement was done as beneficial use of the harbor deepening material.

The following is a quote from the Section 905(b) Study, dated Sept. 2004, "Since 1975, over 6.9 million yd^3 of sand have been placed along Tybee's shoreline. The net erosion rate estimated for the beach erosion control project is approximately 78,000 yd^3/yr. However, hot spots alone that occur primarily at Second Street lose over 125,000 yd^3/yr". Table 1 is a chronology of the recent beach renourishment and erosion control efforts along Tybee Island.

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

YEAR	ACTION
1975	800-ft North End Terminal Groin constructed – 10.5 tons of armor was used and 2,700 pounds of under layer stone was used.
1975-1976	Initial nourishment. – Borrow Area #3 was utilized. 2,262,100 yd^3 of sand placed on the beach between North End Terminal Groin and 18th Street (13,200 feet long).
1986-1987	600-ft South End Terminal Groin constructed between 18th and 19th St. Rehabilitation of North End Terminal Groin. First renourishment -1,200,000 yd^3 of sand placed from between the groins. 157,000 yd^3 of sand placed on 1,400' of shoreline south of South End Groin. Borrow Area #3 was utilized for all of this work.
1993	An estimated 918,000 yd^3 of beach material was placed on beach by Corps and Georgia Ports Authority from Savannah Harbor deepening. The source of sand was the navigation channel.
1994	South Tip Groin Field constructed by Georgia Ports Authority with State funds.
1995	285,000 yd^3 of material placed between South End Groin and 13th Street by Georgia Ports Authority. 50,000 yd^3 of sand placed within South Tip Groin Field by Georgia Ports Authority. Borrow Area #4, cell A was the source of sand.
2000	Back River Groin Field constructed, and initial nourishment of Back River and renourishment of South Tip and renourishment of oceanfront. Borrow Area #4 was utilized. Back River Groin renourishment quantities are: Armor Stone 4,631 tons, Underlay Stone 619 tons, & Bedding Material 1,847 tons. Back River/Tybee Creek Beach 86,319 yd^3 Second Street Beach 1,267,738 yd^3 South Beach 118,654 yd^3 Back River/Tybee Creek/North of Seawall 7,859 yd^3
2001 – 2004	Monitoring North end groin/start of renourishment area 26,660 yd^3 accretion. Second St. renourishment area 369,858 yd^3 erosion. Middle Beach 25,954 yd^3 erosion. South Beach (Tybrisa) renourishment area 92,620 yd^3 erosion. South Tip Beach 33,685 yd^3 accretion. Back River/Tybee Creek at seawall 24,428 yd^3 erosion. Back River/Tybee Cr. north of seawall 27,913 yd^3 accretion. Average annual 142,084 yd^3 erosion.
2008	Front Beach Renourishment with material from Borrow Area 4 Back River/Tybee Creek- 39,679 yd^3 Front Beach- 1,187,469 yd^3 (between Gulick Street and the South End Terminal Groin- 13,200 feet long)

A.1.02 This study is in fulfillment of the Endangered Species Act, as amended, 16 U.S.C. 1531, et seq. and as stated in the 2005 Limited Re-evaluation Report Tybee Island, Georgia 2008, the District will conduct a Biological Assessment of Threatened and Endangered Species (BATES).

A.1.03 The proposed actions by the U.S. Army Corps of Engineers, Savannah District, consist of placing up to 1,748,750 cy of beach compatible sand along those segments of the authorized Federal project shoreline where the recreational and protective beach warrants reconstruction. Figure 2 shows the beach fill limits.

A.1.04 The proposed actions involve dredging material from a borrow area located approximately 7,000 feet southeast of the southern tip of Tybee Island. The dredged material would be used for beach nourishment on the Oceanfront Beach and on Back River Beach.

A.1.05 Table 2 shows the design fill volume and dredged material volume that would be needed for the proposed actions.

Table 2.
Quantity to Fill Design Template
(Based On September 2012 Survey for 2015 Renourishment)

REACH	LOCATION	ANTICIPATED FILL VOLUME*
R1	North Beach (North End Groin to Oceanview Court)	305,000 yd^3
R2	Second St renourishment area (Oceanview Court to Center Street)	670,000 yd^3
R3	Middle Beach (Center Street to 11th Street)	170,000 yd^3
R4	South Beach (11th Street to South End Groin)	225,000 yd^3
R5	Back River/Tybee Creek (South Tip Groin Field to Inlet Avenue)	29,000 yd^3
	Total	1,399,000 yd^3
	Anticipated dredging volume (assuming 20% loss during placement)	1,748,750 yd^3

* includes volume to replace erosion since last renourishment, plus erosion anticipated before the 2015 renourishment (156,000 cy per year based on long term erosion rates between 2001 and 2012), and an additional 312,000 yd^3 to cover 2 additional years of fill. The highest density of fill will be placed on the Second Street Beach, in the area with the highest long term erosion rate.

A.2.00 Environmental Setting. The project area is located on Tybee Island, one of the most developed barrier islands on the coast of Georgia. The mainland of Chatham County is separated from the Atlantic Ocean by marsh and barrier islands. The islands are separated from one another by tidal creeks and inlets. Tybee Island is located south of the Savannah River entrance, about 17 miles east of the city of Savannah, Georgia. It is bounded on the north by the Savannah Harbor, to the east by the Atlantic Ocean, and on the south and west by Tybee Creek and a vast tidal marsh system. The major portion of the land mass above high tide is occupied by the City of Tybee Island which is the only population center on the island.

A.2.01 Most of the dune areas on Tybee Island have been replaced by sea walls and revetment. Construction of residences, hotels and other businesses has removed much of the natural areas on the island. Dune areas still exist mainly on the central portion of the beach and the north end of the island. Dunes were constructed during the 1995 project on the South Tip Beach and a successful dune field has established. Since that time the northernmost segment of the beach fill (centered at 2nd St) has experienced a large scale compromise of the authorized beach width to the point where present day erosion is now back to the historical seawall. During high tides the water line encroaches the dune field. There are no dunes on the Back River.

A.2.02 Primary influences on the morphology of Tybee Island include tidal fluctuations, tidal currents, and nearshore waves. The study area has a mean tidal range of 6.8 feet and a spring tide range of approximately 9.0 feet.

A.2.03 The major wetland habitat types in the project area belong to the marine and estuarine systems (Cowardin et al., 1979). The marine system consists of the open ocean overlaying the continental shelf and its associated high-energy coastline. The sub-systems include: 1) the marine subtidal unconsolidated bottom, which is the sand bottom that is continuously submerged; and 2) the marine intertidal unconsolidated shore, which is the beach area. Estuarine systems consist of deepwater tidal wetlands and adjacent tidal wetlands along Back River and Horse Pen Creek. The estuarine subsystem includes 1) subtidal unconsolidated bottom and aquatic bed and 2) intertidal streambed, unconsolidated shore and emergent wetlands.

A.2.04 The Oceanfront Beach has a wide, gently sloping shelf. On the other hand, the Back River shoreline has a steeper grade. The natural beach slope on Back River is typically 1 vertical on 13 horizontal compared to a typical slope of 1 vertical on 20 horizontal in the intertidal zone along the front beach. Offshore depths drop off rapidly to 20 or 30 feet along the northern end of the Back River area, with a more gradual transition to the south.

A.2.05 In efforts to control erosion on the oceanfront, numerous groins and revetments have been constructed as well as a seawall constructed between 1936 and 1941. This sea wall has a top elevation of 12 feet above mean low water (mlw). Although the seawall

has provided some protection of property, it has also caused additional lowering of the beach profile due to reflected wave action.

A.2.06 The State of Georgia and GPA placed sand material (285,000 c.y.) on the Oceanfront and 50,000 c.y. on the South Tip Beach in 1995 and constructed a series of three groins south of the Federal south groin in an effort to alleviate the extensive erosion at this portion of the beach and stop the potential for failure of the south end seawall. The project is fulfilling its purpose of trapping and holding sand at the South Tip Beach. At the same time, it is believed that the groin field has been the main cause for the sand starvation observed at Back River Beach.

A.2.07 Historic aerial photographs of the Back River Beach area show cyclic erosion and accretion cycles similar to that which has been found on the oceanfront. Evidence of previous efforts to control erosion in this area include the seawall which extends approximately 500 feet into the Back River as well as a series of deteriorated wooden groins which were built between 1931 and 1941. The southernmost portion has large armor stone placed immediately shoreward of the seawall and the public fishing pier has been armored with stone ranging in size from 6 inches to 18 inches.

A.3.00 Threatened and Endangered Species. The species listed on Table 3 may be found in the general project area and have been classified as threatened or endangered species pursuant to the Endangered Species Act of 1973. As such, these species must be protected from adverse impacts that could be expected to cause damage either to the individuals or to habitat that has been found to be critical for their survival. In accordance with Section 7 of the Endangered Species Act of 1973, Savannah District has evaluated the impacts the proposed action could have on any threatened or endangered species potentially occurring in the project area. Each of these species will be described in detail with respect to their sightings and habitat in Chatham County, Georgia. Manatees, right whales, piping plovers and loggerhead sea turtles are the species most likely to be impacted by the proposed project. A Biological Opinion (BO) for the last renourishment was issued on July 18, 2008 by U.S. Fish and Wildlife Service (USFWS). The BO addresses project effects on nesting loggerhead and leatherback sea turtles, non-breeding piping plovers, and designated critical habitat unit GA-1. The Savannah District and USFWS concurred the 2008 renourishment was not likely to adversely affect the West Indian manatee based on the inclusion of the special manatee conditions listed in this BATES (section 4.02, 8.00, and attachment EA-4) and the BO (Appendix D). The USFWS reserves the right to issue an updated BO during the Pre-Construction Engineering and Design (PED) phase. If listing of any other species occurs before construction begins then the District will evaluate any potential impacts and re-consult with appropriate agencies.

A.3.01 To ensure protection of individuals of threatened and endangered species, each dredging and construction contract for the Tybee Island Shore Protection Project contains special conditions to minimize adverse impacts.

Table 3.
Federal Threatened and Endangered Species

Common Name	Scientific Name	Status
West Indian (Florida) manatee	Trichechus manatus latirostris	Endangered
Right whale	Balaena glaciali	Endangered
Sei whale	Balenoptera borealis	Endangered
Blue whale	Balaena musculus	Endangered
Sperm whale	Physeter macrocephalus	Endangered
Finback whale	Balaenoptera physalus	Endangered
Humpback whale	Megaptera novaeangliae	Endangered
Piping plover	Charadrius melodus	Threatened
Wood stork	Mycteria americana	Endangered
Bachman's warbler	Vermivora bachmanii	Endangered
Kirtland's warbler	Dendroica kirtlandii	Endangered
Red-cockaded woodpecker	Picoides borealis	Endangered
Eastern Indigo snake	Drymarshon corais couperi	Threatened
Loggerhead turtle	Caretta caretta	Threatened
Leatherback turtle	Dermochelys coriacea	Endangered
Hawksbill turtle	Eretmochelys imbricata	Endangered
Green turtle	Chelonia mydas	Threatened
Kemp's Ridley turtle	Lepidochelys kempii	Endangered
Shortnose sturgeon	Acipenser brevirostrum	Endangered
Atlantic sturgeon	Acipenser oxyrhyncus	Endangered
Flatwoods salamander	Ambystoma cingulatum	Threatened
Pondberry	Lindera melissifolia	Endangered

NOTE: List developed by the Southeast Region, U.S. Fish and Wildlife Service, December 2012

A.4.00 Discussion of Potential Impacts. The Savannah District reviewed information concerning each of these species and evaluated the potential for the proposed action to impact these species. The results of the evaluation are contained in the following paragraphs:

A.4.01 Whales. These are six species of whales listed as endangered in the State of Georgia: Right whale *(Balaena glacialis*), Sei whale (*Balenoptera borealis*), Blue whale (*Balaena musculus*), Sperm whale (*Physeter macrocephalus*), Finback whale (*Balaenoptera physalus*), and Humpback whale (*Megaptera novaeangliae*). The right whale is the only species likely to be encountered during construction.

The National Recovery Plan for the Northern right whale, dated December, 1991 (NMFS, 1991), defines the coastal waters of the southeastern United States and, especially, the

shallow waters from Savannah, Georgia, south to Cape Canaveral, Florida, as the wintering ground for a small but significant part of the Atlantic right whale population. Right whales visit the coasts of Georgia and Florida to calve in shallow offshore coastal waters. The winter calving season for the right whale appears to begin as early as September and can end as late as April. The peak of right whale abundance off the coast of Georgia is from December through March. This coincides with the construction window for the proposed Tybee Island Shore Protection Project. Most right whales spotted in the southeast are found from 1 to 15 nautical miles offshore (Kraus et al. 1993; Ellis et al. 1993). A Biological Opinion issued by the NMFS on 25 November 1991 concluded that pipeline dredges were not likely to adversely affect listed whale species. Therefore, no adverse impacts to right whales are expected while using pipeline dredges.

Accidental collisions with shipping vessels appear to be the most serious threat to right whales. To ensure that the proposed shore protection project would not impact right whales or other whale species and dolphins, the contractor shall be required to implement an endangered species watch plan during project construction. The Endangered Species Watch Plan shall be similar to previously approved watch plans for the Tybee Island Erosion Control Project detailed in the Biological Assessment of Threatened and Endangered Species for the South Tip Beach/Tybee Creek Project (USACE 1997 and 2008). The watch plan shall extend for the entire period of dredging and transportation of material from the borrow area to the beach project area. The Right Whale Early Warning Systems (RWEW) shall be in place during the period of project construction, and the dredging contractor would be required to abide by all operating rules emanating from the RWEW system. Based upon these protective measures and monitoring protocol, the proposed shore protection project is unlikely to result in adverse impacts to right whales and other migratory whale species and Atlantic bottlenose dolphin (Miller et. al, 2008).

A.4.02 To ensure that the proposed work would not impact whales, manatees, sea turtles, sturgeon or piping plovers special conditions would be added to any contract issued. These conditions are described below.

Special Conditions

- Invasive Species Prevention Plan. USDA Quarantine Requirements for Cleaning Equipment. USACE and the U.S. Department of Agriculture (USDA) have a compliance agreement requiring measures to prevent the spread of certain plant pests that may be present in the soil (ER 1110-1-5). Major portions of all southeastern states are in a quarantine area for such pests, including the imported fire ant. In addition, adjacent states to the north have introduced infestations resulting from movement of soil from infested southeastern states. The Contractor shall thoroughly clean all construction equipment and tools at the previous job site in a manner that ensures that these implements are free from residual soil, egg deposits from plant pests, noxious weeds, and plant seeds. Equipment shall be cleaned using water under pressure, and hand tools shall be thoroughly cleaned by brushing or other means to remove all soil. In addition, all construction equipment used for this USACE contract

shall be thoroughly cleaned by the Contractor before it is removed from this job site. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements that may be necessary.

- Sea turtles, whales and West Indian Manatee have been sighted in the general vicinity of the project. The Contractor shall maintain a special watch for these species for the duration of this contract for these animals and any sightings will be reported to the Contracting Officer.

- Endangered Species Watch Plan. A watch plan (see sample, Attachment E-1) that is adequate to protect endangered species from the impacts of the dredging and associated operations must be approved by the Contracting Officer before any dredging activities take place. The watch plan shall be for the entire period of dredging and transportation of material from the borrow area to the beach project area and shall include the following:

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

- The contractor will instruct all personnel associated with the dredging and renourishing of the beach of the potential presence of manatees, dolphins, sturgeon, whales, and sea turtles, and the need to avoid impacts to these species.

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

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

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

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

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

- Dredge lighting must be shielded, or low-sodium, to prevent potential disruption of courtship or nesting by sea turtles during 1 May through 30 August.

- The contractor agrees that any collision with a manatee, turtle, sturgeon or whale shall be reported immediately to the Corps of Engineers (912-652-5058), the U.S. Fish and Wildlife Service Coastal Suboffice (912-832-8739), and the Georgia Department of Natural Resources (Weekdays: 912-264-7218 or 1-800-241-4113; nights and weekends: 1-800-241-4113). Notification will also be made to the above offices upon locating a dead, injured, or sick endangered or threatened species specimen. Care will be taken in handling dead specimens to preserve biological materials for later analysis of cause of death. Any dead manatee(s) found in the project area must be secured to a stable object to prevent the carcass from being moved by the current before the authorities arrive. The finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. In the event of injury or mortality of a manatee, all aquatic activity in the project area must cease pending section 7 consultation under the Endangered Species Act between the U.S. Fish and Wildlife Service and the Corps of Engineers.

- All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

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

- Prior to each renourishment cycle, the Savannah District shall coordinate with the USFWS to review sea turtle nest records for Tybee Island and other pertinent data to determine if Section 7 consultation should be reinitiated.

- The contractor will keep a log detailing sightings, collision, or injury to manatees, sea turtles, sturgeon, whales, or other endangered species which have occurred during the

contract period. Following project completion, a report summarizing the above incidents and sightings will be submitted to the U.S. Fish and Wildlife Service, 4980 Wildlife Dr. NE, Townsend, Georgia 31331, to the GA DNR, Nongame Conservation Section, 1 Conservation Way, Brunswick, GA 31520, and to the U.S Army Corps of Engineers, Savannah District, Navigation Section, ATTN: CESAS-OP-SN, 100 W. Oglethorpe Ave., Savannah, Georgia 31401-3640.

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

- Shorebird monitoring will be conducted prior to and during construction activities in the vicinity of critical habitat unit GA-1. A 200 foot buffer zone will be established around feeding piping plovers. If necessary, construction activities would be modified to minimize any disturbance to wintering or migratory shorebirds on site. Any construction related activities that could potentially harass feeding piping plovers shall cease while piping plovers are in the buffer zone. If birds settle into designated construction areas such as truck routes, the creation of alternate truck routes would avoid disturbance to the birds. Relocation of the travel corridor shall also be considered if birds appear agitated or disturbed by construction related activities.

A.4.03 Other whales. Dredging activities are not expected to affect the other species of listed whales for two reasons. One, no other species of whales are expected to occur with regularity in the project area where the proposed dredging and beach nourishment would occur. Second, other whales are not known to exhibit behaviors that would make them susceptible to ship collisions, as is known to be the case for the right whale.

A.4.04 Sea Turtles. Five species of threatened or endangered sea turtles are found along the Georgia coast. These include the Kemp's (Atlantic) Ridley turtle (*Lepidochelys kempii*), green turtle (*Chelonia mydas*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), and Hawksbill turtle (*Eretomochelys imbricata*). Of these species only 2 have been known to nest on Tybee Island, the loggerhead and the leatherback. In 2012 Tybee had the highest nesting loggerhead record with 23 nests with an 83.2% mean hatch success rate. Loggerhead nesting was high in 2013 with 21 nests on Tybee Island. Georgia had its highest number of nests statewide during 2013 with 2,314 recorded (www.seaturtle.org). The 1997 National Marine Fisheries Service Biological Opinion on hopper dredging in the southeast found that hopper dredging was much more likely than pipeline dredging to result in adverse impacts to sea turtles. Therefore, negative effects to sea turtles are not anticipated during dredging at the proposed offshore borrow site in association with the use of a hydraulic cutterhead pipeline dredge. To ensure that dredging operations are not likely to adversely impact sea turtles, all dredging operations would be done in compliance with the appropriate Biological Opinion for navigation channels in the southeast issued by the NMFS. Informal consultation has been initiated with the USFWS in accordance with Section 7 of the Endangered Species Act. Further agency coordination will be conducted in December 2013 after District and Division review. The District determined if the

renourishment extends past April 30 loggerhead and leatherback sea turtles are likely to be adversely affected. With implementation of the project with the previous 2008 NMFS and USFWS conditions, this project is not likely to adversely affect sea turtles or their habitat.

The USFWS has issued a petition to designate Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle on several beaches in Georgia including Little Tybee Island and Wassaw Island. Tybee Island is not included in the proposed listing and does not contain habitat which has been previously designated as being critical for the species' survival.

Loss of turtles could occur by means of broken eggs resulting from sand compaction after beach nourishment. Such an event is expected to be unlikely because the dredged material grain sizes are expected to match existing beach sand sufficiently to avoid major compaction problems. Any escarpments in excess of 18 inches extending for more than 100 feet and exceeding 500 cone penetrometer index units (cpu) would be mechanically leveled to the natural beach contour for three consecutive turtle nesting seasons following renourishment. Only areas of compaction greater than 500 cpu and greater than 18 inches high by 100 feet long need to be mechanically leveled. Escarpments that are not compacted should not be mechanically leveled regardless of their size as they do not present a problem to sea turtles. Direct impacts to nesting and hatching sea turtles will be avoided by project construction outside of the turtle nesting season. The proposed construction window is between November 2015 and 30 April 2016 in order to avoid impacts to nesting and hatching sea turtles, larval fish, macroinvertebrate, and shrimp species. Between 1999 and 2007, the latest recorded hatching date was September 20.

The nesting season for loggerheads in this area extends from May 1 through August 30 and the hatching season extends to October 31. Project construction during sea turtle nesting season in Chatham County (May 1st through October 31st) would involve greater potential for mechanical destruction of nests and burial of nests, greater likelihood for encounters with construction equipment/pipes on the beach during nesting activities; increased beach sand compaction due to the presence of heavy equipment and sand deposition, and negative impacts associated with construction-related lighting. Loss of sea turtles would not be expected from the proposed project because of the conditions in the contract that would be in place to protect nesting turtles (Paragraph 4.02).

The Savannah District will seek coordination with GA DNR and NOAA PRD for any activities which may affect sea turtle nesting. Requirements to minimize adverse impacts will include tilling after construction and monitoring beach profiles and compaction levels for at least three years after construction. The City will comply with tilling requirements for the first three years after construction. The renourishment project will be tilled to 36 inches and graded immediately after construction as part of the contract.

A.4.05 GA DNR requires beach construction occur outside the sea turtle nesting season (May 1 – October 31). However, nesting data from Tybee indicate the season is generally over by mid-September.

A.4.06 Tybee Island has passed a beachfront lighting ordinance that applies, with minor exceptions, to all public and private artificial exterior lights within direct line-of-sight of the beach during nesting season and hatching season. A copy of the ordinance can be found at Attachment EA-2. This ordinance seeks to minimize disturbance and disorientation to nesting turtles and hatchlings.

A.4.07 Manatee. Manatees inhabit sluggish rivers, sheltered marine bays, and shallow estuaries, eating most aquatic plants and any terrestrial plants they can reach. Records in Georgia are primarily random sightings and carcass finds and are not the result of systematic research. Systematic aerial surveys were initiated in 1976, and sight records have been increasing in south Georgia in recent years. The Georgia population is primarily migratory in nature and, therefore, fluctuates with season. The majority are sighted in the southern portions of the Georgia coast. Manatees are found in Georgia mainly during the warmer months of the year. During the winter months, most manatees are restricted to peninsular Florida. During the summer, manatees disperse with some individuals moving north along the Atlantic Coast to North Carolina and others west along the Gulf coast to extreme western Florida. Manatees are known to inhabit both salt and fresh water habitats throughout their range where sufficient depths are available (1-5 meters or more). Between October and April, manatees appear to concentrate in areas of warmer water; during other months, they appear to choose areas with an adequate food supply and water depth, often in close proximity to a source of fresh water.

The likelihood of an encounter with a manatee therefore, varies with season but is not likely to occur in the surf zone along the beach during project construction.

Georgia DNR has records of manatees observed in the vicinity of Little Tybee and Tybee Island. This includes manatees observed in the Back River at Tybee Island, back side of Tybee Creek, and in Lazaretto Creek near Tybee Island. There are other records from the Wilmington and Bull Rivers that place manatees in the general vicinity of Little Tybee.

The proposed beach renourishment and dredging operation could impact manatees if precautions are not taken to avoid any adverse impact to this species. Due to the fact that they do occur in the general vicinity of the proposed project area, any dredging contract issued would include the conditions listed (paragraph 4.02) before to ensure protection of manatees (USACE, 1998).

A.4.08 Wood Stork. Wood storks are known to frequent the more protected estuarine areas of the region for both feeding and nesting. Wood stork rookeries and nesting areas are located on hammocks and along the edges of the marsh behind the barrier islands. This species has been observed in the Savannah Harbor area, including the upland disposal areas, Wright River, and particularly the Savannah National Wildlife Refuge.

These birds have a unique feeding technique and require higher prey concentrations than other wading birds. Optimal water regimes for the wood stork involve periods of flooding, during which prey (fish) populations' increase, alternating with drier periods during which receding water levels concentrate fish at high densities. Fish trapped in the disposal sites during maintenance dredging may provide a source of food for wood storks once dewatering of the site nears completion. No suitable habitat for this species would be impacted by beach nourishment activities.

A.4.09 Piping Plover. The piping plover (*Charadrius melodus*) is a migratory shorebird endemic to North America. This species is a small, stocky shorebird that resembles sandpipers. The piping plover was listed by the USFWS as threatened and endangered on December 11, 1985. Preferred habitats for the species are sandy beaches along the ocean and inland lakes, bare areas in dredge disposal sites, and natural alluvial islands in rivers. Shorelines with little vegetation are preferred for both nesting and feeding. These plovers feed primarily on fly larvae, beetles, crustaceans, mollusks, and other invertebrates that they pluck from the sand (Bent, 1929). Breeding grounds along the Atlantic Coast range from Newfoundland to North Carolina. Wintering areas on the Atlantic Coast are from North Carolina southward through Florida and in the Bahamas and West Indies. This species occurs on Tybee Island as a winter resident. It departs its breeding grounds for wintering areas by early September and returns to its breeding grounds in late March or early April. This species has been observed as early as August on Wassaw Island and as early as October at Tybee Island where it is most often found on the north end of the island, west of the north jetty and outside the project area (Steve Calver, personal communication). The species generally avoids areas frequently disturbed by humans and pets. No work would be done in the area in which the species is most often observed. Therefore, disturbance to the species is expected to be minimal since this bird is highly mobile and feeds through the area. Newly deposited material may temporary enhance feeding opportunities, although the work is expected to later result in a temporary decline in some benthic organisms on which this species may feed (USACE, 1998). The Savannah District determined that implementation of this project may affect piping plovers and designated critical habitat unit GA-1.

USFWS designated critical habitat for the piping plover in its wintering range on July 10 2001 (66 FR 17; 36038-36143). Critical habitat includes the land from the seaward boundary of mean low low water (MLLW) to where densely vegetated habitat, not used by the species, begins and where the constituent elements no longer occur. Paved areas such as parking lots are not considered critical habitat. The project area does contain habitat which has been designated as being critical for the species' survival. There are five critical habitat units for wintering piping plover within the vicinity of Tybee Island, extending from Unit GA-1 at the north end of the Tybee Island shore protection project area south to Unit GA-5 on Ossabaw Island (Figure 6). Unit GA-2 is located immediately south of the project area on Little Tybee Island and Units GA-3 and GA-4 are located south of Little Tybee Island on Wassaw Island. A small portion of the north end of the project (approximately the first 2,300 feet south of the north jetty) is within the Critical Habitat Unit GA-1 for piping plovers (See Figures 5, 6 and 7). Piping plovers

may be found on the north tip of Tybee Island between August and early April; therefore, project construction would occur during the months when wintering piping plover would be utilizing the critical habitat. Although the designated critical habitat contains a portion of the front beach south of the north jetty, the species generally favors tidal flats occurring west of the north jetty. Direct, short-term foraging habitat losses would occur along the beach during sand placement within Unit GA-1 during the winter months. However, since only a small portion of Critical Habitat Unit 1 will be directly affected by beach fill placement, adjacent foraging habitat would be available for wintering piping plover immediately west of the construction area within Unit GA-1. The majority of Unit GA-1 would remain undisturbed during construction activities, and high-quality foraging habitat for piping plover and other shorebird species located north and west of the beach fill placement area would not be impacted.

During the 2008 renourishment a twice monthly bird survey was conducted pre, during, and post construction over a 9 month period. One of the two surveys per month was conducted of the entire Unit GA-1 between one hour before high tide and one hour after high tide. The other survey was conducted when birds were feeding either at low tide or on a falling tide of the entire beach. Results of the survey discovered Piping plovers were present in Critical Habitat Unit GA-1 during 80% of the north end surveys and during 20% of the entire beach surveys, with a higher abundance observed on the southern tip. No takes were observed or reported (USACE Tybee Island 2008 EA and Bird Survey). No piping plovers were observed near the active construction sites. Several gull species, sanderlings, boat tailed grackles, and at least one willet were observed gathering at the dredge pipe output area presumably to feed on any species coming through the pipe. Most birds avoided the pipeline output. During tilling operations, all bird species tended to avoid the active construction area.

The proposed project has the potential to adversely affect critical wintering habitat unit GA-1, as well as overwintering and migrating plovers within the proposed project area. The Savannah District will work closely with the USFWS to ensure special protection measures are implemented to minimize impacts to the Piping plovers. Since a small portion of the Critical Habitat will receive material that area may receive positive impacts from increased feeding and roosting areas although a decline in benthic organisms in the renourished segment is likely for a short time span due to covering by fill. It is expected benthic organisms will naturally re-populate the areas of fill over time. Additional minor disturbance of foraging activities is possible due to the location of a construction staging area located west of the beach/dune area in the vicinity of Fort Screven (Figure 7). No equipment or supplies would be stored within the critical habitat area. Given that the construction staging area will be limited to the upland area in the vicinity of the north beach parking lot (Figure 7), potential impacts should be temporary and minor. It is likely that the birds would avoid the immediate construction staging area and utilize the foraging habitat immediately adjacent to this area within Unit GA-1 (Miller et. al., 2008).

Required shorebird monitoring during construction activities in the vicinity of Unit GA-1 and establishment of buffer zones during construction operations should provide

sufficient protection for wintering piping plover. Therefore, direct impacts to foraging activities along the beach shoreline should be minimal. Refer to the U.S. Fish and Wildlife Service Biological Opinion (Appendix D) for a complete analysis of direct, indirect, and cumulative effects of the proposed action on critical habitat for piping plover. A 200-foot buffer zone shall be established around feeding piping plovers. Any construction related activities that could potentially harass feeding piping plovers shall cease while piping plovers are in the buffer zone. Construction activities would be modified to minimize any disturbance to wintering or migratory shorebirds on site. If birds settle into designated construction areas such as truck routes, the creation of alternate truck routes would avoid disturbance to the birds. Relocation of the travel corridor shall be implemented if birds appear agitated or disturbed by construction related activities. Site-specific buffers shall be implemented adjacent to the travel corridors or staging area.

Some activity would be maintained within the designated construction areas on a daily basis, without directly disturbing any shorebirds documented on site or interfering with sea turtle nesting, especially when those corridors are established prior to commencement of construction. The direct placement of sand within the project area will result in high mortality of benthic infauna at the beach fill site. The majority of infaunal loss will be in the shallow waters of the surf zone. Infaunal prey density has frequently been shown to affect habitat use in shorebirds (Goss-Custard et al. 1991). Research by Peterson et al. (2006) suggests that impacts to foraging habitat for shorebird species within the proposed Tybee Island project area would be short-term (less than one-year) (Miller et. al, 2008). Additional discussion regarding the impacts to and recovery of the prey base for foraging shorebirds is presented in Section 4.18.1 of the EA.

While the proposed project has the potential to adversely affect critical wintering habitat unit GA-1, as well as overwintering and migrating plovers within the proposed project area it is the District's belief that the piping plover and designated critical habitat areas would ultimately benefit from the project.

Georgia Department of Natural Resources reported a total of 6 piping plovers sighted during their annual winter surveys in January for the years 2006-2012 (Table 10 EA), an average of 0.9 birds/yr. Piping plovers are more often seen on Little Tybee Island, an undeveloped barrier island located less than 1 mile to the south of Tybee Island.

Figure 5: Fill limits For 2015 Tybee Island Beach Renourishment Within Piping Plover Critical Habitat

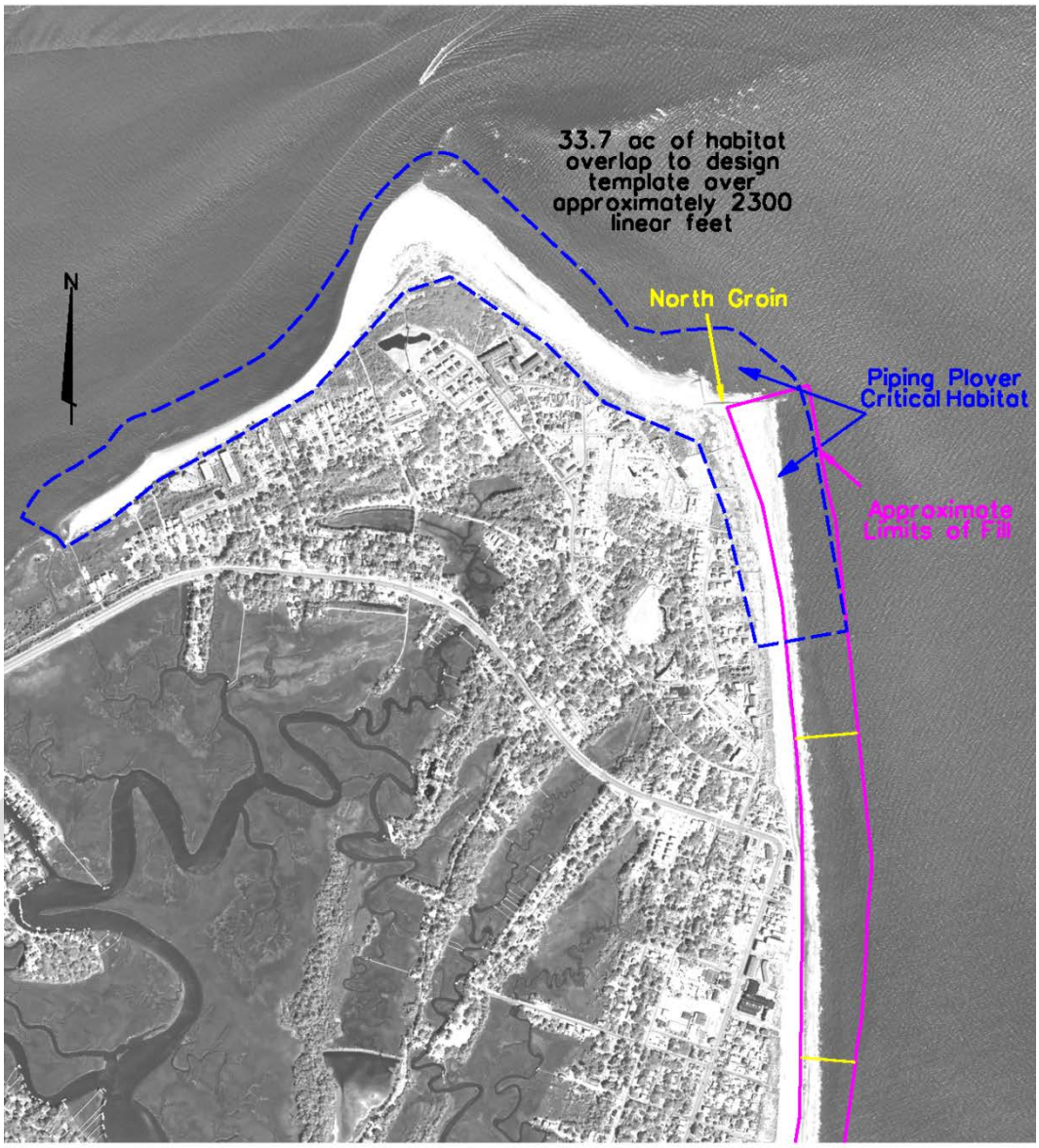
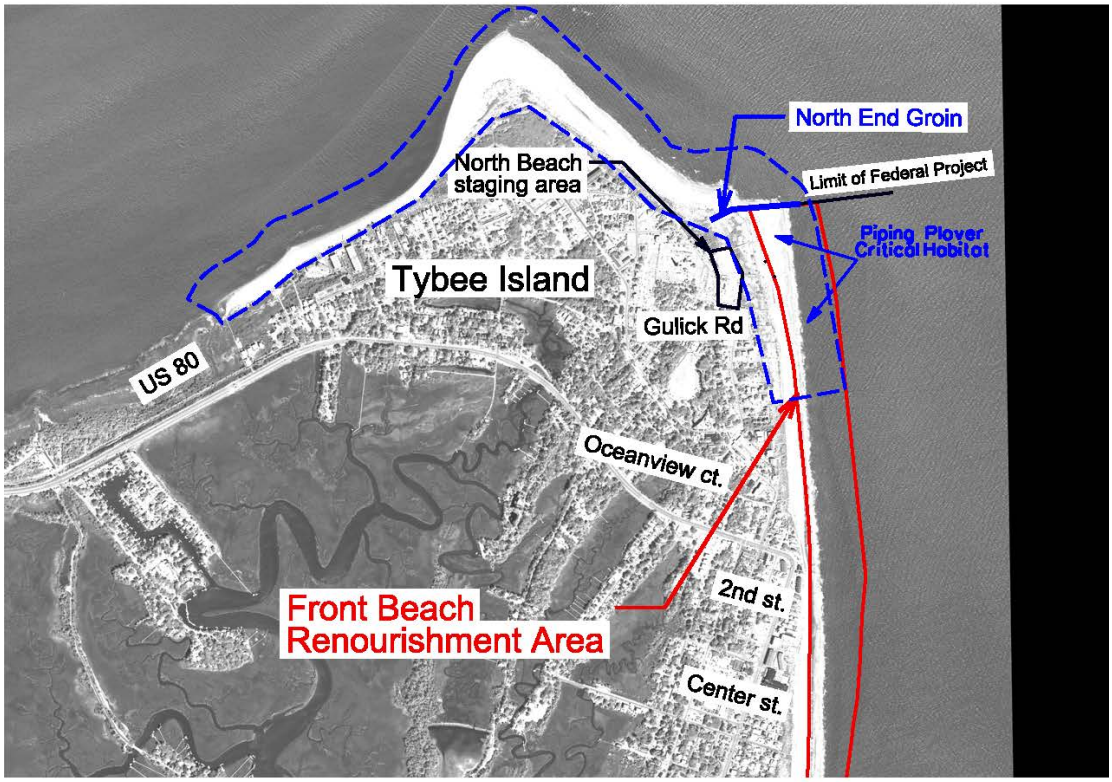


Figure 6: Piping Plover Critical Wintering Habitat: Unit GA-1, Tybee Island (Source: U.S. Fish & Wildlife Service)

Figure 7: Location of North Beach Staging Area adjacent to Critical Habitat Unit GA-1 for piping plover.



E.4.10 Shortnose Sturgeon

The shortnose sturgeon is an anadromous species restricted to the east coast of North America. They have been recorded from New Brunswick to Florida. Throughout its range, shortnose sturgeon occur in rivers, estuaries, and the sea. This species is known to occur in the Savannah, Ogeechee and Altamaha Rivers. The shortnose sturgeon is a suctorial feeder. The preferred prey is small gastropods (NMFS, 1984), but the species will feed on crustaceans, insect larvae, and mollusks (NMFS, 1995). Hall et al., 1991, mention the small clam *Corbicula* as being a possible prey item.

In the majority of the populations, the greatest abundance occurs in the lower portions of the estuary of their respective river systems (NMFS, 1984). They remain in the estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. The general pattern of seasonal movement appears to involve an upstream migration from late January through March when water temperatures range from 9°C to 12°C. Post-spawning fish begin moving back downstream in March and leave the freshwater reaches of the river in May. Juvenile and adult sturgeon use the area located 1 to 3 miles from the freshwater/saltwater interface throughout the year as a feeding ground. During the summer, this species tends to use deep holes at or just above the freshwater/saltwater boundary (Flournoy et al., 1992, Rogers and Weber, 1994, Hall et al., 1991).

Though five Shortnose sturgeon takes by a pipeline (hydraulic cutterhead) have been documented in the Delaware area, the potential for significant numbers of adult and juvenile fish being taken by the cutterhead is fairly low. Eggs and larvae would be expected to be found well upstream and would not be expected to be impacted by the project. Juvenile shortnose sturgeon spend their first year in the upper freshwater reaches of the estuary. No shortnose sturgeon larvae (including ichthyoplankton and ichthyofauna) were found during a 2-year study in 2000 in the Savannah River estuary (Jennings and Weyers 2003). No indication was found that the shortnose sturgeon frequents barrier island beaches. The proposed project may affect but is not likely to adversely affect shortnose sturgeon or their preferred habitats.

E.4.11 Atlantic Sturgeon

The Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) was listed as endangered on February 6, 2012 by NMFS. This listing applies to the South Atlantic and Carolina population segment (one of 5 Distinct Population Segments (DPS) off the US East Coast). This anadromous fish resembles the Shortnose sturgeon, with the most distinguishing physical differences being a longer more pointed snout and a larger maximum size. Atlantic sturgeon spawn in freshwater but primarily lead a marine existence. Currently, there are an estimated 343 spawning adults in the Altamaha and less than 300 spawning adults (total of both sexes) in each of the other major river systems occupied by the DPS, whose freshwater range occurs in the watersheds of the Ashepoo, Combahee, & Edisto (ACE) River Basin in South Carolina to the St. Johns

River, Florida. The South Atlantic DPS was proposed for listing as endangered under the Endangered Species Act (ESA) as a result of a combination of habitat curtailment and alteration, overutilization in commercial fisheries, and inadequacy of regulatory mechanisms in ameliorating these threats and impacts.

The Savannah River supports spawning and Young of Year (YOY) species (NMFS 2010) which utilize the river for nursery grounds. Riverine systems where gravid Atlantic sturgeon or YOY (< age-1; ≤ 41 cm total length (TL) or 35 cm fork length (FL)) have been documented within the past 15 years were considered to contain extant spawning populations, as this is the average period of time to achieve sexual maturity (2007 NMFS Status Review of Atlantic Sturgeon).

Adult and juvenile sturgeons are believed to be very mobile, even when occupying resting areas during the summer months (deep holes and other deep areas). Based on the current understanding of the different dredging operations relative to sturgeon behavior, clamshell and hydraulic cutterhead dredges are still considered by NMFS as alternative dredge types to reduce potential entrainment impacts to sturgeon (NMFS, 1998). The 1995 NMFS BO on beach renourishment activities in the southeastern U.S. from North Carolina through Florida East Coast states "A formal consultation conducted on dredging and beach nourishment operation from North Carolina through Cape Canaveral, Florida, in 1991, and incorporated by reference, concluded that clamshell and pipeline dredges were not likely to adversely affect listed species. There is no new information to change the basis for that finding."

It is not expected that Atlantic sturgeon would commonly use habitats, open nearshore ocean, where the project's activities would be performed. No impacts to sturgeon eggs or larvae are expected. In addition to existing information, an extensive monitoring study in the SE US is being funded by NOAA on the Atlantic and Shortnose sturgeon. This effort began in the spring of 2011 and is scheduled to last for 5 years. The work in the Savannah River is being conducted by SC DNR (USACE SHEP EIS BATES Appendix B July 2012).

No Critical Habitat rules have been published for the Atlantic sturgeon. The proposed project may affect but is not likely to adversely affect Atlantic sturgeon or their preferred habitats.

E.4.12 Eastern Indigo Snake. This snake seems to prefer high, well-drained sandy soils, such as the sandhill habitat preferred by the gopher tortoise. During the warmer months, these snakes also frequent streams, swamps, and occasionally flat woods. No habitat used by this species would be impacted by the project (USACE, 1998).

A.4.13 Flatwoods salamander. Adults and subadults prefer open mesic pine/wiregrass flatwoods dominated by longleaf or slash pine. During breeding season (Oct-Dec) salamanders move to isolated, shallow, small depression (forested with emergent vegetation) that dry on a cyclic basis (www.fws.gov). In conclusion, the proposed

project would not adversely affect this species. In addition, the project area contains no habitat which has been designated as being critical for the species' survival.

A.4.14 Pondberry. Habitat includes shallow depression ponds of sandhills, margins of cypress ponds, and in seasonally wet low areas among bottomland hardwoods (www.fws.gov). In conclusion, the proposed project would not adversely affect this species. In addition, the project area contains no habitat which has been designated as being critical for the species' survival.

A.4.15 Red-cockaded woodpecker. This species requires forested habitat of at least 50 percent pine 30 years or older. No habitat that could potentially be used by this species would be impacted by the project. No known colony of these woodpeckers is located along Tybee Island. In conclusion, the proposed project would not adversely affect this species. In addition, the project area contains no habitat which has been designated as being critical for the species' survival.

A.4.16 Bachman's warbler. The present distribution of Bachman's warbler is unknown. Some authors consider it to probably be extinct (Post and Gauthreaux, 1989). Sightings in the mid 70's came from Charleston County, South Carolina; several Louisiana locations; Kentucky; Maryland; and near the Long/McIntosh County line in Georgia. The last sighting in Georgia was in 1976. This species formerly bred mostly in swamps with an understory of cane. It is currently extremely rare with very few recent sightings. Most authorities agree that if the Bachman's warbler still exists it is most likely in the I'on Swamp area in Charleston and Berkeley Counties, South Carolina. No habitat used by this species would be impacted by the project. Therefore, the proposed project would not adversely affect this species. In addition, the project area contains no habitat which has been designated as being critical for the species' survival.

A.4.17 Kirtland's warbler. This very rare warbler breeds in Michigan and winters in the Bahamas. It is a rare transient along the Southern Atlantic Coast, including Georgia. We are aware of no estimate of the number of individuals migrating through the state. It would be expected to occur as a very rare migrant in coastal scrub and forest land, especially after storms. No habitat would be impacted by this project that this species might use. Therefore, the proposed project would not adversely affect this species.

A.5.00 Quality of Dredged Material. Sediment testing was performed in the project area to assess the potential for contaminant-related environmental impacts from the dredged material. The dredging material did not contain contaminants at an unacceptable level (see EA E.3.08.2. Hazardous and Toxic Waste).

A.6.00 Project Timing. The project is proposed for construction beginning in November 2015 and completing in April 2016. However, various circumstances may occur which delay project implementation or completion.

A.7.00 Coordination. In August 1995, the NMFS released a Regional Biological Opinion covering dredging. In July 2008, USFWS issued a Biological Opinion for this project on piping plovers and their critical habitat Unit-GA-1, and nesting loggerhead and leatherback sea turtles. This BATES incorporates the conditions included in those opinions.

A.7.01 This BATES will be submitted to the NMFS and the USFWS for review and comment during public review period of the draft Environmental Assessment.

A.8.00 Determination. Based on the above evaluation, I find that the proposed project for Tybee Island Shore Protection as proposed in the Environmental Assessment and as outlined in this document will not have significant adverse impacts on these species provided the conditions listed below for the protection of Manatees, Right Whales, Piping Plovers, Sturgeon and Sea Turtles are made a part of the dredging contracts:

a. The contractor will instruct all personnel associated with the dredging and construction of the presence of manatees, right whales, sturgeon and sea turtles and the need to avoid collisions with these species.

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

c. Any collision with a manatee will be immediately reported to the Corps of Engineers' Contracting Officer's Representative (912-652-5058), the U.S. Fish and Wildlife Service Coastal Suboffice (912-832-8739), and the Georgia Department of Natural Resources (weekdays 8:00 a.m. - 4:30 p.m.; 912-264-7218 or 1-800-272-8363; nights and weekends: 1-800-241-4113).

d. All construction activities in open water will cease upon the sighting of manatees within 50 yards of the project area. Construction activities will not resume until the manatee has not been seen in the project area for at least 30 minutes. Upland construction activities will not be required to cease in the event of a manatee sighting.

e. The contractor will keep a log detailing sightings, collisions, or injury to manatees which occur during the dredging operations.

f. A report summarizing the above incidents will be provided to the Savannah District for coordination with the U.S. Fish and Wildlife Service, 4980 Wildlife Dr. NE, Townsend, Georgia 31331.

g. All vessels associated with the project will operate at "no-wake" speeds at all times while in the water where the draft of the vessel provides less than four feet of clearance from the bottom and that vessels will follow routes of deep water to the extent possible.

h. The contractor will instruct all personnel associated with the dredging of the presence of Right Whales and the need to avoid collisions with these mammals. The contractor should also brief all personnel on the habits and behavior of the Right Whale.

i. The contractor shall restrict vessel speeds during the high risk season of December to March of each year such that collisions with adult or juvenile whales can be avoided.

j. The contractor shall be required to post a whale watch and submit a whale watch plan prior to conducting any dredging activities at the site. These measures apply to the dredge and any attendant vessel associated with the dredging activity with a length of over 20 feet.

k. Shorebird monitoring will be conducted during construction activities in the vicinity of critical habitat unit GA-1. A 200 foot buffer zone will be established around feeding piping plovers. If necessary, construction activities would be modified to minimize any disturbance to wintering or migratory shorebirds on site. Any construction related activities that could potentially harass feeding piping plovers shall cease while piping plovers are in the buffer zone. Surveys to detect piping plovers or concentrations of other wintering or migratory shorebirds would begin prior to construction commencement and be conducted once every two weeks by the Contractor through April 30, or the end of construction, whichever comes first. If birds settle into designated construction areas such as truck routes, the creation of alternate truck routes would avoid disturbance to the birds. Relocation of the travel corridor shall also be considered if birds appear agitated or disturbed by construction related activities.

l. Each dredging and construction contract for the Tybee Island Shore Protection Project will contain the following provisions:

1. Each contractor will be required to instruct all personnel associated with the dredging/construction project about the possible presence of endangered right whales, manatees, sturgeon and sea turtles in the area and the need to avoid collisions. Each contractor will also be required to brief his personnel concerning the civil and criminal penalties for harming, harassing or killing species that are

protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972.

2. Dredges and all other disposal and attendant vessels are required to stop, alter course, or otherwise maneuver to avoid approaching the known location of an endangered species.

3. The contractor will be required to submit an endangered species watch plan that is adequate to protect right whales, manatees, and sea turtles from the impacts of the proposed work. This plan will include provisions on board the dredge and all attendant vessels of trained observers (in accordance with the NMFS Regional Opinion) to watch for right whales at all times the vessel is in motion. Observers would be required during those months when these species may be expected to be present in the area.

4. Contractors will be required to use daily available information on the presence of right whales, manatees, and sea turtles in the project area. The dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge and attendant vessels must slow down to five knots or less when transiting between areas if whales have been spotted within 15nm of the vessel's path within the previous 24 hours. If a right whale is known to be within 15 nautical miles of the project area on a given day, dredges and any attendant vessels 20 feet or greater in length will be required to limit speeds that night to 5 knots or less when in the project area. The project area is defined as The Oceanfront Beach, South Tip Beach, Back River Beach, borrow area, and routes traveled between them.

5. If a Right Whale Early Warning System (RWEW) is in place, it will be used to provide adequate information on the presence of whales during dredging operations.

Figure 8: Staging and Access Areas: North Beach, Inlet Avenue and 19th Street

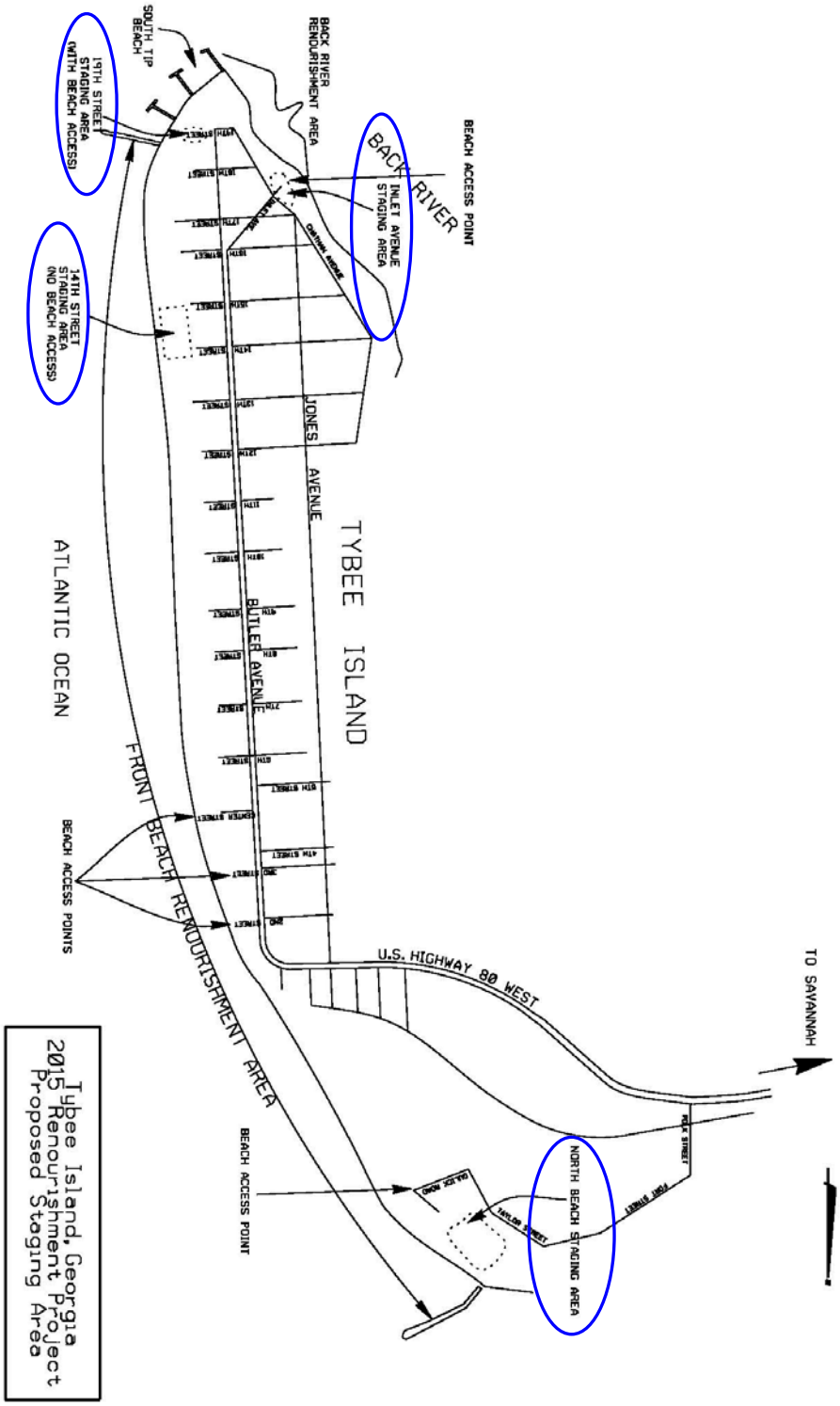


Figure 9: Inlet Avenue Staging Area

TYBEE ISLAND RENOURISHMENT PROJECT
INLET AVENUE STAGING AREA
1"=100'

Figure 10: 19th Street Staging Areas

TYBEE ISLAND RENOURISHMENT PROJECT
19TH STREET STAGING AREAS
1"=100'

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Attachments

Sample Endangered Species Watch Plan

City of Tybee Lighting Code

Sea Turtle Nest Monitoring Protocol

Temporary Manatee Awareness Construction Signs

BATES

ATTACHMENT EA-1

ENDANGERED SPECIES WATCH PLAN

TYBEE ISLAND SHORE PROTECTION PROJECT GEORGIA 2015 RENOURISHMENT

SAMPLE WATCH PLAN FOR ENDANGERED SPECIES

NAME OF DREDGING COMPANY

ENDANGERED SPECIES PROTECTION AND AWARENESS PROGRAM

PROJECT NAME

A. Purpose: Protection of an endangered species (manatee, sea turtle, whale, bird, etc.) during dredging and disposal operations for the above project.

B. Education of employees: Prior to initial work, job site meetings will be conducted by an environmental consultant, who will familiarize all employees with the habits and habitats of the locally found endangered species, together with detailed instructions and procedures for reporting endangered species sightings. This environmental consultant shall be familiar with the endangered species listed in paragraph D below and Federal regulations regarding their protection. Additional meetings will be conducted by an onsite coordinator as needed.

C. Awareness: In order to provide a continuous reminder to employees of the endangered species program, graphics will be displayed about the operating equipment and employees provided with a visual display.

D. Watch Plans: A watch plan that is adequate to protect endangered species from the impacts of dredging must be approved by the Contracting Officer and used during know times of endangered species presence. This plan shall be submitted for approval prior to the pre-construction conference. The watch plan should cover an area adequate to protect the endangered species from impacts associated with all types of dredging activities (i.e., dredging, disposal, blasting, etc.). All activities should stop when an endangered species is in the impact zone and not resume until the species is no longer in the impact zone. Surveillance is mandatory for the following species which are most likely to be present during the following times:

Right Whales----------September through April
Manatees----------March through December
Sea turtles----------April through December
Piping plovers----------August through April

Surveillance must be conducted to whatever extent (aerial, waterborne, etc.) necessary to detect the endangered species.

E. Reports: All sightings must be reported immediately to the dredge inspector within 24 hours of the sighting. Additionally, all sightings must be included in the daily report. Following completion of the project, copies of the daily reports with sightings shall be forwarded to the U.S. Army Corps of Engineers, Dredging Section, ATTN: CESAS-OP-NN, U.S. Army Engineer District, 100 W. Oglethorpe Avenue, Savannah, GA 31401-3640. All of the reports must be dated and signed by the Contractor or his/her representative including the name of the person making the sighting.

F. Submittals: The Contractor shall submit the Endangered Species protection and Awareness Program in the above format to the Contracting Officer for his/her approval before work is commenced in the times identified in Item D above. The submittal must identify the program's coordinator, surveillance personnel, and who will be responsible for reporting sightings.

ENDANGERED SPECIES SIGHTING INFORMATION

Date and Time:

Weather Conditions:

Oceanographic Conditions:

Location:

Species and Reliability of I.D. (sure, unsure):

Number of Animals:

Associated Organisms:

Characteristics Observed Which Resulted in Species Identification:

Behavior of Animals:

Photos Available:

Send to US Department of Commerce, NOAA
National Marine Fisheries Service
9450 Koger Boulevard
St. Petersburgh, FL 33702
ATTN: F/SEP 23

Additional Remarks:

Name and Address of Observer (Ship or A/C):

Endangered whale species, from top to bottom: northern right, southern right, humpback, blue, fin, sei and sperm whale. Source: P. Folkens

Whale Descriptions

Right: Rotund body without dorsal fin; distinctive bumps (callosities) on top of head; color black, brown or mottled with white region on chin and belly. Southern species almost indistinguishable from Northern but may be slightly larger and have minor differences in skull shape.

Humpback: Long nearly white flippers; lumpy dorsal fin; protuberances randomly distributed on the top of the head and lower jaw; distinctive patterns on flukes; color black with white region on belly.

Blue: Broad lat U-shaped head with single ridge from in front of paired blowholes almost to tip of snout; very small dorsal fin (13 inches tall); color bluish and often mottled.

Fin: Dorsal fin up to 24 inches tall located slightly more than 1/3 forward from tail; black on right side of lower jaw and white on the left; color dark gray to brownish gray.

Sei: Differs from other baleens by the very fine bristles (baleen); color dark steel gray on back and sides; often has a shiny or galvanized appearance due to ovid scars.

Sperm: Teeth in lower jaw; hump and ridges instead of dorsal fin; single blowhole to left of midline; large blunt head comprising 1/4 to 1/3 of total body; color bluish black.

Note: Whenever possible take photographs of your sightings. For right whales, photographs of the callosities on the snout are important because they allow individuals to be differentiated. Photographs of the flukes of humpback whales also allow for identification of individuals.

BATES

ATTACHMENT EA-2

CITY OF TYBEE
LIGHTING CODE

TYBEE ISLAND
SHORE PROTECTION PROJECT
GEORGIA
2015 RENOURISHMENT

City of Tybee Lighting Code Sea Turtle Nesting Season 1 May through 31 October

Sec. 3-230. Turtle nesting protection.

The beaches of Tybee Island serve as a prime nesting site for sea turtles, an endangered species. Coastal development threatens the survival of sea turtles because artificial lighting discourages nesting females and causes disorientation of hatchlings during the nesting season, which runs from May 1 through October 31 each year. It is the intention of the city to offer protection to these endangered sea turtles by providing standards for lighting in the shore protection area adjacent to the city's beaches. For the purposes of this section, the protected nesting area shall be the sand beaches of Tybee Island.

(A) Exceptions. The following point sources of artificial light are exempt from the provisions of this section:

(1) All lights necessary for the safe navigation of vessels utilizing the waters surrounding the city;

(2) All lights necessary to mark obstructions to the safe use of airspace over, above and around the city;

(3) All lights necessary for regulating the safe passage and movement of vehicular and pedestrian traffic within the city;

(4) Any light that has been specifically designated by the fire and/or police commissioner(s) as necessary for the security and safety of the human inhabitants of the city.

(B) New development. Building and electrical plans for new construction including parking lots, dune crossovers, and all other outdoor lighting that can be seen from the beach shall comply as follows:

(1) Floodlights shall be shielded and mounted so that no light illuminates the beach and the point source of light is not visible from the breach.

(2) Pole lighting shall be shielded and mounted so that light is directed away from the seaward side of the pole and the point source of light is not visible from the beach.

(3) Low profile luminaries shall be positioned so that no light shines directly onto the beach.

(4) Dune crossovers shall utilize low profile shielded lighting so that no light illuminates the beach and the point source of the light is not visible from the beach.

(5) Lights illuminating buildings and grounds shall be shielded or screened so that they do not illuminate the beach and the point source of light is not visible from the beach, or they shall be turned off from sunset to sunrise during the period of May 1 through October 31 of each year.

(6) Temporary security lights at construction sites shall not be mounted higher than 15 feet above ground and shall be positioned not to illuminate the beach.

(C) Existing development. All lighting shall come into compliance with the following standards:

(1) Lights illuminating buildings and grounds shall be shielded or screened so that they do not illuminate the beach and the point source of light is not visible from the beach, or they shall be turned off from sunset to sunrise during the period of May 1 through October 31 of each year.

(2) Lights illuminating crossovers shall be shielded or screened so that they do not illuminate the beach and the point source of light is not visible from the beach, or they shall be turned off during the period of May 1 through October 31 of each year.

(3) Security lighting shall be shielded or screened so that the beach is not illuminated and the point source of light is not visible from the beach, or low profile luminaries may be used.

(D) Publicly owned lighting. Streetlights and lighting of publicly owned beach access areas must be in compliance with the following:

(1) Wherever possible, streetlights shall be located, shielded or shaded so that they will not directly illuminate the beach and the point source of light is not visible from the beach.

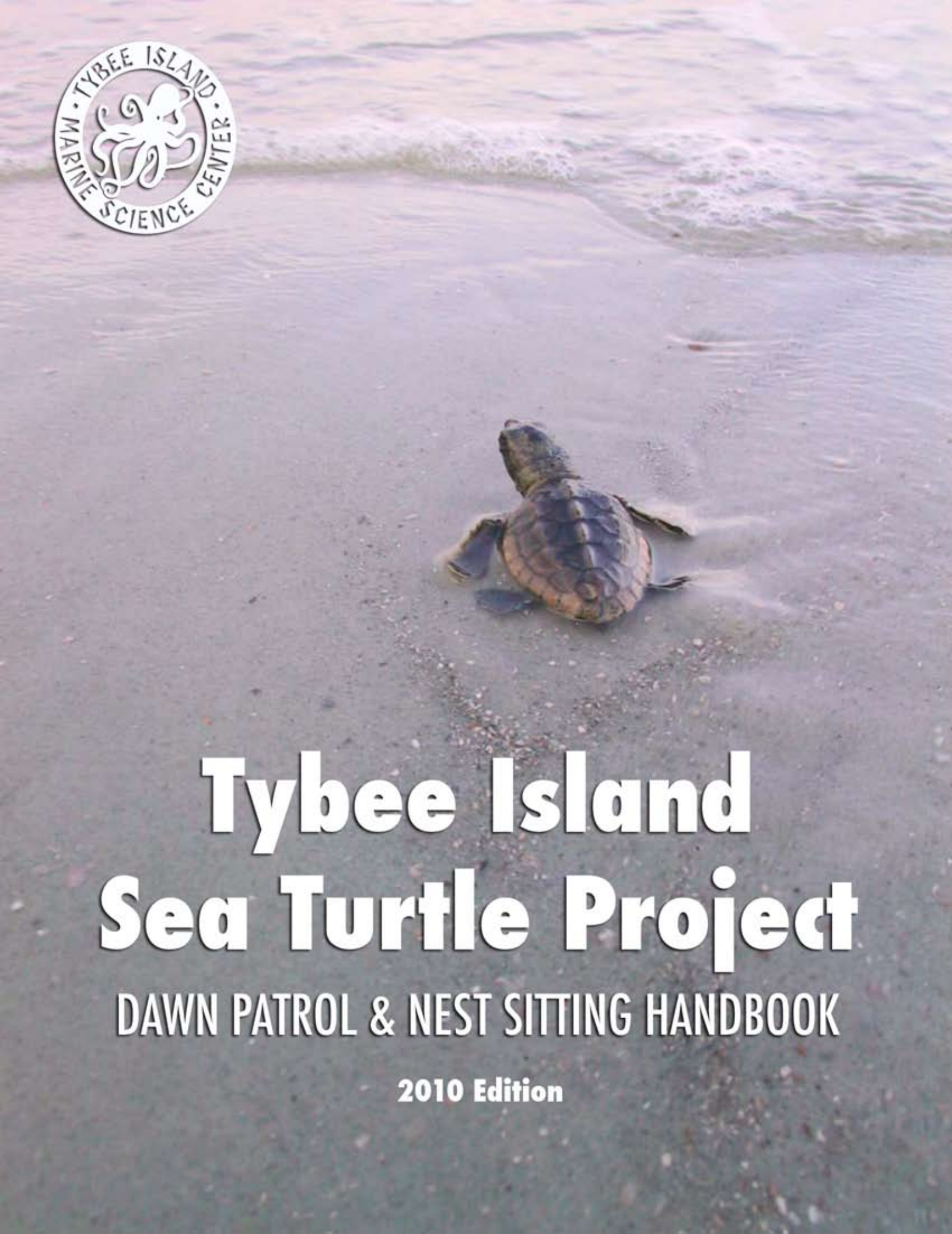
(2) Lights at parks or other public beach access points shall be shielded or shaded so that they will not directly illuminate the beach and the point source of light is not visible from the beach or, if not necessary for security or public safety, utilization may be discontinued during the nesting season.

BATES

ATTACHMENT EA-3

TURTLE MONITORING PROGRAM

TYBEE ISLAND
SHORE PROTECTION PROJECT
GEORGIA
2015 RENOURISHMENT



Tybee Island Sea Turtle Project

DAWN PATROL & NEST SITTING HANDBOOK

2010 Edition

Table of Contents

Intent and Introduction

A Sea Turtle Project Volunteer Cooperator is someone who participates in the dawn patrol schedule and occasionally participates in nest sitting. This handbook is intended to guide seasonal volunteer cooperators in those activities and answer any questions that they may have.

Currently, there are 13 DNR managed sea turtle projects in Georgia. Each year, permits are issued to the Sea Turtle Project Coordinator and participating volunteers, and it authorizes the sea turtle project staff to conduct research and management activities with sea turtles on the assigned Georgia Island in accordance with DNR regulations. In order to be issued a permit and become a volunteer cooperator, one **must** attend an **orientation and training session** with an authorized Georgia Department of Natural Resources representative. After this session, a permit will be issued to the Tybee Island Marine Science Center/Sea Turtle Project Coordinator and will include the names of those who completed the training. **If your name is not on the permit, you will not be authorized to participate in dawn patrol or nest sitting.**

'The Georgia Department of Natural Resources (GADNR) issues permits to cooperators working with marine turtles in the state of Georgia through cooperative agreement with the U.S. Fish & Wildlife Service under Section 6 of the Endangered Species Act. The cooperator is to be issued a letter of agreement (LOA) from the Georgia Sea Turtle Coordinator. This authorizes the principal permit holder to work with marine turtles under some or all of the conditions stated in the Sea Turtle Cooperator Master Permit (or Scientific Collecting Special Purpose Permit). Principal permit holders are responsible for insuring that all personnel authorized to work under the master permit are listed in the LOA. Cooperators are expected to know the terms and conditions in the master permit. It is mandatory that all personnel involved in the management of marine turtles be permitted by the state.' (1)

'The Endangered Species Act of 1973 is the primary federal law protecting marine turtles and their habitat. The purpose of the act is to provide a means whereby the ecosystem upon which endangered and threatened species depend on may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in this act. Chapter 391-4-10 "Protection of Threatened, Rare or Unusual; Species" from the *Georgia Conservation Law Handbook* is the primary state regulation protecting Georgia's marine turtles and their habitat.' (2)

As of 2007, Loggerhead turtles are listed as threatened under the federal Endangered Species Act, but are listed as endangered under the Georgia Endangered Species Act.

(1)(2) Information taken from Guidelines for GA DNR Sea Turtle Interns

History of Tybee Island Sea Turtle Project

Tybee Island has enjoyed many years of loggerhead sea turtles nesting on our beaches. Georgia Department of Natural Resources began collecting data on the turtle nest in 1989. This year will mark out 19 year in the study with GADNR.

Over the years our island has its share of nesting females who deposited their eggs on our wonderful beach. Many years ago, the nests were found and relocated by the Tybee Island Department of Public Works (DPW), to a fenced hatchery on the flat beach north of the northern most jetty. Later the nests were left in the location they were deposited by the nesting female. These nests were protected by large wood and metal cages. The cages posed a problem because they shaded the nest.

Beginning in 2000, Tybee Island Marine Science Center assumed responsibility as the primary manager of the Tybee Sea Turtle Project and began keeping the data for GADNR. Through the organized effort of the Sea Turtle Project Coordinator and the volunteer cooperators, dawn patrols are made daily, from May through October, to check for any turtle activity that occurred during the night. Every effort is made to leave the nest as natural as possible and to relocate a nest only when absolutely necessary.

The developed barrier islands of Georgia historically have lower numbers of sea turtle nests than undeveloped islands. The increase in human activity, lights, and pollution deter sea turtles from choosing Tybee Island as a viable nesting site. It is a goal of the Tybee Island Marine Science Center to address these issues and bring sea turtles back to Tybee Island through community involvement in the Tybee Island Sea Turtle Project and public education.

Dawn Patrol – May 1 to August 31

- Dawn patrollers locate any sea turtle activity: i.e. nest, non-nesting emergence, stranding, etc. and contact the Sea Turtle Project Coordinator when any activity is sighted. Volunteer cooperators are trained by GADNR staff as to current procedures for identifying and marking nests but should not verify nests, relocate nests, process strandings, record data, etc., without the Sea Turtle Project Coordinator present.

- Cooperators who will be acting as a dawn patroller will begin the morning beach survey as early as possible, usually at sunrise, rain or shine. Use common sense, do not go out if weather conditions are dangerous. The patrol requires walking the full length of Tybee beach at the most recent high tide line. It is important to stay alert the entire time, constantly surveying above and below the tide line. You may start at either end of the island, but parking is easier at the southern most section of the beach (last crossover and public parking at the end of Chatham Ave.). See following map for reference.

- A sign-up schedule for the months of May and June will be initiated at the DNR training session in April and repeated again at the end of June for the months of July and August.

- You will be responsible for your own transportation but if you get to the end of your walk and need a ride, there may be someone at the Tybee Island Marine Science Center available to pick you up and return you to your vehicle. Dawn patrols may be split as long as they overlap and one person is responsible for checking in at the end of the walk. By sharing walks, you can eliminate the transportation issue. If you do not have a Tybee Island parking sticker, you may obtain a parking pass for your dawn patrol days only from the science center.

- Cooperators are required to wear a Sea Turtle Project issued identification card and carry a cell phone. Other suggested items to bring are water, camera, bug spray, and a trash bag.

- If you cannot make a patrol, notify the Sea Turtle Project Coordinator 24 hours prior to your scheduled day. One “emergency” call will be allowed (canceling with less than 24 hour notice) but a second call will result in that cooperator being moved to a substitute list, and future patrols will be assigned to someone else. Messages or emails are not considered proper notification.

- **If tracks are found**, call the Sea Turtle Project Coordinator immediately at 912-484-3416 (Tammy Smith’s cell phone). Look for landmarks and the closest boardwalk (crossover) to identify location. If possible, identify the closest street to the crawl site. Please note that dawn patrol for the entire beach must still be completed. (See section on Nest Crawls and Site Identification for tracks reference.)

- **If tracks are not found**, report to the Sea Turtle Project Coordinator **no later than 10 am** with start/finish time and significant information relating to the patrol. This can be done by phone (912-484-3416) or email *Tammy@TybeeMarineScience.org*

- Once nests are identified and marked, dawn patrollers will need to check each nest during their patrol for any disturbance, wash out, or little hatchling crawls. An email will be sent to the volunteer cooperators when a new nest is found.

- It is possible that you may encounter a sea turtle stranding during your patrol (a dead animal that has washed up). This should be reported to the Sea Turtle Project Coordinator immediately. (See Strandings section for more information).

- Remember that during your patrol you are a representative of the Tybee Island Marine Science Center and GADNR. Please act professional and ecologically responsible. As a representative, it is important that you are educated on sea turtle ecology and conservation. The last section of this handbook contains sea turtle information pertinent to this project and frequently asked questions.

- Contact list and important telephone numbers:

  Tammy Smith - Sea Turtle Project Coordinator, cell 484-3416
  Cheryl Tilton – Volunteer Cooperator liaison , home 897-0736, cell 398-0550
  Tybee Island Marine Science Center 786-5917
  Police 786-5600
  Lifeguard Station 786-4573 ext. 119
  DPW 786-4573 ext. 120
  24 hour Stranding Hotline: 1-800-2-SAVEME

Nest Crawls and Site Identification

- The most common sea turtle tracks found on Tybee's beach are for the loggerhead turtle. They resemble alternating commas with a wavy, smooth center and are approximately 2 feet wide. Characteristics of a loggerhead nest site indicate tracks showing a secondary body pit with a mound of thrown sand that is wider than the track. It's possible that you may encounter a false crawl (turtle abandoned its nesting attempt) either above or below the high tide line. These false crawls should also be reported immediately so that the Sea Turtle Project Coordinator can record the data and report to GADNR. As a guide to help distinguish tracks while on dawn patrol, please refer to the following at the end of this section:

  Loggerhead tracks photographs
  Figure 1 - Characteristics of sea turtle tracks found on Georgia beaches.
  Figure 2 - Characteristics of loggerhead crawls

- If there is a crawl that might be a nest, contact the Sea Turtle Project Coordinator immediately to come and verify/mark the nest. **Do not disturb the tracks or the nest pit area.**

- **Nest verification:** Once a crawl has been located, it must be verified that the emergence resulted in a nest. **Only the Sea Turtle Project Coordinator is authorized to perform this verification.** This is done by gently removing the top layer of sand to expose the top eggs. Once the top layer of eggs is discovered, they are covered once again with the sand.

- **Nest relocations:** If a nest is located too close to the high tide line and in jeopardy of being washed over or in a well lit, high traffic area, it may be necessary to relocate it. **Only the Sea Turtle Project Coordinator is authorized to make this determination and perform the relocation. Relocation is a last resort action and the Sea Turtle Project Coordinator is technically limited by how many nests can be moved.**

- **Nest marking:** After a nest has been verified, it will be marked with stakes, yellow caution tape, and a GADNR sign identifying it as a sea turtle nest and stating it's a federal offense to disturb the nest. **Only the Sea Turtle Project Coordinator is authorized to mark the nest.**

Figure 1. Characteristics of sea turtle tracks found on Georgia beaches.

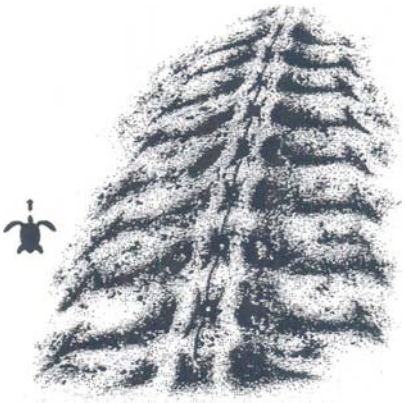
LOGGERHEAD TRACK

A. Alternating comma-shaped flipper marks

B. Wavy and smoothed track center with no thin, straight, and well-defined tail-drag mark

C. No regular marking from front flippers at the margins of the track

GREEN TURTLE TRACK

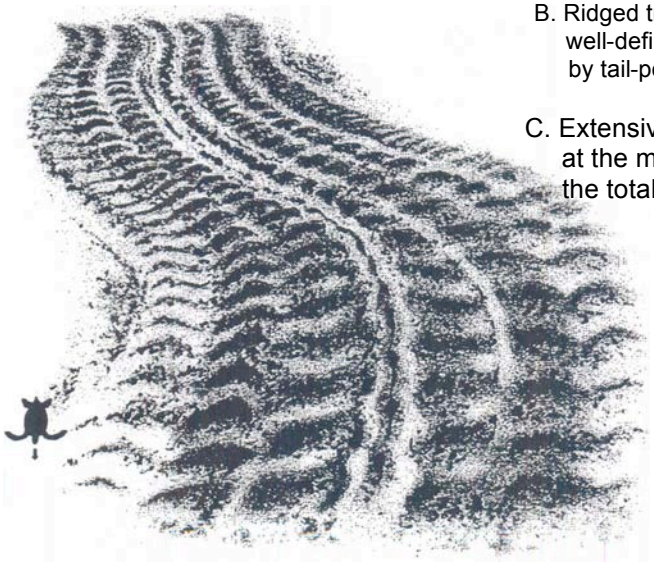


A. Parallel flipper marks as from a "butterfly-stroke" crawling pattern

B. Ridged track center with a thin, straight, and well-defined tail-drag mark that is punctuated by tail-point marks

C. Regular marking from front flippers at the margins of the track

LEATHERBACK TRACK



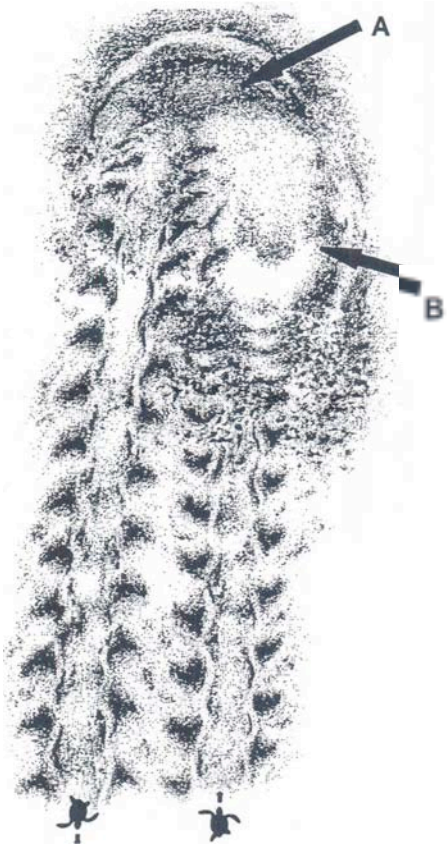
A. Parallel flipper marks as from a "butterfly-stroke" crawling pattern

B. Ridged track center with a thin, straight, and well-defined tail-drag mark that is punctuated by tail-point marks

C. Extensive marking from front flippers at the margins of the track and extending the total track width to 5 – 6 feet or greater

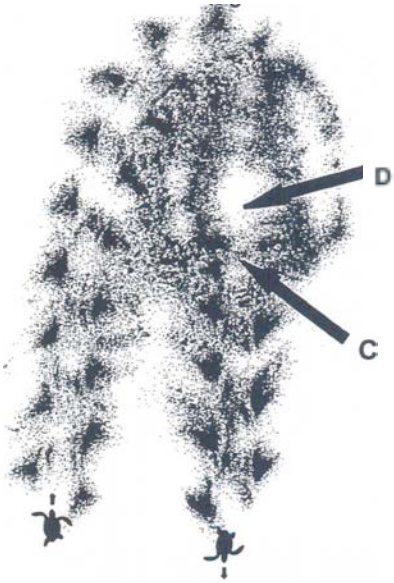
Figure 2. Characteristics of **loggerhead crawls** indicating either that the turtle had previously nested (left a nest) or had abandoned its nesting attempt (left a "false crawl").

A **loggerhead nest** site
showing a secondary body pit (A)
and a mound of thrown sand (B)
that is wider than the track.



A **loggerhead false crawl**
showing no evidence of
disturbed sand other than
the track.

A **loggerhead false crawl** showing a small abandoned primary body pit (C) and a mound of pushed sand (D) no wider than the track and lying between two conspicuous ridges.



Nest Sitting and Hatching

- Loggerheads lay an average of 120 ping pong sized eggs per nest. They are soft and leathery so that they will not break inside the sandy nest. The eggs incubate in the sandy nest for 50 – 70 days. When the weather is extremely hot for an extended period of time, incubation is usually shortened to 50 –55 days. The temperature of the nest determines the sex - higher temperatures produce more females, lower temperatures produce more males.

- Bring a flashlight covered with red brake light tape or multiple layers of red cellophane and a clean bucket (the science center can provide you with one). Make sure you have a cell phone and the number for the Sea Turtle Project Coordinator. **Cameras are not allowed**. Check in with the Sea Turtle Project Coordinator the next day to report how the night went, so that cooperator hours can be recorded.

- Do not go alone, don't leave valuables in you car, and lastly, don't leave litter (including cigarette butts) at the nest site.

- **At the first sign of a possible hatch (nest develops a small sink hole), call the Sea Turtle Project Coordinator immediately.** Do not disturb the hatchlings once they begin to emerge. **Hatchlings are NOT to be handled.** Stand back and make sure they are heading toward the ocean. Remember, we want their hatching to be as natural as possible. Specific protocol will be outlined in training and meetings regarding nests where disorientation is possible.

- **Your responsibility: Ward off predators – human and animal, keep count of how many hatchlings emerge, and make sure only trained cooperators are assisting with the hatch. All others should be standing off to the side and observing only.**

- **Remember, you are representing GADNR and the science center. Act accordingly and be prepared prepared to answer questions from visitors at the nest regarding sea turtle habitat, nesting cycles, and conservation.**

Nest Excavations

- According to GADNR Guidelines, all nests are to excavated 5 days after emergence or 70 days after incubation and immediately if fire ants are present.
- We excavate to determine hatching success and report all data to GADNR
- Nest excavations are done by the Sea Turtle Project Coordinator according to GADNR protocol and regulations. Volunteer Cooperators are welcomed to observe and assist as needed. The Sea Turtle Project Coordinator will notify volunteers, by email, of the location, date and time of the excavation.

Strandings

- If you find a live or dead sea turtle stranded on Tybee Island, call the Sea Turtle Project Coordinator – Tammy Smith at 484-3416.

- If you find a live or dead sea turtle stranded elsewhere, call the Sea Turtle Stranding Network at 912-269-4019 or 1-800-2SAVEME.

- Report stranded marine mammals to the Tybee Island Marine Science Center at 912-786-5917 or GADNR Nongame Conservation Section at 912-269-7587

Sea Turtles:

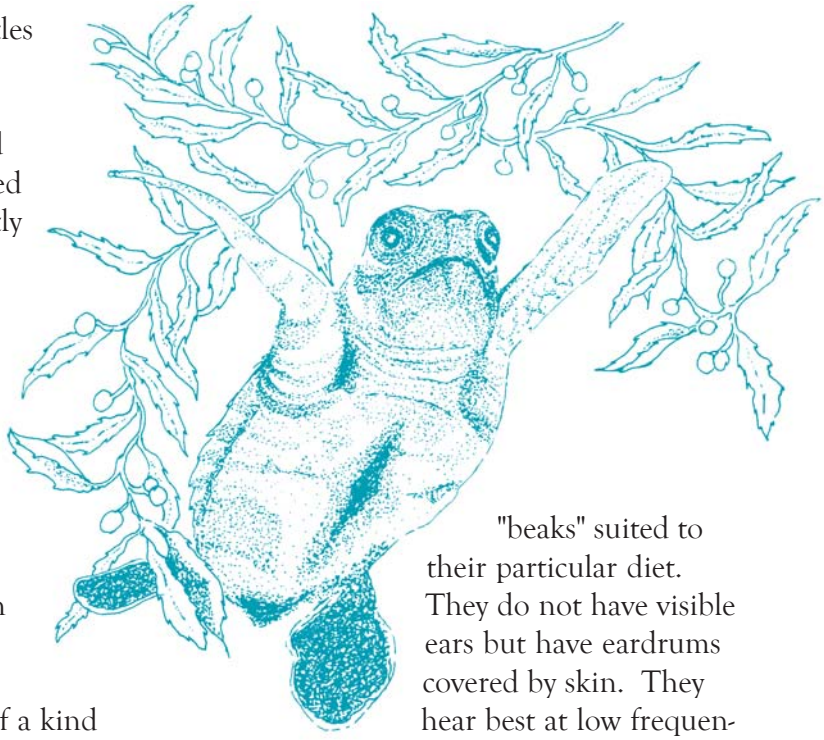
A Brief Overview

Sea turtles are large, air-breathing reptiles that inhabit tropical and subtropical seas throughout the world. Their streamlined bodies and large flippers make them remarkably adapted to life at sea. However, sea turtles maintain close ties to land. Females must come ashore to lay their eggs in the sand; therefore, all sea turtles begin their lives as tiny hatchlings on land.

Research on marine turtles has uncovered many facts about these ancient creatures. Most of this research has been fo-cused on nesting females and hatchlings emerging from the nest, largely because they are the easiest to find and study. Thousands of sea turtles around the world have been tagged to help collect information about their growth rates, reproductive cycles and migration routes. After decades of studying sea turtles, much has been learned. However, many mysteries still remain. New technologies, such as satellite telemetry, are allowing scientists to monitor turtles throughout their range. The information gathered through satellite-tracking should answer many questions and help conservation groups like the Sea Turtle Survival League develop better strategies for protecting sea turtles.

Turtles and Humans

Sea turtles have long fascinated people and have figured prominently in the mythology and folklore of many cultures.



In the Miskito Cays off the eastern coast of Nicaragua, the story of a kind "Turtle Mother," still lingers. Unfortunately, the spiritual significance of sea turtles has not saved them from being exploited for both food and for profit. Millions of sea turtles once roamed the earth's oceans, but now only a fraction remain.

General Description

Each species of sea turtle looks and behaves distinctly, but they do have several common characteristics. Their shells consist of an upper part (carapace) and a lower section (plastron). Hard scales (or scutes) cover all but the leatherback turtle, and the number and arrangement of these scutes can be used to determine the species. They do not have teeth, but their jaws have modified "beaks" suited to their particular diet. They do not have visible ears but have eardrums covered by skin. They hear best at low frequencies, and their sense of smell is excellent. Their vision underwater is good, but they are nearsighted out of water.

Reproduction

Only females come ashore to nest; males rarely return to land after crawling into the sea as hatchlings. Most females return to nest on the beach where they were born (natal beach). Nesting seasons occur at different times around the world. In the U.S., nesting occurs from April through October. Most females nest at least twice during each mating season; some may nest up to ten times in a season. A female will not nest in consecutive years, typically skipping one or two years before returning.

Growth & Development

Researchers do not yet know how long baby turtles spend in the open sea, or exactly where they go. It is theorized that they spend their earliest, most vulnerable years floating around the sea in giant beds of sargasso weeds, where they do little more than eat and grow. Once turtles reach dinner-plate size, they appear at feeding grounds in nearshore waters. They grow slowly and take between 15 and 50 years to reach reproductive maturity, depending on the species. There is no way to determine the age of a sea turtle from its physical appearance. It is theorized that some species can live more than 100 years.

Status of the Species

The earliest known sea turtle fossils are about 150 million years old. In groups too numerous to count, they once navigated throughout the world's oceans. But in just the past 100 years, demand for turtle meat, eggs, skin and colorful shells has reduced their numbers. Destruction of feeding and nesting habitats and pollution of the world's oceans are all taking a serious toll on remaining sea turtle populations. Many breeding populations have already become extinct, and entire species are being wiped out. There could be a time in the near future when sea turtles are just an oddity found only in aquariums and natural history museums — unless action is taken today.

What is Extinction and Why Should You Care If Sea Turtles Go Extinct?

A plant or animal becomes extinct when the last living individual of its species dies, causing it to vanish from the earth forever. If there is ever a time when the last green turtle on earth dies, then never again will this magnificent creature grace our world.

Species have been going extinct for millions of years; it is a natural part of the evolutionary process. For example, most of the species that existed during the time of dinosaurs have perished. Many probably went extinct because of sudden geological or climatic changes – possibly because of a large volcanic eruption or because of a giant meteor hitting the earth.

Today, however, species are going extinct because of abrupt changes brought about by humans. Habitat destruction, pollution and overconsumption are causing species to decline at a rate never before seen in history. This loss of species is eroding the diversity of life on earth, and a loss of diversity can make all life vulnerable.

Much can be learned about the condition of the planet's environment by looking at sea turtles. They have existed for over 100 million years, and they travel throughout the world's oceans. Suddenly, however, they are struggling to survive – largely because of things people are doing to the planet's oceans and beaches. But what does this mean for the human species?

It is possible that a world in which sea turtles cannot survive may soon become a world in which humans struggle to survive. If, however, we learn from our mistakes and begin changing our behavior, there is still time to save sea turtles from extinction. In the process, we will be saving one of the earth's most mysterious and time-honored creatures. We might just be saving ourselves too.

How You Can Help

There are many things each of us can do to help sea turtles survive. First, we must remember that we share the oceans and the beaches with many other species. Second, become informed about the things that are killing sea turtles or destroying their habitat. Elected officials and other leaders are making decision on issues that affect sea turtles almost every day. As an informed citizen, you have the power to influence the outcome of these issues by making your voice heard. Third, take personal responsibility for your actions. By simply reducing the amount of plastic garbage, using biodegradable chemicals and not leaving trash on the beach when you leave, you can help save sea turtles and protect Florida's coastal habitats.

Sea Turtles:

Differences Between the Species

Sea Turtle Names

Each sea turtle has both a scientific name and a common name. The scientific name identifies the genus and species, and the common name typically describes some characteristic of the turtle's body. The **loggerhead**, for example, gets its name from its exceptionally large head. The **hawksbill** turtle gets its name because its narrow head and large beak make it look like a hawk. The **Australian flatback** gets its name because its shell is very flat. The **leatherback** is the only sea turtle without a hard shell. It is named leatherback because its shell is made of a layer of thin, tough, rubbery skin that looks like leather.

Other turtles are named for colors on their bodies. The shell of the **black turtle** is dark gray or black, and the shell of the **olive ridley** is olive green. The **green turtle** is a little bit trickier. You might think the shell of a green turtle would be green, but it's not. It can have a black, gray, or brown shell. The green turtle is actually named for the green color of its fat.

Last but not least is the **Kemp's ridley**. This turtle's first name, "Kemp's," was given to it because a man named Richard Kemp helped discover and study the turtle. The second part of its name is a mystery. No one is sure why it is called "ridley." Some think turtle researcher Dr. Archie Carr was the one who named it "ridley." The name "ridley" might be short for the word "riddle" or "riddler." The ridley would have gotten that name because it was like a riddle to researchers. It was hard for them to figure out where the turtle came from and what its breeding habits were.

Appearance

Sea turtles come in many different sizes, shapes and colors. The olive ridley is usually less than 100 pounds, while the leatherback typically ranges from 650 to 1,300 pounds! The upper shell, or carapace, of each sea turtle species ranges in length, color, shape and arrangement of scales.

What They Eat

Different species of sea turtles like to eat different kinds of food. Sea turtles have mouths and jaws that are specially formed to help them eat the foods they like.

The **hawksbill** has a narrow head and jaws shaped like a beak. This allows the hawksbill to get food from crevices in coral reefs. They eat sponges, anemones, squid and shrimp.

Loggerheads are primarily carnivorous and feed mostly on shellfish that live on the bottom of the ocean. They eat horseshoe crabs, clams, mussels, and other invertebrates. Their powerful jaw muscles help them easily crush the shellfish.

Kemp's ridleys and **olive ridleys** are also carnivorous. Like loggerheads, the ridleys have powerful jaws that help them crush and grind crabs, clams, mussels, and shrimp. They also like to eat fish, sea urchins, squid and jellyfish.

Unlike loggerheads, Kemp's ridleys, and olive ridleys, **leatherbacks** have delicate, scissor-like jaws. Their jaws would be damaged by anything other than a diet of soft-bodied animals. Leatherbacks feed almost exclusively on jellyfish.

The diets of **green turtles** and **black turtles** change significantly during their lives. Young green and black turtles eat a variety of food. Their diets may include worms, young crustaceans and insects, as well as grasses and algae.

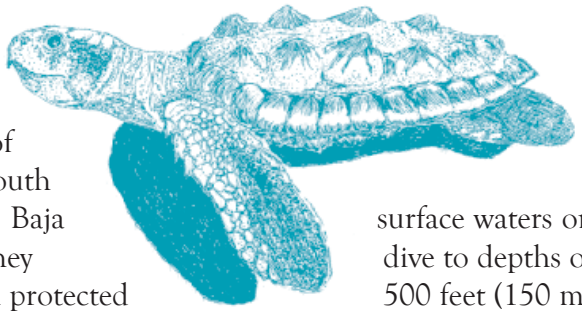
When green turtles reach 8 to 10 inches in length, their diets change. Adult green and black turtles are the only sea turtles that are strictly herbivorous. They mostly eat sea grass and algae. Their jaws are finely serrated which aids them in tearing vegetation. The **Australian flatback** apparently eats sea cucumbers, jellyfish, mollusks, prawns, bryozoans, and other invertebrates, as well as seaweed.

Habitat Preferences

Each species of sea turtle eats, sleeps, mates and swims in distinctly different areas. Sometimes their habitats overlap, but for the most part they each have different preferences.

Loggerheads can be found in temperate and subtropical waters throughout most of the world. Adults usually stay close to mainland shores. They prefer to feed in coastal bays and estuaries, as well as in the shallow water along the continental shelves of the Atlantic, Pacific and Indian Oceans. Loggerheads inhabit an enormous range from north to south. In the western hemisphere they are found as far north as Newfoundland and as far south as Argentina.

Green turtles are found in all temperate and tropical waters, including those near Central America, the Bahamas, and the U.S. They mainly stay near the coastline and around islands. **Black turtles** are found along the west coasts of North, Central and South America, from central Baja California to Peru. They mostly live in bays and protected shores. Rarely are they observed in the open ocean.



Hawksbills are considered the most tropical of all sea turtles. They are typically found around coastal reefs, rocky areas, estuaries and lagoons of the tropical and subtropical Atlantic, Pacific and Indian Oceans.

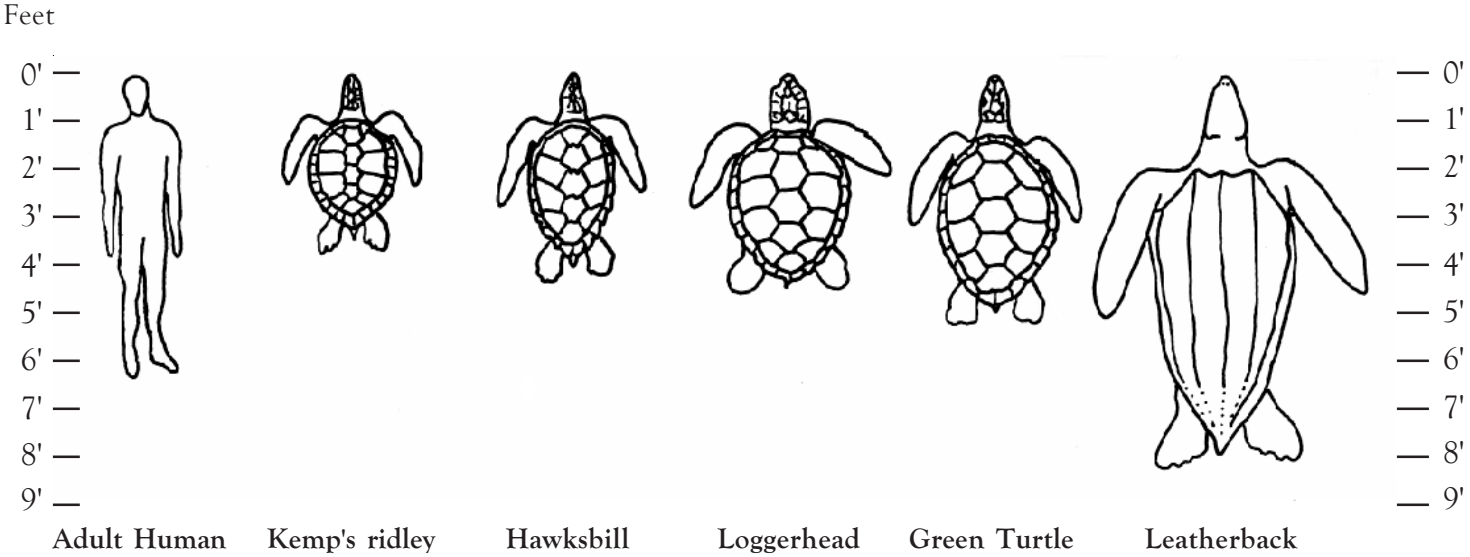
The range of the adult **Kemp's ridley** is mostly limited to the Gulf of Mexico. Juveniles range between tropical and temperate coastal areas of the northwest Atlantic Ocean and can be found up and down the east coast of the United States. They prefer shallow areas with sandy and muddy bottoms.

Olive ridleys live in tropical regions of the Pacific, Indian and Atlantic Oceans. They typically forage off shore in surface waters or dive to depths of 500 feet (150 m) to feed on bottom dwelling crustaceans.

Flatbacks have the most restricted range of all sea turtle species. Their range is limited to the coastal waters of the northwestern, northern and northeastern regions of Australia. Flatbacks do not venture beyond Australia's continental shelf; they prefer turbid inshore waters and bays.

Leatherbacks are the most widely distributed of all sea turtles. They are primarily found in the open ocean, as far north as Alaska and as far south as the southern tip of Africa. Leatherbacks are known to be active in water below 40 degrees Fahrenheit, the only reptile known to remain active at such a low temperature.

Sea Turtles Found in U.S. Waters ~ A Size Comparison



Sea Turtles:

The Seven Species of Sea Turtles

Most scientists recognize seven living species of sea turtles, which are grouped into six genera.

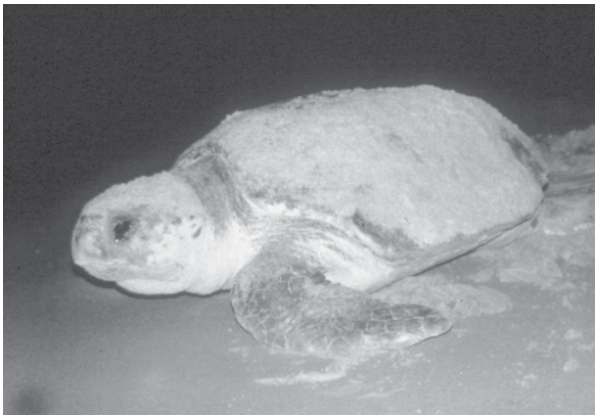
Loggerhead

(*Caretta caretta*)

Of all the sea turtles that nest in the United States, the loggerhead is the one seen most often. While all other species found near the U.S. coastline are listed as endangered, the loggerhead is classified as threatened. This means loggerheads are more numerous than the other species, but they are still in danger of extinction.

Adult loggerheads weigh up to 350 pounds and have a reddish-brown carapace (upper shell) and a dull brown to yellow plastron (lower shell). Fully grown, a loggerhead's carapace is typically 32 to 41 inches long (82-105cm).

Loggerhead hatchling



Adult loggerhead sea turtle

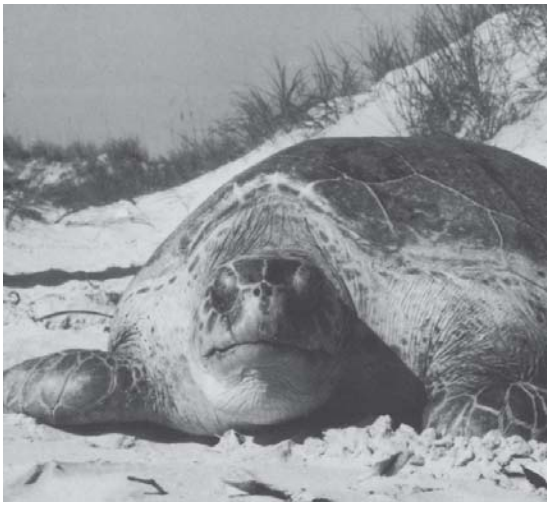
Loggerheads lay eggs at intervals of 2, 3, or more years. Nesting season runs from May through September in the U.S. They lay 4 to 7 nests per season, approximately 14 days apart. The average number of eggs in each clutch ranges from 100 to 126, and the eggs incubate for about 60 days. Loggerhead nesting is concentrated in two main areas of the world -- at Masirah Island, Oman, in the middle east and on the coast of the southeastern United States. The Masirah Island's annual nesting population is about 30,000 females, while up to 25,000 loggerheads nest in the southeast U.S. each year. The majority of nesting in the southeast U.S. takes place on Florida's Atlantic coast between the inlet at Cape Canaveral and Sebastian Inlet, especially within the Archie Carr National Wildlife Refuge.

Green turtle

(*Chelonia mydas*)

Green turtles are an endangered species around the world, but they still nest in significant numbers on the east coast of Florida. They are easily distinguished from other sea turtles because they have a single pair of scales in front of their eyes rather than two pairs as other sea turtles have. The green turtle is the largest of the Cheloniidae family. Female green turtles that nest in Florida average more than three feet in carapace length, and average about 300 pounds in weight. The largest green turtle ever found was 5 feet in length and 871 pounds.

Green turtles nest at intervals of 2, 3, or more years. They lay an average of 3 to 5 egg clutches, with about 12 days



Adult green sea turtle

Green sea turtle hatchling

between each nesting. There are an average of 115 eggs per clutch and they incubate for about 60 days. Nesting season runs from June through October in the U.S. The largest nesting site in the western hemisphere is at Tortuguero, Costa Rica.

Leatherback

(*Dermochelys coriacea*)

Leatherbacks are also endangered, but a few nest on the east coast of Florida each year. The leatherback is the champion of sea turtles. This species grows the largest, dives the deepest, and travels the farthest of all sea turtles. Mature leath-erbacks typically reach about 4 to 8 feet in length and weigh from 650 to 1,300 pounds. The largest leatherback ever recorded was almost 10 feet (3 m) from the tip of its beak to the tip of its tail and weighed in at 2,019 pounds (916 kg). The leatherback is the only sea turtle that lacks a hard shell. It is named for its large, elongated shell which is composed of a layer of thin, tough, rubbery skin, strengthened by thousands of tiny bone plates. Seven narrow ridges run down the length of the carapace, which is typically black with many white spots. The lower shell is whitish to black and marked by 5 ridges. The body of a leatherback is barrel shaped, tapering at the rear to a blunt point. With this streamlined body shape and the powerful front flippers, a leatherback can swim thousands of miles over open ocean and against fast currents.

Adult leatherback sea turtle

Leatherbacks feed almost exclusively on jellyfish. It is remarkable that this large, active animal can survive on a diet of jellyfish, which are composed mostly of water and appear to be a poor source of nutrients. Young leatherbacks in captivity can eat twice their weight in jellyfish each day.

Leatherbacks approach coastal waters only during breeding season. Nesting occurs throughout the Caribbean, on the northern coast of South America, the Pacific coast of Central America, and on the east coast of Florida. Nesting season runs from March through July. Leatherbacks nest every 2 to 3 years, laying 6 to 9 egg clutches in a nesting season. Each clutch contains approximately 80 fertilized eggs the size of billiard balls and 30 smaller, unfertilized eggs. There is an average of 10 days between nestings. The eggs incubate for approximately 65 days.

Adult hawksbill sea turtle

Hawksbill

(*Eretmochelys imbricata*)

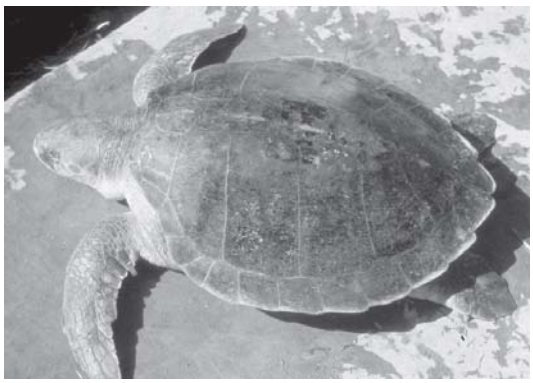
Hawksbills are endangered in large part because people kill them to get their beautiful shells, which are used to make jewelry and other products. Although they are found in U.S. waters, they rarely nest in North America.

The hawksbill is one of the smaller sea turtles, measuring 30

Leatherback hatchling

to 36 inches in carapace length (76-91 cm) and weighing 100 to 150 pounds (40-60 kg).

Hawksbill turtles nest at intervals of 2, 3, or more years. An average of 2 to 4 egg clutches are laid approximately 15 days apart during nesting season. An average of 160 eggs per clutch are laid and they incubate for approximately 60 days. Although they nest on beaches throughout the Caribbean, they are no longer found anywhere in large numbers.



Adult Kemp's ridley sea turtle

Kemp's ridley

(*Lepidochelys kempii*)

Kemp's ridleys are the most endangered of all sea turtles; they are also the smallest. Adults measure about 24 inches (62 cm) in carapace length and weigh between 77 and 100 pounds (35-45 kg). The carapace of adults is olive green and the plastron is yellowish.

Unlike other sea turtles, Kemp's ridleys nest annually. They lay about 2 clutches during each season, about 25 days apart. Each nest contains around 105 eggs, which incubate 55 days. The only major breeding site of the Kemp's ridley is on a small strip of beach at Rancho Nuevo, Mexico. Kemp's ridleys nest in mass synchronized nestings called *arribadas*(Spanish for "arrival"). The arribada of Kemp's ridleys occurs at regular intervals between April and June. In 1942, a Mexican architect filmed an estimated 42,000 ridleys nesting at Rancho Nuevo in one day. During 1995, only 1,429 ridley nests were laid at Rancho Nuevo.

Olive ridley

(*Lepidochelys olivacea*)

One of the most common of all sea turtles found worldwide; their numbers are in decline from the direct harvest of adults and eggs, incidental capture in commercial fisheries and loss of nesting habitat.

Adults measure around 30 inches (70 cm) in carapace length and weigh close to 100 pounds (45 kg). The carapace of adults is bony without ridges, has large scutes, and is grey green and the plastron is yellowish.

Similar to the Kemp's ridley, the olive ridley nests annually and in *arribadas*. They lay about 2 clutches during each season, about 25 days apart. Each nest contains around 110eggs, which incubate from 52 to 58 days.

Australian flatback

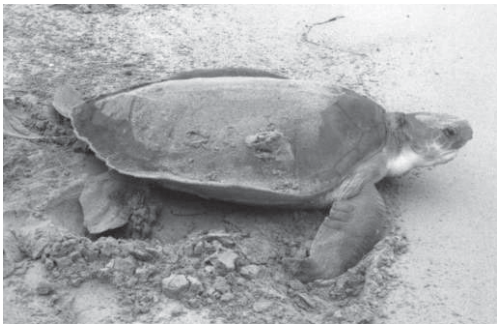
(*Natator depressus*)

Adult olive ridley sea turtle

The Australian flatback is very limited in its range being found only in the waters around Australia and Papua New Guinea in the Pacific. Adults up to just over 36 inches (99 cm) in carapace length and weigh an average of 200 pounds (90 kg). The carapace of adults is bony without ridges, has large, non-overlapping, scutes, and is olive-grey with pale brown and yellow tones on margins.

Adult females will nests 4 times per season, with an average of 50 eggs per nest. The eggs are quite large for their body size and incubate for about 55 days.

They are threatened with capture, harvesting of eggs, destruction of nesting beaches, ocean pollution, oil spills, and entanglement in fishing nets.



Adult flatback sea turtle

Sea Turtles:
Scientific Classification

The chart below shows the scientific classification of the sea turtles that still exist today.

KINGDOM ..... **Animalia**

PHYLUM ..... **Chordata**

CLASS ..... **Reptilia**

Class Reptilia includes snakes, lizards, crocodiles, and turtles. Reptiles are ectothermic (cold-blooded) and are vertebrates (have a spine). All reptiles have scaly skin, breath air with lungs, and have a three-chambered heart. Most reptiles lay eggs.

ORDER ..... **Testudines**

Order Testudines includes all turtles and tortoises. It is divided into three suborders. Pleurodira includes side-necked turtles, ***Cryptodira*** *includes all other living species of turtles and tortoises, and Amphichelydia includes all extinct species.*

SUBORDER ..... **Cryptodira**

Suborder Cryptodira includes freshwater turtles, snapping turtles, tortoises, soft-shelled turtles, and sea turtles.

FAMILY ..... **Cheloniidae** or **Dermochelyidae**

Sea turtles fall into one of two families. Family Cheloniidae includes sea turtles which have shells covered with scutes (horny plates). Family Dermochelyidae includes only one modern species of sea turtle, the leatherback turtle. Rather than a shell covered with scutes, leatherbacks have leathery skin.

GENUS and SPECIES

Most scientists currently recognize seven living species of sea turtles grouped into six genera. The black sea turtle is considered by some to be an eigth species.

Caretta caretta	***Chelonia mydas***	***Eretmochelys imbricata***	***Lepidochelys kempii***	***Natator depressus***	***Dermochelys coriacea***
loggerhead	green turtle	hawksbill	Kemp's ridley	Australian flatback	leatherback
	&		&		
	mydas agassizi black turtle		***olivacea*** olive ridley		

Sea Turtles:

Behavior Patterns

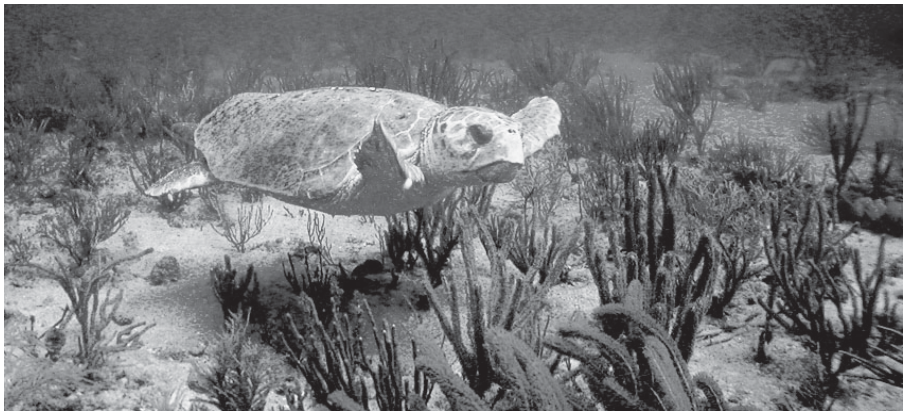
Sea turtles are generally solitary creatures that remain submerged for much of the time they are at sea, which makes them extremely difficult to study. They rarely interact with one another outside of courtship and mating. Ridleys, however, do come together in massive groups during their arribadas. But even when large numbers of turtles gather on feeding grounds or during migration, there is little behavioral exchange among individuals. Because of the difficulty in studying marine turtles in the open ocean, there are a great many things still unknown about their behavior. Decades of research, however, including observations at sea, have produced useful insights into daily activities and behaviors such as courtship, mating and nesting.

Daily Activities

Sea turtles are known to feed and rest off and on during a typical day. During the nesting season, research conducted in the southeast United States has shown that loggerheads follow regular patterns between the nesting beach and offshore reefs and other rocky structures. It is presumed that mating and/or feeding occur at these offshore areas. Sea turtles may migrate hundreds or even thousands of miles during their migations.

Sea turtles can sleep at the surface while in deep water or on the bottom wedged under rocks in nearshore waters. Many divers have seen green turtles sleeping under ledges in reefs and rocks. Hatchlings typically sleep floating on the surface, and they usually have their front flippers folded back over the top of their backs.

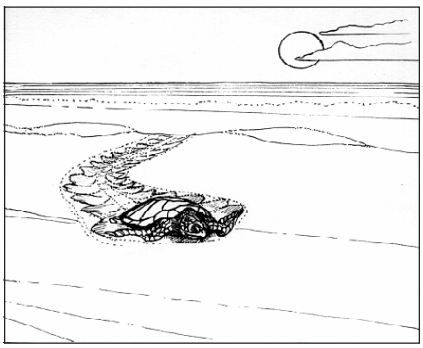
Courtship & Mating



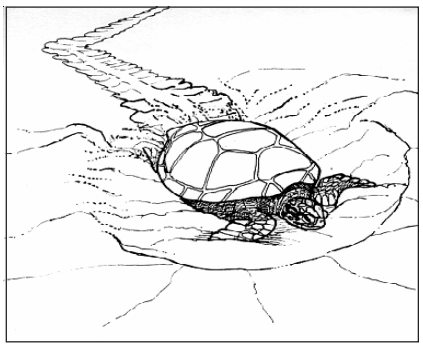
Courtship and mating for most sea turtles is believed to occur during a limited "receptive" period prior to the female's first nesting emergence. Afterwards, only females come ashore to nest; males almost never return to land once they leave the sand of their natal beach. During mating season, males may court a female by nuzzling her head or by gently biting the back of her neck and rear flippers. If the female does not flee, the male attaches himself to the back of the female's shell by gripping her top shell with claws in his front flippers. He then folds his long tail under her shell to copulate. Females observed on the nesting beach after recently mating often have scratched shells and may be bleeding from where the males were hooked to their shells.

Copulation can take place either on the surface or under water. Sometimes several males will compete for females and may even fight each other. Observers of sea turtle mating have reported very aggressive behavior by both the males and females.

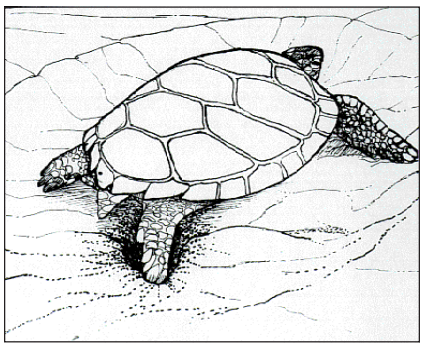
Females may mate with several males just prior to nesting season and store the sperm for several months. When she finally lays her eggs, mucus being secreted throughout egg-laying. The average size of a clutch ranges from about 80 to 120 eggs, depending on the species. Because the eggs are flexible, they do not break as



Step 1: Crawling to a suitable nesting site



Step 2: Digging the body pit



Step 3: Digging the egg chamber

they will have been fertilized by a variety of males. This behavior may help keep genetic diversity high in the population.

Nesting, Incubation and Emergence

Very little is known about why sea turtles nest on some beaches and not on others. In Florida, loggerheads nest by the thousands on the central east coast, while identical looking beaches to the north see far fewer loggerheads. This nesting distribution may reflect conditions that existed centuries ago, when temperature, beach profiles or the lack of predation made some areas preferable to sea turtles.

Today, humans are affecting the places where sea turtles nest. Beach erosion caused by coastal armoring and navigational inlets, artificial lighting and beach renourishment are all impacting once pristine beaches. These changes will likely have lasting effects on future nesting patterns. The more we understand about how, where and when sea turtles nest, the better we will be able to protect their nesting habitat.

Beach Selection

Most females return faithfully to the same beach each time they are ready to nest. Not only do they appear on the same beach, they often emerge within a few hundred yards of where they last nested.

Nesting Behavior

Only the females nest, and it occurs most often at night. The female crawls out of the ocean, pausing frequently as if carefully scoping out her spot. Sometimes she will crawl out of the ocean, but for unknown reasons decide not to nest. This is a "false crawl," and it can happen naturally or be caused by artificial lighting or the presence of people on the beach.

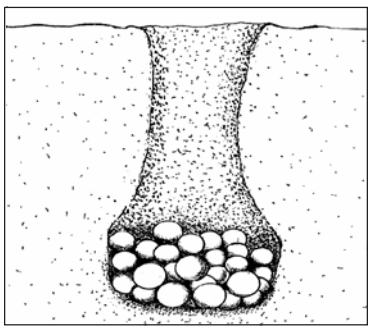
Most females nest at least twice during the nesting season, although individuals of some species may nest only once and others more than ten times. Sea turtles are generally slow and awkward on land, and nesting is exhausting work.

Constructing the Nest

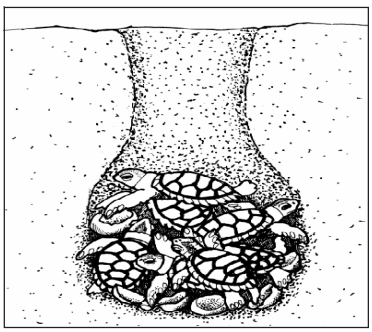
The female turtle crawls to a dry part of the beach and begins to flings away loose sand with her flippers. She then constructs a "body pit" by digging with her flippers and rotating her body. After completing the body pit, she digs an egg cavity using her cupped rear flippers as shovels. The egg cavity is shaped roughly like a tear drop and is usually tilted slightly.

Laying and Burying the Eggs

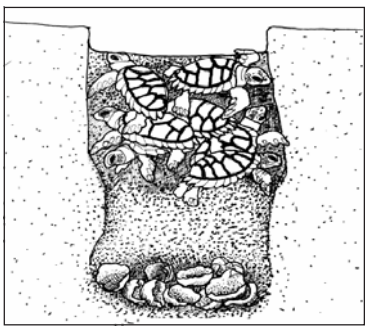
When the turtle has finished digging the egg chamber, she begins to lay eggs. Two or three eggs drop out at a time, with



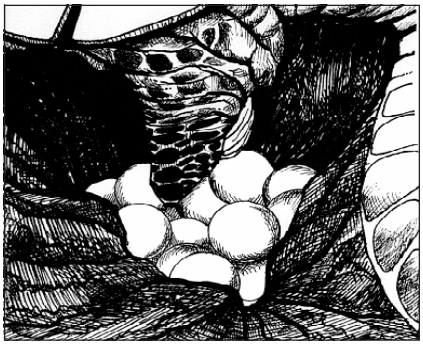
Eggs incubating in the nest.



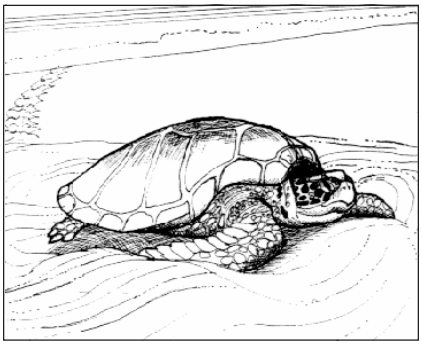
Hatchlings begin breaking out of shells.



Hatchlings work their way to top of nest.



Step 4: Laying the eggs



Step 5: Burying and disguising the nest

they fall into the chamber. This flexibility also allows both the female and the nest to hold more eggs.

Nesting sea turtles appear to shed tears, but the turtle is just secreting salt that accumulates in her body.

Many people believe that while laying her eggs a sea turtles goes into a trance from which she cannot be disturbed. This is not entirely true. A sea turtle is least likely to abandon nesting when she is laying her eggs, but some turtles will abort the process if they are harassed or feel they are in danger. For this reason, it is important that sea turtles are never disturbed during nesting.

Once all the eggs are in the chamber, the mother turtle uses her rear flippers to push sand over the top of the egg cavity. Gradually, she packs the sand down over the top. She then begins using her front flippers to refill the body pit and disguise the nest. By throwing sand in all directions, it is much harder for predators to find the eggs. After the nest is thoroughly concealed, the female crawls back to the sea to rest before nesting again later that season or before beginning her migration back to her feeding ground. Once a female has left her nest, she never returns to tend it.

Incubation

Incubation takes about 60 days, but since the temperature of the sand governs the speed at which the embryos develop, the hatching period can cover a broad range. Essentially, the hotter the sand surrounding the nest, the faster the embryos will develop. Cooler sand has a tendency to produce more males, with warmer sand producing a higher ratio of females.

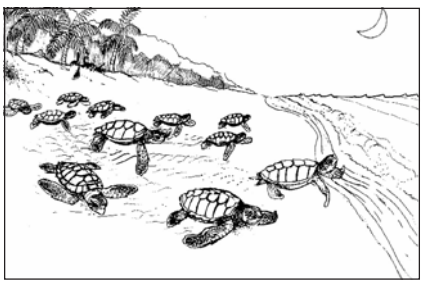
Emerging from the Nest

Unlike baby alligators, which are liberated from their nest by their mother, sea turtle hatchlings must do it all themselves. To break open their shells, hatchlings use a sharp, temporary egg-tooth, called a "caruncle." The caruncle is an extension of the upper jaw that falls off soon after birth.

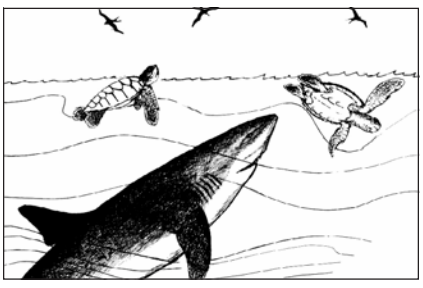
Digging out of the nest is a group effort that can take several days. Hatchlings usually emerge from their nest at night or during a rainstorm when temperatures are cooler. Once they decide to burst out, they erupt from the nest cavity as a group. The little turtles orient themselves to the brightest horizon, and then dash toward the sea. If they don't make it to the ocean quickly, many hatchlings will die of dehydration in the sun or be caught by predators like birds and crabs.

Once in the water, they typically swim several miles off shore, where they are caught in currents and seaweed that may carry them for years before returning to nearshore waters.

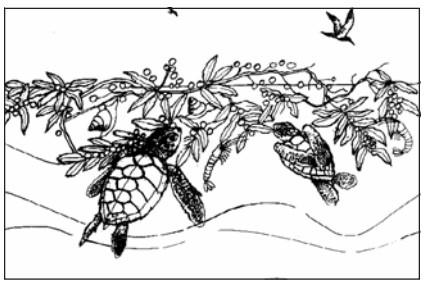
There are many obstacles for hatchlings in the open ocean. Sharks, big fish and circling birds all eat baby turtles, and they die after accidentally eating tar balls and plastic garbage. The obstacles are so numerous for baby turtles that only about one in 1,000 survives to adulthood.



Hatchlings erupt and head for water.



Many animals eat hatchlings in the ocean.



Hatchlings eat and drift in sargasso weed.

Sea Turtles:

Migration and Navigation Abilities

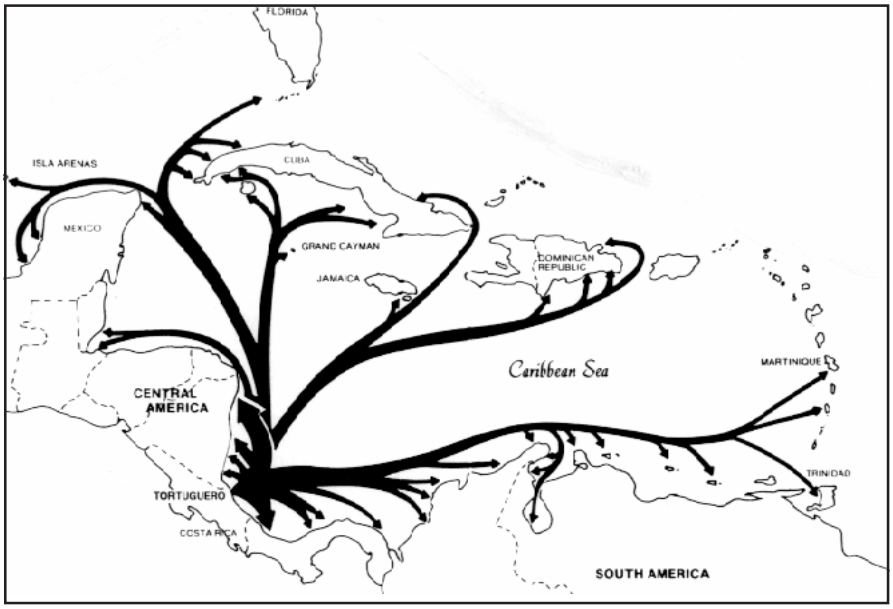
Migration

The ability of a sea turtle to migrate hundreds (and occasionally thousands) of miles from its feeding ground to its nesting beach is one of the most remarkable acts in the animal kingdom. That adult females return faithfully to nest on the very beach where they were born makes the feat even more amazing.

Research into where and how sea turtles migrate has been a focus of scientists for decades. The information collected is vital to the development of conservation strategies for the species.

We now know that sea turtles undergo migration throughout their lives, beginning with the first frenzied swim as a hatchling. During its first critical 48 hours, a hatchling must travel from the beach to a place in the ocean where it is relatively safe from predators and where it can find food. Many hatchlings in the Atlantic and Caribbean make their way into Gulfstream currents, which are filled with floating sargassum weed. There the young turtles find an ample food supply and few predators. After several years of floating around the Atlantic, these young turtles are big enough to venture back into nearshore waters.

Sea turtles typically spend their juvenile years eating and growing in nearshore habitats. Once they reach adulthood and sexual maturity, it is believed that they migrate to a new feeding ground. It is in this primary feeding area where adult turtles probably remain throughout their lives, except during breeding season. When it is their time to mate and nest, both males and females leave their feeding grounds and migrate to the nesting beach. This periodic migration will continue throughout their lives.

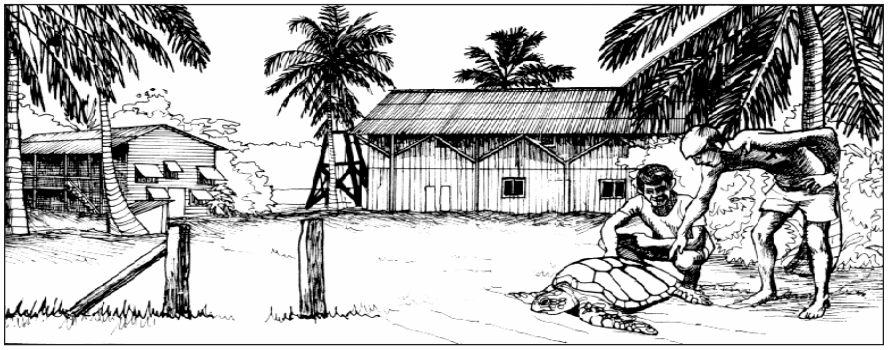


Caribbean Conservation Corporation has been tagging green turtles that nest at Tortuguero, Costa Rica, for over three decades. Tag recoveries from different parts of the Caribbean show some of the places where these turtles migrate after nesting.

Navigation

In the open ocean, sea turtles encounter strong currents; they have only modest vision; they can only raise their heads several inches out of the water; and there are often no visible land marks. Even with these limitations, sea turtles regularly navigate long distances to find the same tiny stretch of nesting beach. How they do it is one of the greatest mysteries in the animal kingdom, and finding an answer has been the focus of generations of researchers.

One promising new theory on how sea turtles navigate suggests that they can detect both the angle and intensity of the Earth's magnetic field. Using these two characteristics, a sea turtle may be able to determine its latitude and longitude, enabling it to navigate virtually anywhere. Early experiments seem to prove that sea turtles have the ability to detect mag-



One of the first groups to start tagging sea turtles was the Caribbean Conservation Corporation, under the leadership of Dr. Archie Carr. CCC began tagging green turtles on the nesting beach at Tortuguero, Costa Rica, in the early 1950s, and this important research continues to this day.

netic fields. Whether they actually use this ability to navigate is the next theory being investigated

Studying Migration

The migratory nature of sea turtles creates a number of challenges for those working to fully understand and protect these creatures. In particular, to adequately protect sea turtles in all their habitats, we must know where these habitats are, how the turtles behave while there, and what routes the turtles take to migrate between them.

Most sea turtle research has been carried out on nesting beaches — and for very logical reasons. These areas are easier for researchers to access, and what occurs on the nesting beach (production of new sea turtles) is extremely important to the species' survival. Conservation efforts are also most easily directed at nesting beaches.

However, of all the places where sea turtles travel throughout their life cycle, the least amount of time is spent on the nesting beach. More than 90% of a sea turtle's life is spent in the water — feeding, mating, migrating and doing whatever else a sea turtle does when no one is watching. Consequently, the threats faced by sea turtles in the ocean present the greatest challenges to conservationists.

To fully protect sea turtles throughout their range, more must be known about their migratory patterns and their behavior in the water.

Several methods are used by researchers to determine where sea turtles move. One of the simplest methods involves placing a small, harmless metal tag on one of the turtle's flippers when she comes ashore to nest. Each tag includes a coded number and a message asking people to return the tag to a certain address if it is found. When people return a tag, they get a small reward and are asked where the turtle was encountered. In this way, researchers gradually learn about the many places to which turtles migrate.

In the case of turtles nesting at Tortuguero, Costa Rica, tag returns make it clear that turtles nesting there disperse to feeding areas throughout the Caribbean. A large portion of them go to the Miskito Coast of Nicaragua. Efforts are now focused on limiting the number of turtles killed there for food.

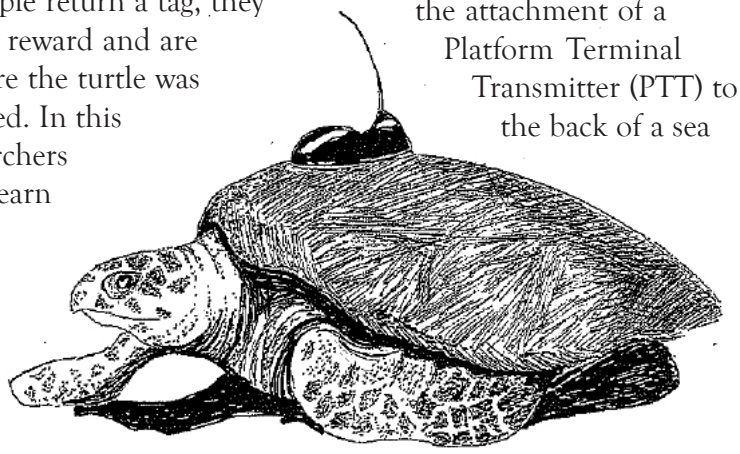
The use of flipper tags has provided vital information, but it still leaves many questions unanswered.

Satellite Telemetry

Since most research conducted on marine turtles has been carried out on nesting beaches and well over 90% of a sea turtle's life is spent in the water, we are missing important information that can help us better protect sea turtles.

This is where the technology of satellite telemetry becomes useful and important in protecting sea turtles. Researchers been utilizing satellite telemetry (following an object on the earth with the use of orbiting satellites) track these highly migratory marine animals in the open ocean for over a decade.

Satellite telemetry involves the attachment of a Platform Terminal Transmitter (PTT) to the back of a sea



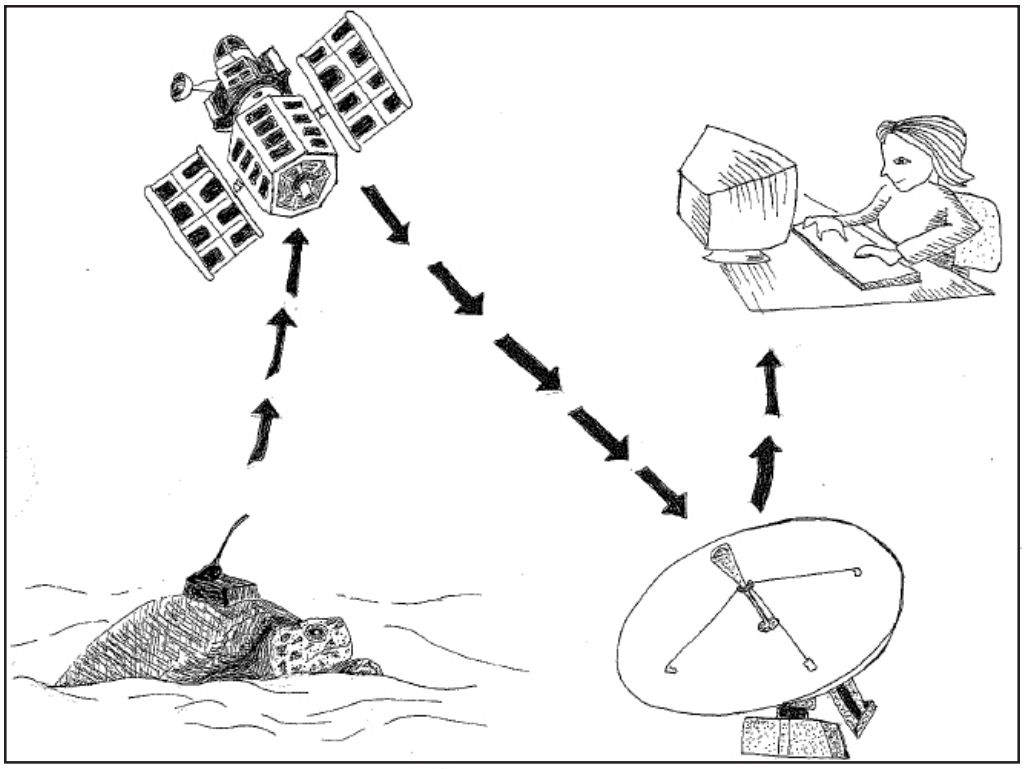


Diagram of how data is received, via global orbiting satellites, by researchers from a transmitter attached to a sea turtle.

turtle. The attachment process involves placing a small transmitter to the back of an adult or juvenile sea turtle. For all the sea turtle species, except the leatherback, the transmitter is attached directly to the turtle's carapace, behind the head, where the unit's small flexible antenna can break the surface to transmit a signal full of information to orbiting satelllites when the turtle is at the surface of the ocean to breathe.

The satellites are operated by the U.S. National Oceanic and Atmospheric Organization (NOAA) and are the same satellites used to monitor global weather patterns. Attached to these satellites are special instruments operated by a company called ARGOS. These special instruments are designed to listen for transmitters like those placed on turtles and to determine where those transmitters are located.

While such a task would seem simple, it is not. Each satellite circles the earth every 101 minutes and so it is only over any one place on the planet for about 10 minutes. At the equator, this means that the satellites make about 6-8 passes per day for 10 minutes each. For the satellite to determine the location of the transmitter it the transmitter must be on at the surface long enough to be detected.

The satellite re-transmits the data to a receiving station on earth, which researchers can access through their computer. Generally, after about a year the transmitters quit working and fall safely off the turtle.

The data received from the turtle's transmitter comes in the form of digital codes, which must be deciphered. The codes allow researchers to determine, with varying degrees of reliability, the latitude and longitude location of the turtle, the number of dives taken during the last 24 hours, the duration of the most recent dive, and the water temperature.

Using computer mapping programs, researchers can then see where the turtles migrate, what routes they travel and how fast they generally swim. If the map a researcher is using has enough detail, it is also possible to determine the habitat characteristics at the turtle's location.

While viewing the migration maps shown on CCC's website, viewers should be aware that the plotted turtle movements represent the best data available; however, any given plot mark may not be 100% accurate. This limitation really doesn't detract from the overall value of the research. After monitoring a number of turtles in a specific population, researchers learn where that population's major feeding grounds are located and what threats they may be facing at sea. This information allows conservationists to focus efforts on the most important areas.

Sea Turtles:

Threats to their Survival

Each year thousands of hatchling turtles emerge from their nests along the southeastern coast of the United States and enter the Atlantic ocean. Sadly, only an estimated one in 1,000 to 10,000 will survive to adulthood. The natural obstacles faced by young and adult sea turtles are staggering, but it is the increasing threats caused by humans that are driving them to extinction. Today, all sea turtles found in U.S. waters are federally listed as endangered, except for the loggerhead, which is listed as threatened.

Natural Threats

In nature, sea turtles face a host of life and death obstacles to their survival. Predators such as raccoons, crabs and ants raid eggs and hatchlings still in the nest. Once they emerge, hatchlings make bite-sized meals for birds, crabs and a host of predators in the ocean. After reaching adulthood, sea turtles are relatively immune to predation, except for the occasional shark attack. These natural threats, however, are not the reasons sea turtle populations have plummeted toward extinction. To understand what really threatens sea turtle survival, we must look at the actions of humans.

Human-Caused Threats

In many cultures around the world, people still harvest sea turtle eggs for food. Most countries forbid the taking of eggs, but enforcement is lax. Poaching is rampant, and the eggs can often be found for sale in local markets. In these same areas, adult sea turtles are harvested for their meat. Turtle products, such as jewelry made from hawksbill shells, also create a direct threat to sea turtles. Lack of information about sea turtles leads many Americans to unwittingly support the international trade in these endangered species. Buying and selling turtle products within the U.S. is strictly prohibited by law, but turtle shell jewelry and souvenirs are the most frequent contraband seized by customs officials from tourists returning from the Caribbean.

Indirect threats are harder to quantify, but it is likely that they are causing the greatest harm to sea turtle survival.

Commercial Fishing

The waters of the Gulf of Mexico and west Atlantic coast are a major habitat for turtles, but are also the main shrimping grounds in the U.S. Each year, thousands of turtles become entangled in fishing nets and drown. Worldwide, shrimp trawling probably accounts for the incidental death of more juvenile and adult sea turtles

The killing of sea turtles for meat is still a significant problem in many Caribbean countries.

than any other source. At one time, as many as 55,000 sea turtles were killed each year in shrimp nets in the southeastern United States alone. Today, all U.S. shrimpers are required to put Turtle Excluder Devices (TEDs) in their trawl nets. Unfortunately, not all fishermen comply with the law, and sea turtles continue to drown in shrimp nets.

Ingestion of Debris and Plastic

Thousands of sea turtles die from eating or becoming entangled in nondegradable debris each year, including packing bands, balloons, pellets, bottles, vinyl films, tar balls, and styrofoam. Trash, particularly plastic bags thrown overboard from boats or dumped near beaches and swept out to sea, is eaten by turtles and becomes a deadly meal. Leatherbacks especially, cannot distinguish between floating jellyfish — a main component of their diet — and floating plastic bags.

Artificial Lighting

Nesting turtles once had no trouble finding a quiet, dark beach on which to nest, but now they must compete with tourists, businesses and coastal residents for use of the beach. U.S. beaches are rapidly being lined with seaside condominiums, houses and hotels. Lights from these developments discourage females from nesting and cause hatchlings to become disoriented and wander inland, where they often die of dehydration or predation.

Coastal Armoring

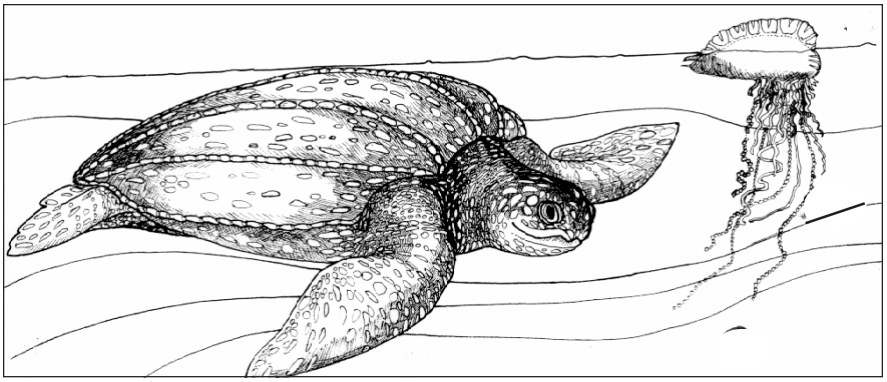
Coastal armoring includes structures such as sea walls, rock revetments and sandbags that are installed in an attempt to protect beachfront property from erosion. These structures often block female turtles from reaching suitable nesting habitat and accelerate erosion down the beach. Armoring is especially problematic along the east coast of Florida, where beach development is occurring in the very places where sea turtles come to nest by the thousands.

Beach Nourishment

Beach nourishment consists of pumping, trucking or otherwise depositing sand on a beach to replace what has been lost to erosion. While beach nourishment is often preferable to armoring, it too can negatively impact sea turtles. If the sand is too compacted for turtles to nest in or if the sand imported is drastically different from native beach sediments, it can affect nest-site selection, digging behavior, incubation temperature and the moisture content of nests. If renourishment is allowed to proceed during nesting season, nests can also be buried far beneath the surface or run over by heavy machinery.

Pollution

Pollution can have serious impacts on both sea turtles and the food they eat. New research suggests that a disease now killing many sea turtles (fibropapillomas) may be linked to pollution in the oceans and in nearshore waters. When pollution kills aquatic plant and animal life, it also takes away the food sea turtles eat. Oil spills, urban runoff of chemicals, including fertilizers and petroleum, all contribute to water pollution.



Leatherbacks feed on jellyfish, but can die by eating discarded plastic bags.

It may seem that the threats to sea turtles are almost too big to overcome, but they are not. Through personal actions, such as making sure that oil, paints and other toxic chemicals are disposed of properly, reducing the amount of fertilizer and chemicals used on lawns, participating in plastic recycling programs and teaching others about what they can do help are all ways to make a difference.

Sea Turtles:

Conservation Strategies

To truly protect sea turtles around the world, many different countries and cultures must cooperate and share responsibility. International laws and agreements, research, and the work of dedicated organizations and individuals each must play a part. Long-term protection of sea turtles also means developing solutions that reduce reliance on management methods requiring direct human involvement – such as moving nests or raising hatchlings in captivity. If sea turtles cannot survive and reproduce on their own, without help from humans, then they are doomed.

Feeding and nesting grounds must be protected, and a public wildlife conservation ethic must be fostered that can withstand gaps in government regulations, pressure from private interests, and changes in the political climate.

National Laws

Sea turtles are given legal protection in the United States and its waters under the **Endangered Species Act (ESA)**. The ESA lists the hawksbill, leatherback, Kemp's ridley and green turtle as endangered; and lists the loggerhead as threatened. This designation makes it illegal to harm, harass or kill any sea turtles, hatchlings or their eggs. It is also illegal to import, sell, or transport turtles or their products. In the United States, the National Marine Fisheries Service has jurisdiction over sea turtles in the water, while the U.S. Fish and Wildlife Service is responsible for them on land. Other countries have their own conservation laws and regulations that apply to sea turtles.

International Agreements

Some regulations affecting sea turtles are global in scope. The "Convention on International Trade in Endangered Species" (CITES) controls international trade in endangered and threatened species. Sea turtles are covered under Appendix I of this agreement and receive protection from international trade by all countries that have signed the treaty.

State and Local Protection

In many states where sea turtles nest, state laws have been passed to protect the species. These laws meet or exceed the requirements of the ESA. In Florida for instance, the Marine Turtle Protection Act was passed giving state agencies the power to enforce regulations protecting turtles and their habitat.

Some local governments have passed regulations to eliminate or control artificial beachfront lighting, which is known to deter females from nesting and disorient hatchlings.

Conservation Goals

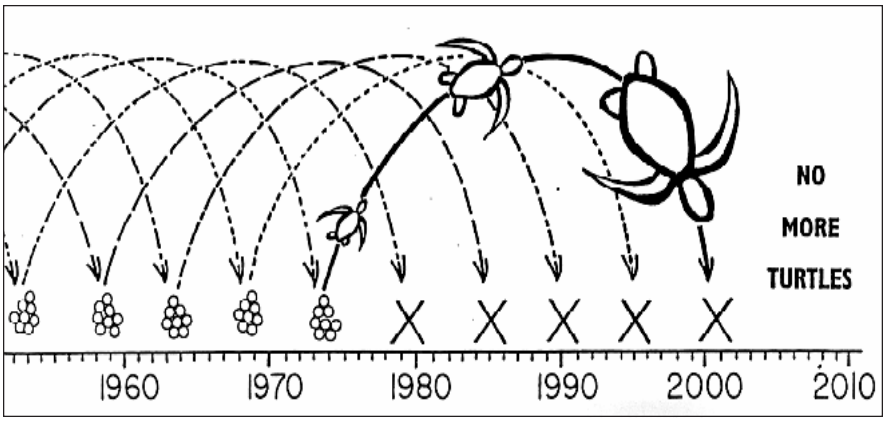
The threats facing sea turtles are numerous and, for the most part, humans are the problem. For those of us trying to protect sea turtles, it is a mixed blessing that so many threats are human-caused. On one hand, it is very hard to change human behavior. On the other hand, at least there is hope for eliminating threats. If sea turtles were going extinct because of geological or climatic changes, there would be very little we could do to help.

Some immediate goals for protecting sea turtles include:

* Crack down on illegal international trade in sea turtles and their products by enforcing laws and agreements.
* Decrease the turtle deaths caused by commercial fishing through enforcement of **Turtle Excluder Device (TED)** and gill net regulations.
* Protect nesting beaches by establishing parks and refuges or through regulations combined with public education initiatives.
* Eliminate disturbances at nesting beaches by decreasing artificial lighting, halting beach armoring, regulating beach nourishment and

limiting the impacts of people on the beach.

* Enforce national and international laws to minimize the dumping of pollutants and solid waste into the ocean and nearshore waters.
* Continue research and monitoring activities so that the population can be monitored and conservation efforts can be focussed where they are most needed.
* Increase public awareness and community participation in sea turtle conservation through educational programs such as this one.

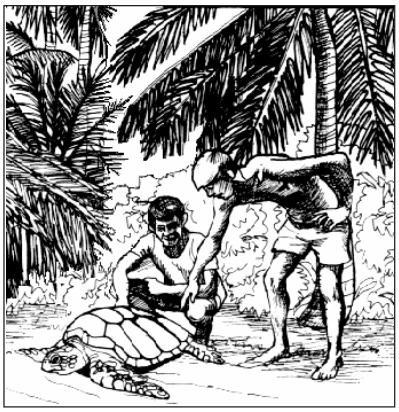


As sea turtles continue to be killed around the world by poachers on the nesting beach, in commercial fishing nets or by pollution, it is very difficult to explain the severe consequences this has on the species when the numbers of nesting turtles seems to remain stable in areas. This visual aid, prepared by Dr. Jeanne Mortimer, is helpful in explaining how the complete harvesting of nesting females in a particular population (which is happening now in some parts of the world) may actually take decades to manifest itself on the nesting beach in reduced numbers of nesting adults. While there may seem to be a never-ending supply of adult turtles to harvest, at some point there will be no more maturing new generations of sea turtles to replace those that have been killed. And once these too have been slaughtered, the population will crash suddenly.

What to Do If You Encounter a Nesting Sea Turtle

In Florida and other states where sea turtles nest, turtle watches are conducted by trained and permitted individuals. The goal is to educate people about sea turtles through direct contact, without disturbing the turtles. If you are interested in going on a turtle walk, you can call the Caribbean Conservation Corporation at (352) 373-6441 for a list of guides near you. Sometimes people encounter sea turtles on their own while walking on the beach at night during nesting season. If this happens to you, here are some simple rules to follow:

* *Do not walk on the beach with a flashlight or shine a light in the sea turtle's face. The light may cause the female to abort the nesting process, or other sea turtles nearby may be discouraged from nesting if there are lights on the beach.*



* *Do not take pictures using flashes. This high-intensity light can be even more disturbing than the flashlights.*
* *Stay clear and out of sight of the turtle until she begins laying eggs, otherwise you may scare her back into the sea.*
* *For your safety, stay away from the turtle's head. Sea turtles, especially loggerheads, have very strong jaws and can harm you if provoked.*
* *Do not handle the eggs or put any foreign objects into the nest. You can introduce bacteria or injure the eggs.*
* *Do not handle or ride the sea turtle. In addition to being illegal, you may injure the turtle or cause her to leave without finishing nesting.*
* *Do not disturb tracks left by turtles. Researchers sometimes use the tracks to identify the type of turtles that nested and to find and mark the nests.*
* *Do enjoy the experience and remember it for the rest of your life.*

BATES

Attachment EA-4

Temporary Manatee Awareness Construction Signs
Tybee Island Shore Protection Project
Georgia
2015 Renourishment

Attachment EA-4: Temporary Construction Signs

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

Approved Suppliers of Manatee Signs:

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

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

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

Fendig Signs
411 Arnold Rd
St. Simons Island, GA 31522

Good & Associates
St. Simons Island, GA
(912) 638-7664