Sea Turtle Consultation Framework
NOAA Fisheries Southeast Region

Revised August 2022

PURPOSE AND SCOPE

In order to inform the National Marine Fisheries Service (NMFS) Southeast Region's consultation activities regarding sea turtles, this document consolidates and interprets existing information available from a host of sources including, but not limited to, listing documents, recovery plans, previous consultations, and existing literature. This collection of information provides Section 7 assistance, and identifies early conservation and recovery concepts for consideration during consultation. The contents summarize best available information as well as facilitate integration of conservation and recovery considerations into our routine consultation practices. This document is a job aid and used as general guidance only.

SECTION 7 CONSIDERATIONS

This section provides information to help with Section 7 consultations and identifies federal actions that have the potential to affect the species. This analysis considers sea turtle distribution and habitat use within their range based on the various life stages of the species.

Jurisdiction

NMFS has jurisdiction over sea turtles in the marine environment and the U.S. Fish and Wildlife Service (USFWS) has jurisdiction on land. "Marine environment" means oceans and seas, bays, estuaries, brackish or riparian water areas, and any other marine waters adjacent to the terrestrial environment. Biologist should not exceed NMFS' jurisdiction, however, you can remind the action agency to contact USFWS when appropriate (seaturtle@fws.gov). Coordination between the USFWS and the consultation biologist can occur if either one has questions or concerns that need clarification. The 2015 NOAA Fisheries and USFWS Memorandum of Understanding on Sea Turtles (MOU) provides jurisdiction details.

General Sea Turtle Facts and Species/Distinct Population Segment (DPS) Ranges General Sea Turtle Facts

Sea turtles are air-breathing reptiles with streamlined bodies and large flippers. They inhabit tropical and subtropical ocean waters throughout the world. Sea turtles are primarily diurnal and feed and rest intermittently during a typical day. Sea turtles can spend their nights sleeping 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. Although sea turtles live most of their lives in the ocean, adult females must return to beaches, on land, to lay their eggs at night[1] (Figure 1). Nesting studies provide the majority of scientific knowledge about sea turtles. They often migrate long distances between feeding grounds and nesting beaches. Six sea turtle species occupy U.S. waters (Table 1). Distinct Population Segments (DPS), which are treated as individual 'species' under the ESA, further separate the loggerhead and green turtles.

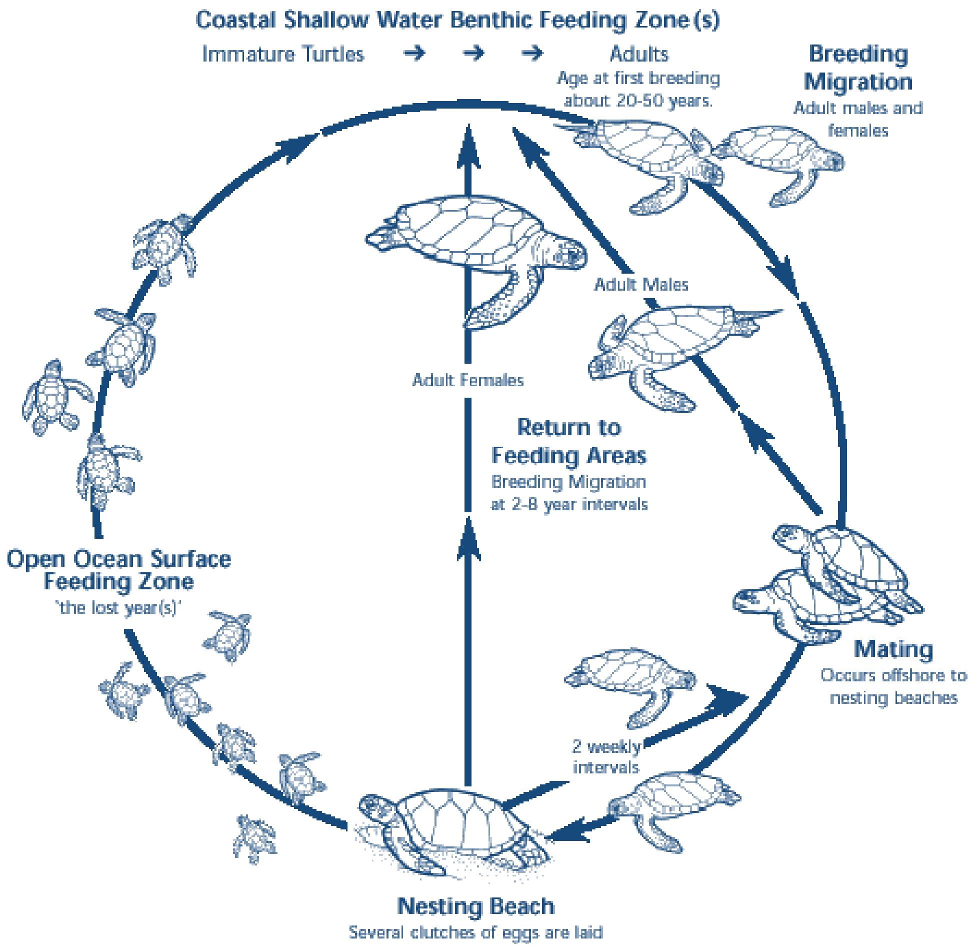

Figure 1. General Sea Turtle Life Cycle[2]

[1] See Kemp's ridley section for exception to this general sea turtle behavior.
[2] Note: Leatherbacks have a slightly different cycle, as they do not migrate to nearshore waters to mature.

Table 1. Sea Turtle Species, ESA Listing Status, Rule/Date, and Recovery Plan

Sea Turtle Species and DPSs	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan Date
Loggerhead (Northwest Atlantic [NWA] DPS)	T	76 FR 58868/ September 22, 2011	December 2008
Green (North Atlantic [NA] DPS)	T	81 FR 20057/ April 6, 2016	October 1991
Green (South Atlantic [SA] DPS)	T	81 FR 20057/ April 6, 2016	October 1991
Kemp's ridley	E	35 FR 18319/ December 2, 1970	September 2011
Hawksbill	E	35 FR 8491/ June 2, 1970	December 1993
Leatherback	E	35 FR 8491/ June 2, 1970	April 1992

How to Properly Cite the Recovery Plans

Loggerhead

National Marine Fisheries Service and U.S. Fish and Wildlife Service 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. National Marine Fisheries Service, Silver Spring, MD.

Green

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991. Recovery Plan for U.S. Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

Kemp's ridley

National Marine Fisheries Service, U.S. Fish and Wildlife Service, and SEMARNAT. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. National Marine Fisheries Service. Silver Spring, Maryland 156 pp. + appendices.

Hawksbill

National Marine Fisheries Service and U.S. Fish and. Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

Leatherback

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery Leatherback Turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. Marine Fisheries Service, Washington, D.C.

Loggerhead Sea Turtle *(Caretta caretta)*

Photo Credit 1: NOAA/UNCW ROV June 2014

- Weight: hatchling: 0.05 pounds (20 grams [g]); adult: 200–350 pounds (90–158 kilograms [kg])
- Length: hatchling: 2 inches (4 centimeters [cm]); adult: 3 feet (~1 meter [m])
- Sexual maturity ~35 years old
- Diet: omnivores (hatchling); sea pens (*Virgularia presbytes*), horseshoe crabs, crabs, and molluscs such as whelks and conch (gradually transitions to this specialized diet from juvenile to adult)
- Females return to their natal beaches, principally at night, every 2–3 years to lay eggs. Typically, nests are deposited mid-beach.[3]
- Younger and smaller hatchlings/juveniles occupy pelagic habitats while older and larger juveniles gradually transition to a neritic habitat.
- Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. They are the most abundant species of sea turtle found in the U.S. NMFS and USFWS published a Final Rule designating nine DPSs for loggerhead sea turtles (76 FR 58868). The NWA DPS is the only DPS that occurs in the Southeast Region.
- The neritic zone also provides crucial foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads in the Northwest Atlantic. Largely, these habitats overlap with the juvenile stage, the exception being most of the bays, sounds, and estuaries along the U.S. Atlantic and Gulf coasts from Massachusetts to Texas, which juveniles occupy but adults infrequently use. However, adult loggerheads are present year-round in Florida Bay, an important feeding area, probably because of relatively easy access to open ocean and migratory routes.
- The predominate foraging areas for NWA DPS adult loggerheads are found throughout the relatively shallow continental shelf waters of the U.S., Bahamas, Cuba, and the Yucatán

[3] Mid-beach is the mid-point of the total beach width of suitable nesting habitat. This varies based on beach topography e.g., not all beaches have dunes and/or vegetation, numerous beaches have coastal armoring/development thus changing the nesting habitat, etc. Individual species nesting habits dictate the average location for nest deposition.

Peninsula, Mexico. Migration routes from foraging habitats to nesting beaches (and vice versa) for a portion of the population are restricted to the continental shelf, while other routes involve crossing oceanic waters to and from the continental shelf waters. Seasonal migrations of adult loggerheads along the mid- and southeast U.S. coasts also occurs.

- In the Atlantic, the loggerhead turtle's range extends from Newfoundland to as far south as Argentina. During the summer, nesting occurs primarily in the subtropics. Adult loggerheads undergo extensive migrations between foraging areas and nesting beaches. During non-nesting years, adult females from U.S. beaches occupy waters off the eastern U.S. and throughout the Gulf of Mexico (GOM), Bahamas, Greater Antilles, and Yucatán. See Appendix A for range map as it relates to SERO consultations.
- Critical habitat has been designated for this species in the Caribbean (please refer to the SERO Sea Turtle Critical Habitat Consultation Framework).

Areas of consideration for consultations

- **Continental U.S.** In North Carolina, South Carolina, and Georgia, nesting season is May 1–August 30 and hatching season is June 15–October 31. In all other areas, nesting season is April 1–September 30 and hatching season is May 15–November 30.

  Loggerhead sea turtles are ubiquitous in Northwest Atlantic waters adjacent to the continental shelf. U.S. Loggerheads nest on ocean beaches, generally preferring high energy, relatively narrow, steeply sloped, coarse-grained beaches. See Appendix B for website links to additional information on nesting beaches and habitat use.

  Although the major nesting concentrations in the U.S. extend from North Carolina through southwest Florida, minimal nesting occurs outside of this range northward to Virginia and westward to Texas.

  Approximately 80% of loggerhead nesting occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). In Brevard and Indian River Counties, a 20 mile (32.2 km) section of coastline from Melbourne Beach to Wabasso Beach comprises the Archie Carr National Wildlife Refuge (ACNWR). The Refuge is the most important nesting area for loggerhead turtles in the western hemisphere, comprising 25% of all U.S. loggerhead nesting. ACNWR researchers have recorded nesting densities of 1,000 nests per mile (625 nests per km).

  Oceanic juveniles may be present year-round for projects occurring anywhere in *Sargassum*/ convergence zone habitats.

- **Puerto Rico** loggerheads are infrequently seen in the waters, no known nesting.

- **U.S. Virgin Islands (USVI)** nesting season on Buck Island is regular from July–August, but in very small numbers. Nesting outside Buck Island is sporadic; however, loggerheads may be present in USVI waters throughout the nesting season.

Hillis-Starr et al. (1998) notes loggerhead turtles in the U.S. Caribbean are mainly transitory and only occasionally seen. Although the likelihood of encountering the species in Puerto Rico and the USVI is low and effects determinations from projects in these areas may be No Effect or Not Likely to Adversely Affect (NLAA), consider project details before making this determination. For larger projects occurring over longer timeframes, the likelihood of encountering a loggerhead sea turtle increases, and biologists should consider whether and to what extent loggerhead sea turtles may be affected.

Green Sea Turtle *(Chelonia mydas)*

Photo Credit 2: Andy Bruckner, NOAA

- Weight: hatchling: 0.05 pounds (25 g); adult: 300-350 pounds (135-150 kg)
- Length: hatchling: 2 inches (5 cm); adult: 3 feet (1 m)
- Sexual maturity occurs anywhere between 20–50 years
- Diet: omnivores (hatchling); seagrasses and algae (gradually transitions to this specialized diet from juvenile to adult)
- Females return to their natal beaches, principally at night, every 2–4 years to lay eggs. Typically, nests are deposited high on the beach.
- Younger and smaller hatchlings/juveniles occupy pelagic habitats while older and larger juveniles gradually transition to a neritic habitat. See Appendix A for range map as it relates to SERO consultations.
- Only NA DPS nest in continental U.S., while both DPSs occur in the marine environment. Adults from the NA DPS and juveniles from both the NA and SA DPS occur in waters off the continental U.S. (see Incidental Take Calculation).
- Critical habitat has been designated for this species in the Caribbean (please refer to the SERO Sea Turtle Critical Habitat Consultation Framework).

Areas of consideration for consultations

- **Continental U.S.** NA DPS nesting season is May–October. Hatching season is July–November. Green turtles nest primarily along the central and southeast coast of Florida and some nesting occurs in southwest Florida. See Appendix B for website links to additional information on nesting beaches and habitat use.

  In U.S. Atlantic and GOM waters, green turtles occupy inshore and nearshore waters from Texas to Massachusetts, the USVI, and Puerto Rico. Inshore and nearshore areas with seagrass, algae, hardbottom habitat, and/or wormrock reef comprise their primary foraging areas throughout their range. Some examples of important feeding areas in Florida include the Indian River Lagoon, the Florida Keys, Florida Bay, Homosassa, Crystal River, Cedar Key, and St. Joseph Bay. Wormrock reef, found in areas from Cape Canaveral south to Palm Beach County, serves as both foraging and refuge habitat for green turtles.

Oceanic juveniles may be present year-round for projects occurring anywhere in *Sargassum*/ convergence zone habitats.

Incidental Take Calculation for NA and SA DPSs when the project occurs in the GOM or Atlantic:

- Impacts to nesters or hatchlings would only be to the NA DPS.
- Within the continental U.S., individuals from both the NA and SA DPSs occupy foraging grounds. The two DPSs mix in the marine environment, please read the Status of Species (SOS) carefully. Take percentages are calculated among the two DPSs based on genetics.

- **Puerto Rico** nesting season is June 1–October 31. Hatching season is July 15–December 31.

- **U.S. Virgin Islands** peak nesting occurs July–October. Peak hatching season is August-December. Sporadic nesting and hatching occur on either side of these windows.

Within the U.S. Caribbean, carefully analyze nearshore foraging areas with seagrass, algae, and/or hardbottom habitat for potential presence of this species.

Incidental Take Calculation for NA and SA DPSs when the project occurs in the U.S. Caribbean:

- Since we have no information specific to U.S. Caribbean waters, the effects analysis and jeopardy determination will be conducted separately for both the NA and the SA DPS as if ALL of the takes from the project will occur to EACH of the DPSs. This is a protective/conservative way to approach it without being arbitrary until we have better genetic information.

Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*

Photo Credit 3: National Park Service

- Weight: adult: 100 pounds (45 kg); hatchling: 0.5 ounces (14 g)
- Length: adult: 24–28 inches (60–70 cm); hatchling: 1.5 inches (3.8 cm)
- Sexual maturity is unknown but is estimated to be 10–16 years and at 58+ cm straight carapace length
- Diet: omnivores (hatchling); crabs, fish, jellyfish, and mollusks (gradually transitions to this specialized diet from juvenile to adult)
- Females return to their natal beaches, principally during daylight hours, every 1–3 years to lay eggs. Typically, nests are placed mid-beach within the initial vegetation line.
- Younger and smaller hatchlings/juveniles occupy pelagic habitats while older and larger juveniles gradually transition to a neritic habitat.
- Adult Kemp's primarily occupy neritic habitats. Neritic zones typically contain muddy or sandy bottoms where prey may be located.
- Kemp's ridleys distribution is throughout coastal waters of the GOM and U.S. Atlantic from Florida to New England. See Appendix A for range map as it relates to SERO consultations.

Areas of consideration for consultations

- **Continental U.S.** nesting season is April 1–July 15. Hatching season is May 15–September 15.

  Ridley's display a unique synchronized nesting habit. Large groups of Kemp's ridleys gather off the beaches in Mexico, with the largest aggregation located near Rancho Nuevo, in the state of Tamaulipas, where wave upon wave of females come ashore and nest an "arribada," which means "arrival" in Spanish. Smaller nesting assemblages have not exhibited this behavior, e.g., Texas, Florida, etc. Occasional isolated nesting occurs in North Carolina, South Carolina, and Florida. See the Appendix B for website links to additional information on nesting beaches and habitat use.

While U.S. nesting for Kemp's ridleys primarily occurs in south Texas, benthic-stage juveniles and adults occupy coastal and inshore waters throughout much of the GOM and Atlantic, including important foraging grounds in the North Carolina bays, sounds, and estuaries at the northern reaches of our Region.

Male Kemp's ridleys appear to occupy many different areas within the GOM depending on their breeding strategy. Some males migrate annually between feeding and breeding grounds, yet others may not migrate at all, mating with females opportunistically encountered.

Female Kemp's ridleys migrate to and from nesting beaches in Mexico. Females leave breeding and nesting areas and continue to foraging zones ranging from the Yucatán Peninsula to southern Florida. Some females take up residence in specific foraging grounds for months at a time, leading scientists to suggest that females have a goal-oriented migration. Kemp's ridleys rarely venture into waters deeper than 160 feet (50 m) (Byles and Plotkin 1994).

- Oceanic juveniles may be present year-round for projects occurring anywhere in *Sargassum*/ convergence zone habitats.

- **Puerto Rico and USVI** nesting, hatching, and foraging is not known to occur in these locations. Biologists can conclude "No Effect" for this species in these locations.

Hawksbill Sea Turtle (Eretmochelys imbricata)

Photo Credit 4: Michelle T. Scharer

- Weight: adult: 100–150 pounds (45–70 kg); hatchling: 0.5 ounces (15 g)
- Length: adult: ~3 feet (~1 m); hatchling: 2 inches (4 cm)
- Sexual maturity is not known but is estimated to be 31+ years and at 35+ cm straight carapace length
- Diet: omnivores (hatchling); sponges and other invertebrates, algae (gradually transitions to this specialized diet from juvenile to adult)
- Females return to their natal beaches, principally at night, every 2–3 years to lay eggs. Typically, nests are placed under vegetation.
- Younger and smaller hatchlings/juveniles occupy pelagic habitats while older and larger juveniles gradually transition to a neritic habitat.
- Hawksbills are widely distributed throughout the Caribbean Sea and western Atlantic Ocean, regularly occurring in southern Florida and the GOM (especially Texas), Puerto Rico, USVI, in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil.
- Hawksbill turtles use different habitats at different stages of their life cycle, but adults are most commonly associated with healthy coral reefs. The ledges and caves of coral reefs provide shelter for resting hawksbills both during the day and night. Hawksbills inhabit the same resting spot night after night. Hawksbills also occupy rocky outcrops and high-energy shoals, which are optimum sites for sponge growth. They also inhabit mangrove-fringed bays and estuaries, particularly along the eastern shore of continents where coral reefs are absent. See Appendix A for range map as it relates to SERO consultations.
- Critical habitat has been designated for this species in the Caribbean (please refer to the SERO Sea Turtle Critical Habitat Consultation Framework).

Areas of consideration for consultations

- **Continental U.S.** nesting season is sporadic May–November. Hatching season is July–December. Hawksbills are concentrated in Florida, with abundance declining outside of the state. There is intermittent low-density hawksbill nesting in the continental U.S. Adult hawksbills occupy areas supporting reefs and other hardbottom habitats supporting sponges (especially the East Coast of Florida from Palm Beach County south to the Florida Keys, where there are established hawksbill home ranges).

  Hawksbills primarily occur in Florida and Texas waters, though they are present in all the Gulf states. In Florida, hawksbills are occupy reefs off Palm Beach, Broward, Miami-Dade, and Monroe Counties. Most sightings involve juveniles, approximately 8–28 in (20–70 cm). In Texas, juvenile hawksbills are associated with stone jetties (Amos 1989; Hildebrand 1987).

  Oceanic juveniles may be present year-round for projects occurring anywhere in *Sargassum*/ convergence zone habitats.

  For most projects outside of Florida, the likelihood of encountering hawksbills is extremely low and projects may often result in a No Effect or NLAA determination. For larger projects occurring over longer periods, the likelihood of encountering a hawksbill sea turtle increases, and biologists should consider whether and to what extent hawksbill sea turtles may be affected.

  See Appendix B for website links to additional information on nesting beaches and habitat use.

- **Puerto Rico** nesting season is April 1–November 1 and hatching season is June 1–December 31.

- **U.S. Virgin Islands** nesting season is April 1–November 1 and hatching season is June 1–December 31.

  Hawksbills are more abundant throughout the Caribbean than the continental U.S., commonly occurring in Puerto Rico, its associated islands, and the USVI. In the Caribbean, as hawksbills grow they begin exclusively feeding on only a few types of sponges. There are regular nesting and foraging populations of hawksbills in the U.S. Caribbean. Consider this species in all Section 7 consultations in these areas.

Leatherback Sea Turtle *(Dermochelys coriacea)*

Photo Credit 5: R. Tapilatu

- Weight: adult: up to 2,000 pounds (900 kg); hatchling: 1.5 ounces (42.5 g)
- Length: adult: 6.5–8 feet (2-2.5 m); hatchling: 2–3 inches (5-7.5 cm)
- While leatherbacks may grow to sexual maturity at an earlier age than other sea turtles, more data are needed before growth rates can be accurately calculated.
- Diet: omnivores (hatchling); soft-bodied animals, such as jellyfish, salps, and pyrosomes (gradually transitions to this specialized diet from juvenile to adult).
- While the majority of females return to the same nesting beach repeatedly throughout the nesting season, some females nest on separate beaches > 100 km apart within a season. Nocturnal nesting is typical while diurnal nesting occurs only occasionally. The remigration rate (time interval between nesting seasons) is 2–3 years, with nests deposited from mid to high on the beach.
- The only sea turtle species that lacks a hard shell, hence its name.
- Leatherbacks have the widest global distribution of all reptile species. The leatherback turtle occurs worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. Leatherbacks are the most migratory and wide ranging of sea turtle species.
- Leatherbacks, commonly known as pelagic animals, also forage in coastal waters.
- Leatherbacks mate in the waters adjacent to nesting beaches and along migratory corridors. After nesting, female leatherbacks migrate from tropical waters to latitudes that are more temperate. These latitudes support high densities of jellyfish prey in the summer.
- Adult leatherbacks are capable of tolerating a wide range of water temperatures and occur along the entire continental east coast of the U.S. as far north as the Gulf of Maine and south to Puerto Rico, the USVI, and into the GOM. They are also the deepest divers, reaching depths exceeding 1,000 meters, which is deeper than some cetaceans and pinnipeds.
- There is poor understanding of juvenile leatherback distribution and developmental habitats. In an analysis of available sightings (Eckert 2002), researchers found that leatherback turtles smaller than about 3 feet (100 cm) carapace length were only sighted in waters about 79°F (26°C) or warmer, while adults were found in waters as cold as 32–59°F (0–15°C) off

Newfoundland (Goff and Lien 1988). See Appendix A for range map as it relates to SERO consultations.

- Critical habitat has been designated for this species in the Caribbean (please refer to the SERO Sea Turtle Critical Habitat Consultation Framework).

Areas of consideration for consultations

- **Continental U.S.** nesting season is February 1July 31. Hatching season is April 1–October 15.

  Leatherbacks mainly nest along the beaches in southeast Florida but have also been documented nesting on the west coast of Florida, including the Panhandle. However, for most inshore and coastline projects in the SER, it is appropriate to make a “No Effect” determination based on the fact that adult leatherbacks prefer open, deep-water habitat where they forage primarily on jellyfish. Consider adult leatherbacks in projects occurring in the marine/offshore environment. Adult and hatchling leatherbacks must be considered in nearshore waters off or near nesting beaches during the mating, nesting, and hatching seasons. High jellyfish concentrations can also occur seasonally in nearshore waters (often from April-May off Georgia, South Carolina, and North Carolina and during spring and fall in the GOM), and leatherbacks will be found in high densities close to shore, in those circumstances. See Appendix B for website links to additional information on nesting beaches and habitat use.

- **Puerto Rico** nesting season is March 1–July 31 and hatching season is May 1–October 15.

- **U.S. Virgin Islands** nesting season is March 1–July 31 and hatching season is May 1–October 15.

  For most coastal projects, it is appropriate to make a “No Effect” determination because adult leatherbacks prefer open, deep-water habitat where they forage primarily on jellyfish. Consider adult leatherbacks for projects occurring in the marine/offshore environment. Also, consider adult and hatchling leatherbacks in coastal waters off or near nesting beaches during the mating, nesting, and hatching seasons.

Common Effects, Considerations, Stressors, and Responses Relevant to All Sea Turtle Species

Potential Stressors and Activities when it may be appropriate to make a “No Effect” determination

Turbidity - Some projects can result in a temporary increase in turbidity, though turbidity curtains are often used to control and reduce turbidity, and projects must adhere to state water quality standards. Sea turtles are able to swim through or avoid any potential turbidity without harm. These species are naturally exposed to turbidity throughout their environment in areas of naturally lower water clarity. Therefore, we believe any potential exposure to a short-term increase in turbidity, as a result of the construction, will have no effect on sea turtles.

Noise - Pile installation by jetting, using an auger or drop punch to create a pilot hole, or installing I-beam boatlifts using a vibratory hammer, will not result in physical injury (injury from exposure to peak pressure or cumulative sound exposure) or behavioral noise effects, because it will not create noise levels in excess of the respective thresholds for physical injury or behavioral responses of sea turtles. Therefore, we believe any potential exposure to the limited increase in noise as a result of the pile driving methods described above will have no effect on sea turtles.

Movement and access to foraging or refuge habitat[4] - We believe the following activities will have no effect[5] on sea turtles (will not limit their movement or ability to access foraging or refuge habitat):

- Activities that occur along the shoreline: Shoreline stabilization, pile-supported structures, water management outfall structures, and boat ramps. The placement of such materials along the shoreline would not create an obstruction for species to move around these features to access foraging and refuge habitat in surrounding areas. The placement of a single pile or buoy for an ATON also would not create an obstruction when placed in open water.

- Scientific survey devices and transmission and utility lines are small and not expected to create an obstruction to movement of species in an area. Scientific survey devices only allows the temporary placement of materials, which the U.S. Army Corps of Engineers (USACE) assumes will be under 50 ft^2 each based on previously authorized devices. Transmission and utility lines are either subaqueous or are supported on single piles spaced apart to support aerial transmission lines.

Limiting species movement for reproduction - In specific locations and during certain times of year, sea turtles migrate for reproductive purposes. Loggerhead, green (NA DPS), Kemp’s, hawksbill, and leatherback sea turtles nest on U.S. Continental beaches and, loggerhead, green (NA DPS), hawksbill, and leatherback sea turtles nest on beaches in the U.S. Caribbean. Female sea turtles migrate to nesting beaches to lay eggs and hatchlings migrate away from these beaches. The

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[4] If project is removing foraging or refuge habitat, those effects should be considered separately.
[5] No effect determinations refer to the presence of the structures, but the effects of installation may differ.

placement of materials or presence of equipment in front of (i.e., waterward of) nesting beaches could interfere with or obstruct sea turtles' ability to access or leave the beach. In addition, the presence of lights in the area could disorient hatchlings leaving the beach that use the moon to navigate to sea. However, the following activities with associated project design and requirements will likely result in no effect to movement for reproductive purposes (however there may be other routes of effect to be considered):

- Activities associated with pile-supported structures and ATONs, dredging, outfall structures, scientific survey devices, seagrass restoration, utility and transmission lines, and marine debris removal will not create obstructions, add lighting, or otherwise disrupt access to and from nesting beaches, or otherwise interfere with the use of these areas, by adult or hatchling sea turtles. These activities (1) are small in size such they will not obstruct movement, (2) are typically completed during the day when turtles are not approaching the beaches for nesting[6], and (3) do not create lighting, structures, or other potential disruptions to nesting beach access.

- Docks installed within visible distance of beaches are required to use turtle-friendly lighting if lighting is necessary for the project. Turtle-friendly lighting is installed in a manner that does not allow light to be seen so that it does not disorient turtles leaving the beach or discourage them from approaching a beach.

Therefore, we believe that none of these activities will result in obstructions to sea turtles accessing nesting beaches or create lighting that would be disorienting to sea turtles, and thus we believe these activities will not affect sea turtles by limiting their ability to access or use nesting beaches.

[6] Excluding Kemp's who are daytime nesters

Potential Activities that are “Not Likely to Adversely Affect” or “Likely to Adversely Affect (LAA)”

The biologist must carefully analyze the effects of the proposed action to confirm whether NLAA or LAA is most applicable (Table 2). An activity that is typically NLAA for an activity could be LAA for a different consultation if circumstances are significantly different or certain Best Management Practices (BMPs) are not incorporated.

Table 2. Activities that May Affect Sea Turtles

Activity	Route of Effects	Potential Impact to All Sea Turtle Species	Considerations
Shoreline stabilization near nesting beaches (e.g., breakwater, jetty, groin)	• Potential disturbance during construction • May create a physical barrier for hatchlings and nesting females • May alter nearshore currents • May concentrate predators • Interaction with construction equipment	• May pose threat of impingement or stranding of hatchlings upon the barrier. Impingement on the barrier is likely to injure or kill hatchlings through traumatic injury, exposure, or predation. Such a barrier may also preclude, or discourage, a nesting female from making the approach to the beach to nest • Hatchlings may become disoriented if project alters nearshore currents • Concentration of predators may result in take of hatchlings • Interaction with construction equipment is typically extremely unlikely to occur due to species’ mobility; however, the biologist must consider if the turtle may be cold-stunned (water temp <60°F/16°C), which would affect the mobility of the animal.	• Location and length of the structure? • Distance of the structure from shore? • Water depth from the top of the structure to the water surface? • Water depth at the terminus of the structure? • Depth of proposed structure? • Is the structure parallel or perpendicular to shoreline? • Timing of the project (in nesting season)? • What species and life stages may be present? • Type of equipment to be used and duration of in-water construction? • Type of material? • Design type? • Offshore profile? • Presence/absence of existing predators and concentrations? • Water current patterns? • Use of beachfront by sea turtles? If so, are nests left *in situ*? • Hatchling/adult ability to enter the water from landward origin?

Activity	Route of Effects	Potential Impact to All Sea Turtle Species	Considerations
Beach Nourishment	• Potential disturbance during construction • Burial of nearshore foraging/refuge habitat • Vessel strike • Interaction with construction equipment • Disturbance to nesting females and hatchlings in the water (from noise and lighting)	• Lost foraging habitat for juvenile green sea turtles if the project will result in burial of nearshore hardbottom habitat, which typically support macroalgae upon which the turtles graze. • Interactions with construction equipment are typically extremely unlikely to occur due to species' mobility; however, the biologist must consider if the turtle may be cold-stunned (in winter months), which would affect the mobility of the animal • Nighttime construction could be a disturbance (and potentially LAA) for nesting females and hatchlings in the water	• What species and life stages may be present? • What habitat types may be affected? Are these important habitats for sea turtles (e.g., nearshore hardbottom habitat or coral reefs)? **Note:** If nearshore hardbottom occurs in your project area, it may be LAA for juvenile green sea turtles, depending on scope of habitat loss. • Timing of the project (in nesting/ hatching/cold-stunning season)? • Type of equipment to be used and the duration of in-water construction? • Average speed of support vessels? How many vessels will be in the project area at a given time? • Will construction occur at night? If so, will they use downward-facing lighting on the dredge? • Type of material? • Offshore profile? • Presence/absence of existing predators and concentrations? • Water current patterns? • Project design?

Dredging (e.g., hopper, clamshell, or cutterhead)	• Potential disturbance during construction • Short and/or long-term habitat alteration • Impingement/ entrainment in the dredge and/or drowning in trawl net (if there is relocation trawling prior to dredging)	• **Of the 3 dredge types, only hopper dredges are LAA for sea turtles**; if relocation trawling is proposed, there is potential for lethal and nonlethal take • Long-term habitat alteration may result in take (e.g., in the case of removing nearshore hardbottom or removing coral reefs) • Interaction with equipment (excluding hopper dredging) is typically extremely unlikely to occur due to species' mobility; however, the biologist must consider if the turtle may be cold-stunned (in winter months), which would affect the mobility of the animal	• What species and life stages may be present? • What habitat types may be affected? Are these important habitats for sea turtles (e.g., nearshore hardbottom habitat or coral reefs)? **Note:** If nearshore hardbottom occurs in your project area, it may be LAA for juvenile green sea turtles depending on scope of habitat loss. • Timing of the project (in nesting/ hatching/cold-stunning season)? • Type of equipment to be used and the duration of dredging? **Note:** In areas of high turtle abundance, NMFS recommends a cutterhead dredge instead of a hopper dredge to minimize take. NMFS also recommends bed-leveling during cleanup in lieu of continued hopper dredging in areas of high turtle abundance. • What is the average speed of support vessels and how many vessels will be in the project area at a given time? • Will construction occur at night? If so, will they use downward-facing lighting on the dredge? • Type of material? • Offshore profile? • Presence/absence of existing predators and concentrations? • Water current patterns? • Project design?

Activity	Route of Effects	Potential Impact to All Sea Turtle Species	Considerations
Aquaculture	• Potential disturbance during construction • May be a physical barrier • May pose an entanglement risk; entanglement risk can be increased if turtles are attracted to the cultured animals or their food • May alter water quality and/or habitat	• Interaction with construction equipment is typically extremely unlikely to occur due to species' mobility; however, the biologist must consider if the turtle may be cold-stunned (water temp <60°F/16°C), which would affect the mobility of the animal • Physical barrier could block access to nesting beach or foraging grounds • Entanglement could result in drowning or injury • Water quality/habitat degradation could reduce habitat quality	• What species and life stages may be present? • What type of habitat will be affected? • Type of equipment to be used and duration of in-water construction? • Duration of the permit (i.e., how long will the project be in operation so we know how long any structures would be in the water)? • What is the configuration and design of the aquaculture equipment? • What are the maintenance plans for the facility (e.g., how often will nets be inspected and any holes repaired; how often will encrusting organisms be removed?) • Vessel activity?

Activity	Route of Effects	Potential Impact to All Sea Turtle Species	Considerations
Artificial Reefs[7]	• Potential disturbance during construction • Potential for entanglement in fishing line that gets wrapped around the structure • Entrapment within certain reef structures • Habitat alteration • Blasting impacts, if explosives are used to sink vessels • Physical injury from placed material • Concentration of predators	• These projects are typically NLAA, but need to consider potential for entanglement and/or entrapment (if entanglement and/or entrapment is not extremely unlikely to occur, it may be LAA) • Use of explosives would likely be LAA • Interaction with construction equipment and placement of material is typically extremely unlikely to occur due to species' mobility; however, the biologist must consider if the turtle may be cold-stunned (in winter months), which would affect the mobility of the animal. Also consider the amount and manner of material placement	• If you have an artificial reef project, please refer to the Interim Guidance for Consultations Involving Artificial Reefs for more information. • What species and life stages may be present? • What type of habitat will be affected? • Type of equipment to be used and duration of in-water construction? • Design and configuration of reef • Duration of the permit (consider how often action agency may request reauthorization since most artificial reef permits are ongoing leading to an increase in structures placed in the marine environment over time)? • Is the artificial reef proposed offshore from a sea turtle nesting beach? If so, consider the potential for increased predation (due to predators potentially being attracted to the artificial reef structures).

[7]Refer to Mike Barnette's NOAA Tech Memo, "Potential Impacts of Artificial Reef Development on Sea Turtle Conservation in Florida" (https://repository.library.noaa.gov/view/noaa/13140).

Consulting biologists must 1) assess the proposed action for a specific consultation, 2) determine what routes of effect derive from it, and 3) refer to this section of the framework for assistance in evaluation given those stressors or routes of effect.[8]

a. Entanglement - In scenarios where SERO's *Protected Species Construction Conditions* and other BMPs are not adhered to, or any proposed actions where entanglement still remains a risk, the biologist must determine whether entanglement may adversely affect sea turtles. The presence of flexible materials in the water could create an entanglement risk to sea turtles.

b. Entrapment - The construction or placement of structures have the potential to entrap sea turtles. Entrapment can occur in two ways: entrapment within a structure, such as an artificial reef, grated intake pipe, or other in-water structure; or entrapment in a confined area such as a bay, canal, etc. from construction activities creating a barrier. When reviewing the proposed action factors to be considered include the size of openings of the structure, potential ability for a turtle to enter and exit the structure, the likelihood of sea turtles being in the confined area when the barrier is erected, and length of time the barrier or structure is expected to be in place.

c. Physical injury from equipment - We believe sea turtles have the potential to be physically injured or killed by interactions with construction equipment, vessels, and materials. However, we believe this effect is typically extremely unlikely to occur because these species are mobile and expected to move away from active construction equipment. If this determination is valid for your specific proposed action, you should also check that BMPs are included in the proposed action that help ensure project activities will be conducted in a precautionary manner. Action agencies typically requires applicants to follow SERO's *Protected Species Construction Conditions.* When reviewing the proposed action, check to see whether the incoming consultation package indicates whether these conditions will be followed.

d. Physical barrier - The construction of physical barriers (such as breakwater, jetty, groin), especially parallel to a nesting beach, has the potential to impact nesting females and hatchlings. A physical barrier may pose the threat of impingement or stranding of the hatchlings upon the barrier. Impingement on the barrier is likely to injure or kill hatchlings through traumatic injury, exposure, or predation. Such a barrier may also preclude, or discourage, a nesting female from making the approach to the beach to nest. Among factors to consider are location and length of the structure, distance of the structure from shore, and depth from the top of the structure to the water surface.

e. Alteration of nearshore currents and/or wave patterns - Nearshore structures such as breakwaters have the potential to alter nearshore currents and/or wave patterns, potentially to the detriment of hatchling sea turtles. Some nearshore structures have the potential to create strong longshore currents, which can cause hatchling sea turtles leaving the beach to be swept alongshore and expend extra energy as they attempt to reach deeper water and offshore

[8] There may be other stressors not listed, please evaluate your proposed action thoroughly. You must determine if any aspects of your project present a situation in which the suggestions here are not applicable

currents. Other structures have the potential to alter the wave patterns/directions by diffracting the waves as they come towards the beach (such as a segmented, emergent breakwater creating a series of semi-circular wave patterns). Hatchlings rely on wave patterns as one of their cues to determine swimming direction to the open ocean, thus changes in the patterns can result in disorientation in the water, and prolonged likelihood of predation or exhaustion.

f. Habitat exclusion - Sea turtles may be unable to use project sites as forage or refuge habitat due to avoidance of routine construction/project activities related to noise and physical exclusion from the area blocked by turbidity curtains, or from activity disturbance. We believe these types of effects would typically be insignificant, based on the typical small footprint and short duration associated with most projects. Additionally, sea turtles are highly mobile organisms, and if similar habitat is nearby we expect that alternative sites could provide similar short-term refuge or forage opportunities. You must confirm that this determination fits your specific circumstances related to your proposed action.

g. Habitat alterations/loss - Sea turtles use a variety of habitats. We believe any effects from many small scale removals or modifications of habitat will be insignificant; however, consider the uniqueness or importance of the habitat and if there is other habitat in close proximity to the project site that can serve a similar habitat function for sea turtles. Projects removing or altering areas of habitat and/or unique habitat features (e.g., nearshore hardbottom habitat) will require further consideration and analyses and, in some cases, may be LAA. Additionally, the cumulative impact of such habitat removal or alteration should be considered, tracked, and monitored.

h. Vessel strikes - Vessel traffic, both recreational and commercial, have been documented in stranding reports adversely affecting sea turtles. Some projects (e.g., federal fisheries) may result in *direct* impacts to sea turtles and must be analyzed to assess potential take (please refer to Fishery Management Plan consultations done with the SERO Sustainable Fisheries Division). Construction of pile-supported structures (like piers) and boat ramps may *indirectly* result in increase in vessel use by introducing additional and increased shore-based transfer and support facilities. As such, the potential exists for adverse effects to these species from a possible increase in vessel usage. You must determine if these activities would be expected to result in a permanent increase in the number of vessels beyond what currently exists.[9] Consider whether the addition of a new vessel slip(s) may introduce vessels to an area where there is currently little to no vessel traffic. Additionally, whether the introduction of new vessels to this area may pose an increased risk of a vessel striking, injuring, or killing a sea turtle. In any vessel strike analysis, you should ascertain whether project) BMPs (e.g., speed limits) exist and if they do not, they should be discussed with the federal agency. Depending on your individual analysis and the facts of your situation, you can then determine if vessel strike is extremely unlikely to occur (NLAA) or likely to result in take (LAA).

[9] PRD looks at permanent increase (dry storage, permanent/leased moorage). Facilities with temporary/day mooring do not necessarily contribute to an increase in vessel traffic, but rather a redistribution from the surrounding area.

Note: Hazel et al. (2007) reported results that implied that vessel operators could not rely on sea turtles actively avoiding being struck by a vessel if it exceeds 2 knots. For projects that propose to add one or more new vessel slips, please refer to the memo written by Mike Barnette (Barnette, 2018).

j. Noise - Sea turtle hearing range is 100-2,000 Hz, based on Ketten and Bartol (2006); Lenhardt et al. (1996); Lenhardt (1994); McCauley et al. (2000a); McCauley et al. (2000b); Moein et al. (1994); O'Hara and Wilcox (1990). Effects to sea turtles, because of noise created by in-water activities, can physically injure animals (e.g., severe damage of major organ systems, hearing structure damage) which may ultimately result in mortality.[10] It can also change animal behavior. Injurious effects can occur in two ways. First, immediate adverse effects can occur to listed species if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects interfere with the animal migration, feeding, resting, or reproduction, for example. The biologist should conduct a noise analysis to evaluate effects to ESA-listed sea turtles identified by NMFS and whether the effects are NLAA or LAA. The biologist should use the multi-species pile driving calculator found at https://www.fisheries.noaa.gov/southeast/consultations/section-7-consultation-guidance.

k. Concentration of predators - The construction of nearshore structures adjacent to sea turtle nesting beaches have the potential to result in an increase/concentration of predatory fishes. This can lead to increased predation rates (and thus, mortality) of hatchling sea turtles as they leave the nesting beach to head out to open waters. Factors such as density of nests on the beach, depth of structure, distance of the structure from shore, and pre-construction seafloor topography (plain sand, rocky, reefs, existing structures, etc.) need to be considered in the analysis.

l. Pollution - The effects of possible pollutants, both chemical (toxins) and physical (ingestion of plastics, entanglement) must be considered for both direct effects to sea turtles and indirect effects via habitat impacts (see “f. Habitat alterations/loss”).

m. Fishery bycatch (e.g., from piers) - Fishing piers result in fishing, which results in potential for indirect effects of incidental capture (e.g., hooking) by fishers. Thus take could occur and these consultations cannot be conducted informally (i.e., are not typically NLAA) and you must pursue a formal consultation (with Incidental Take Statement).

[10] SERO PRD analyzes the injurious noise effects from pile driving and blasting. For non-pile-driving activities, PRD analyzes behavioral effects (i.e., animals may avoid the area during construction due to noise, equipment, etc.)

Conservation and Recovery Considerations

One of the goals of PRD is to promote conservation and recovery of ESA listed species. Section 7 consultations and the related engagement with action agencies (and applicants) provide an opportunity to help achieve the goal. You can further conservation and recovery through minimization of effects, negotiation of conservation measures, and devising effective conservation recommendations.

Minimization of Effects and Conservation Measures

You can work to minimize or avoid the effects of an action agency's proposed action during the consultation process, seeking ways to incorporate best management practices, recommending different equipment, materials, or methods to ensure that project activities are carried out in the most careful and least impactful manner possible to species and critical habitat. This back and forth with the action agency can result in a proposed action that will help PRD and the agency ensure that the action has a minimal negative effect on conservation and recovery of the species. When conducting a formal consultation which results in take and an Incidental Take Statement, you can also develop "Terms and Conditions" designed to minimize the impact of any such take on the species. Possible issues to consider during consultation in SERO informal and formal consultations include, but are not limited to:

- Ensuring projects prevent debris from entering environment. (This may include, but is not limited to, requiring fishing line depository containers on public docks, minimizing/avoiding fish discards from pier cleaning stations by requiring trashcans with lids or by not allowing fish cleaning stations, and mitigating for fuel spills.)
- Reducing boat speeds.
- Requiring "turtle friendly" artificial lighting on piers and vessels used during the proposed action.
- Year or day/night scheduling of project to avoid impacts.
- Need to observe for species right before or during proposed action activities.
- Need to specify handling and release requirements (for species that are taken).
- Design of equipment used in proposed action (e.g., circle hooks vs. J hooks).
- Material(s) used, such as stiff (versus looping) ropes.

Conservation Activities and Recommendations

It is also important to work with action agencies to promote proactive, forward thinking efforts to help conserve and recover the species. This will help the agency comply with its section 7(a)(1) obligations, improve the environmental baseline of species, and recover species so they no longer need the protections of the ESA. These can be implemented through Conservation Recommendations resulting from the consultation. They provide an opportunity to stimulate partnerships. They also allow federal agencies to get credit for doing positive things for ESA species and critical habitat. Biologists should give thought to possible conservation recommendations based on the project type, location, and action agency and /or applicant performing the activity. Where applicable and practicable, staff should seek the cooperation and assistance of action agencies and applicants in helping with public outreach concerning the plight of the species. This may include, but is not limited to, helping communicate the importance of minimizing human impacts to habitats used by sea turtles (and other protected species) (e.g., educational signage), promoting responsible fishing practices (e.g., the use of circle hooks when fishing in areas where this species may be captured, safely returning the species to the water if captured, etc.). Refer to the sea turtle recovery plans for conservation recommendations.

Examples of Conservation Recommendations

Examples of Conservation Recommendations for dredging/nourishment activities, fishing piers, and fisheries research activities from SERO's biological opinions are provided below. Please search the Environmental Consultation Organizer (ECO) and Recovery Plans to find additional examples that may be useful depending on the type of action being evaluated in your consultation.

Dredging/Nourishment

NMFS believes the following conservation recommendations further the conservation of listed sea turtle species. NMFS strongly recommends that these measures be considered and implemented, and requests to be notified of their implementation.

1. To the extent practicable, the USACE and Bureau of Ocean Energy Management (BOEM) should schedule dredging operations at times of year when listed species are least likely to be present in the borrow areas.

2. Whenever possible, the USACE and BOEM should outfit any hopper dredge with a rigid deflector draghead as designed by the USACE Engineering Research and Development Center. Alternatively, if that is unavailable, a rigid sea turtle deflector should be attached to the draghead.

3. To the extent practicable, the USACE and BOEM should minimize the use of hopper dredges in favor of cutterhead dredges. Should a hopper dredge be necessary, USACE and BOEM will require NMFS-approved observers to monitor dredged material inflow and overflow screening baskets on the hopper dredge.

4. The USACE and BOEM should conduct studies in conjunction with cutterhead dredging where disposal occurs on the beach to assess the potential for improved screening to: (1) establish the type and size of biological material that may be entrained in the cutterhead dredge, and (2) verify that monitoring the disposal site without screening is providing an accurate assessment of entrained material.

5. The USACE and BOEM should support studies to determine the effectiveness of using a sea turtle deflector to minimize the potential entrainment during hopper dredging.

6. The USACE and BOEM should explore alternative means for monitoring for interactions

with listed species when unexploded ordnance (UXO) screening is in place including exploring the potential for video or other electronic monitoring and consider designing pilot studies to test the efficiency of innovative monitoring and screening techniques.

Fishing piers

NMFS strongly recommends that these measures be considered and implemented by USACE and/or the applicant:

1. Perform pier surveys to determine the percent of captured sea turtles that are reported so they can be treated at a rehabilitation facility.

2. USACE encourages the Florida sea turtle rehabilitation centers to work with other state sea turtle rehabilitation facilities on the best handling techniques, data collection and reporting, and public outreach.

3. USACE encourages research to develop deterrents to discourage turtles from using fishing piers as a habitualized food source.

Fisheries and Fishery Research

NMFS should support in-water abundance estimates of sea turtles to achieve more accurate status assessments for these species and to better assess the impacts of incidental take during fishing.

NMFS should collect data describing locations and movements in the Atlantic Ocean to assist in future assessments of interactions between fishing gear and migratory and feeding behavior. NMFS should fund or collect future research to identify ways to reduce the mortality rate of incidentally captured animals.

General Threats Faced by All Sea Turtle Species

Sea turtles face numerous natural and man-made threats that shape their status and affect their ability to recover. Many of the threats either are the same or similar in nature for all listed sea turtle species. Those identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding Status of the Species sections where appropriate.

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS et al. 2011b; NMFS et al. 2011a; NMFS and USFWS 1991; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008). Domestic fisheries often capture, injure, and kill sea turtles at various life stages. Sea turtles in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Sea turtles in the benthic environment in waters off the coastal U.S. are exposed to a suite of other fisheries in federal and state waters. These fishing methods include trawls, gillnets, purse seines, hook-and-line gear (including bottom longlines and vertical lines [e.g., bandit gear, handlines, and rod-reel]), pound nets, and trap fisheries. The Southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern U.S. and continue to interact with and kill large numbers of sea turtles each year.

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially loggerheads and leatherbacks, circumnavigating the Atlantic are susceptible to international longline fisheries including the Azorean, Spanish, and various other fleets (Aguilar et al. 1994; Bolten et al. 1994). Bottom longlines and gillnet fishing is known to occur in many foreign waters, including, but not limited to, the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

Non-Fishery In-Water Activities

There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the U.S., the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997). Sea turtles entering coastal or inshore areas have also been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment and/or injury resulting from private and commercial vessel operations, military detonations and training exercises, in-water construction activities, and scientific research activities. Artificial lighting on board ship is also a concern to newly emergent hatchlings as they enter the water and concentrate around the light source rather than continue their swim out to sea resulting in exhaustion and becoming susceptible to predation.

Coastal Development and Erosion Control

Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and nourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). These factors may decrease the amount of nesting area available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings. Sea turtle hatchlings typically emerge from the nest sites during night hours. As such, these animals have a strong affinity for the brightest horizon, which should be the reflection of the moon and stars off the ocean. Artificial lighting is a concern when it misdirects the hatchlings from finding the ocean, swimming seaward to deeper water, or causing them to aggregate around a light source thus increasing predation rates. Adult sea turtles are also affected by artificial lighting but to a lesser extent. In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination

Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., dichlorodiphenyltrichloroethane [DDT], polychlorinated biphenyls [PCB], and perfluorinated chemicals [PFC]), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface, and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

The April 20, 2010, explosion of the Deepwater Horizon oil rig affected sea turtles in the GOM. An assessment has been completed on the injury to GOM marine life, including sea turtles, resulting from the spill (DWH Trustees 2015). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had sub lethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e. leatherbacks, juvenile loggerheads, and juvenile green turtles).

Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (http://www.climate.gov).

Climate change impacts on sea turtles currently cannot be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007a). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007a).

The effects from increased temperatures may be intensified on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990). These impacts will be exacerbated by sea level rise. If females nest on the seaward side of the erosion control structures, nests may be exposed to repeated tidal overwash (NMFS and USFWS 2007b). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat, as a result of climate change, could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish) which could ultimately affect the primary foraging areas of sea turtles.

Other Threats

Predation by various land predators is a threat to developing nests and emerging hatchlings. The major natural predators of sea turtle nests are mammals, including raccoons, dogs, pigs, skunks, and badgers. Emergent hatchlings are preyed upon by these mammals, as well as, ghost crabs, laughing gulls, and the exotic South American fire ant (*Solenopsis invicta*). In addition to natural predation, direct harvest of eggs and adults from beaches in foreign countries continues to be a problem for various sea turtle species throughout their ranges (NMFS and USFWS 2008).

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals. Cold stunning is defined as “the state that turtles enter when they are suddenly exposed to very cold water (<16 °C). They become lethargic and begin to float on the surface of the water. In this state, they are susceptible to predators, accidental boat strikes, and even death if water temperatures continue to drop.”

References:

Ackerman, R. A. 1997. The nest environment and the embryonic development of sea turtles. Pages 83-106 *in* P. L. Lutz, and J. A. Musick, editors. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Aguilar, R., J. Mas, and X. Pastor. 1994. Impact of Spanish swordfish longline fisheries on the loggerhead sea turtle *Caretta caretta* population in the western Mediterranean. Pages 91-96 *in* J. I. Richardson, and T. H. Richardson, editors. Proceedings of the 12th Annual Workshop on Sea Turtle Biology and Conservation. U.S. Department of Commerce, Jekyll Island, Georgia.

Amos, A. F. 1989. The occurrence of Hawksbills (*Eretmochelys imbricata*) along the Texas Coast. Pages 9-11 *in* S. A. Eckert, K. L. Eckert, and T. H. Richardson, editors. Ninth Annual Workshop on Sea Turtle Conservation and Biology.

Antonelis, G. A., J. D. Baker, T. C. Johanos, R. C. Braun, and A. L. Harting. 2006. Hawaiian monk seal (*Monachus schauinslandi*): Status and conservation issues. Atoll Research Bulletin 543:75-101.

Baker, J., C. Littnan, and D. Johnston. 2006. Potential effecfs of sea-level rise on terrestrial habitat and biota of the northwestern Hawaiian Islands. Pages 3 *in* Twentieth Annual Meeting Society for Conservation Biology Conference, San Jose, California.

Barnette, M. C. 2018. Threats and effects analysis for protected resources on vessel traffic associated with dock and marina construction. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, NMFS SERO PRD Memorandum, October 31, 2018, Saint Petersburg, FL.

Bass, A. L., and W. N. Witzell. 2000. Demographic composition of immature green turtles (Chelonia mydas) from the east central Florida coast: Evidence from mtDNA markers. Herpetologica 56(3):357-367.

Bolten, A. B., K. A. Bjorndal, and H. R. Martins. 1994. Life history model for the loggerhead sea turtle (*Caretta caretta*) populations in the Atlantic: Potential impacts of a longline fishery. Pages 48-55 *in* G. J. Balazs, and S. G. Pooley, editors. Research Plan to Assess Marine Turtle Hooking Mortality, volume Technical Memorandum NMFS-SEFSC-201. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center.

Bouchard, S., and coauthors. 1998. Effects of exposed pilings on sea turtle nesting activity at Melbourne Beach, Florida. Journal of Coastal Research 14(4):1343-1347.

Byles, R. A., and P. T. Plotkin. 1994. Comparison of the migratory behavior of the congeneric sea turtles *Lepidochelys olivacea* and *L. kempii*. Pages 39 *in* B. A. Schroeder, and B. E. Witherington, editors. Thirteenth Annual Symposium on Sea Turtle Biology and Conservation.

Daniels, R. C., T. W. White, and K. K. Chapman. 1993. Sea-level rise - destruction of threatened and endangered species habitat in South Carolina. Environmental Management 17(3):373-385.

DWH Trustees. 2015. DWH Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2015. Deepwater Horizon Oil Spill: Draft Programmatic Damage Assessment and Restoration Plan and Draft Programmatic Environmental Impact Statement. Retrieved from http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

Eckert, S. A. 2002. Distribution of juvenile leatherback sea turtle *Dermochelys coriacea* sightings. Marine Ecology Progress Series 230:289-293.

Fish, M. R., and coauthors. 2005. Predicting the Impact of Sea-Level Rise on Caribbean Sea Turtle Nesting Habitat. Conservation Biology 19(2):482-491.

Foley, A. M., K. E. Singel, P. H. Dutton, T. M. Summers, A. E. Redlow, and J. Lessman. 2007. Characteristics of a green turtle (*Chelonia mydas*) assemblage in northwestern Florida determined during a hypothermic stunning event. Gulf of Mexico Science 25(2):131-143.

Garrett, C. 2004. Priority Substances of Interest in the Georgia Basin - Profiles and background information on current toxics issues. Canadian Toxics Work Group Puget Sound, Georgia Basin International Task Force, GBAP Publication No. EC/GB/04/79.

Geraci, J. R. 1990. Physiologic and toxic effects on cetaceans. Pages 167-197 *in* J. R. Geraci, and D. J. S. Aubin, editors. Sea Mammals and Oil: Confronting the Risks. Academic Press, San Diego.

Goff, G. P., and J. Lien. 1988. Atlantic leatherback turtle, Dermochelys coriacea, in cold water off Newfoundland and Labrador. Can. Field Nat. 102(1):1-5.

Grant, S. C. H., and P. S. Ross. 2002. Southern Resident killer whales at risk: Toxic chemicals in the British Columbia and Washington environment. Department of Fisheries and Oceans Canada, Sidney, B.C.

Hartwell, S. I. 2004. Distribution of DDT in sediments off the central California coast. Marine Pollution Bulletin 49(4):299-305.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robinson. 2007. Vessel speed increases collision risk for the green turtle Chelodina mydas. Endangered Species Research 3:105-113.

Hildebrand, H. 1987. A reconnaissance of beaches and coastal waters from the border of Belize to the Mississippi River as habitats for marine turtles. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory.

Hillis-Starr, Z.-M., B. Phillips, and J. T. Crow. 1998. A Windows operated database for sea turtle research. Pages 194-195 *in* S. P. Epperly, and J. Braun, editors. Seventeenth Annual Sea Turtle Symposium.

Iwata, H., S. Tanabe, N. Sakai, and R. Tatsukawa. 1993. Distribution of persistent organochlorines in the oceanic air and surface seawater and the role of ocean on their global transport and fate. Environmental Science and Technology 27(6):1080-1098.

Ketten, D., and S. M. Bartol. 2006. Function measures of sea turtle hearing: Final report.

Lenhardt, M., S. E. Moein, and J. A. Musick. 1996. A method for determining hearing thresholds in marine turtles. Pages 160-161 *in* J. A. Keinath, D. E. Barnard, J. A. Musick, and B. A. Bell, editors. Fifteenth Annual Symposium on Sea Turtle Biology and Conservation.

Lenhardt, M. L. 1994. Seismic and very low frequency sound induced behaviors in captive loggerhead marine turtles (*Caretta caretta*). Pages 238-241 *in* K. A. C. Bjorndal, A. B. C. Bolten, D. A. C. Johnson, and P. J. C. Eliazar, editors. Fourteenth Annual Symposium on Sea Turtle Biology and Conservation.

Lutcavage, M., P. Plotkin, B. Witherington, and P. Lutz. 1997. Human impacts on sea turtle survival. Pages 387–409 *in* P. Lutz, and J. A. Musick, editors. The Biology of Sea Turtles, volume 1. CRC Press, Boca Raton, Florida.

Matkin, C. O., and E. Saulitis. 1997. Restoration notebook: killer whale (*Orcinus orca*). Exxon Valdez Oil Spill Trustee Council:12.

McCauley, R. D., and coauthors. 2000a. Marine seismic surveys: a study of environmental implications. APPEA Journal 40:692-708.

McCauley, R. D., and coauthors. 2000b. Marine Seismic Surveys: Analysis and Propagation of Air-gun Signals; and Effects of Air-gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid. Centre for Marine Science and Technology, Western Australia.

Moein, S. E., and coauthors. 1994. Evaluation of seismic sources for repelling sea trutles from hopper dredges. In Sea Turtle Research Program, Summary Report. Final Report. Prepared for US Army Engineer Division, South Atlantic, Atlanta, GA, and US Naval Submarine Base, Kings Bay, GA. Technical Report CERC-95. Original not seen, cited in Moein-Bartol S.E. 2008. Review of auditory function of sea turtles. Bioacoustics 2008: 57-59. Viewed online March 2011 at http://www.seaturtle.org/PDF/BartolSM_2008_Bioacoustics.pdf.

NMFS. 1997. Biological Opinion on Navy activities off the southeastern United States along the Atlantic Coast. Biological Opinion.

NMFS, USFWS, and SEMARNAT. 2011a. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. National Marine Fisheries Service, Silver Spring, Maryland.

NMFS, USFWS, and SEMARNAT. 2011b. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. Pages 156 *in*. National Marine Fisheries Service, Silver Spring, Maryland.

NMFS and USFWS. 1991. Recovery plan for U.S. Population of Atlantic Green Turtle (*Chelonia mydas*). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland.

NMFS and USFWS. 1992. Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington DC.

NMFS and USFWS. 1993. Recovery plan for the hawksbill turtle *Eretmochelys imbricata* in the U.S. Caribbean, Atlantic and Gulf of Mexico. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, St. Petersburg, Florida.

NMFS and USFWS. 2007a. Kemp's ridley sea turtle (*Lepidochelys kempii*) 5-year review: summary and evaluation. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS and USFWS. 2007b. Loggerhead sea turtle (*Caretta caretta*) 5-year review: Summary and evaluation. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS and USFWS. 2008. Recovery plan for the northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*), second revision. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland.

NRC. 1990. Decline of the sea turtles: Causes and prevention. National Research Council, Washington, D. C.

O'Hara, J., and J. R. Wilcox. 1990. Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. Copeia (2):564-567.

Witherington, B., S. Hirama, and A. Moiser. 2003. Effects of beach armoring structures on marine turtle nesting. U.S. Fish and Wildlife Service.

Witherington, B., S. Hirama, and A. Moiser. 2007. Changes to armoring and other barriers to sea turtle nesting following severe hurricanes striking Florida beaches. U.S. Fish and Wildlife Service.

Witherington, B. E. 1992. Behavioral responses of nesting sea turtles to artificial lighting. Herpetologica 48(1):31-39.

Witherington, B. E., and K. A. Bjorndal. 1991. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles *Caretta caretta*. Biological Conservation 55(2):139-149.

Appendix A: Sea Turtle Range Maps for Use in SERO Consultations

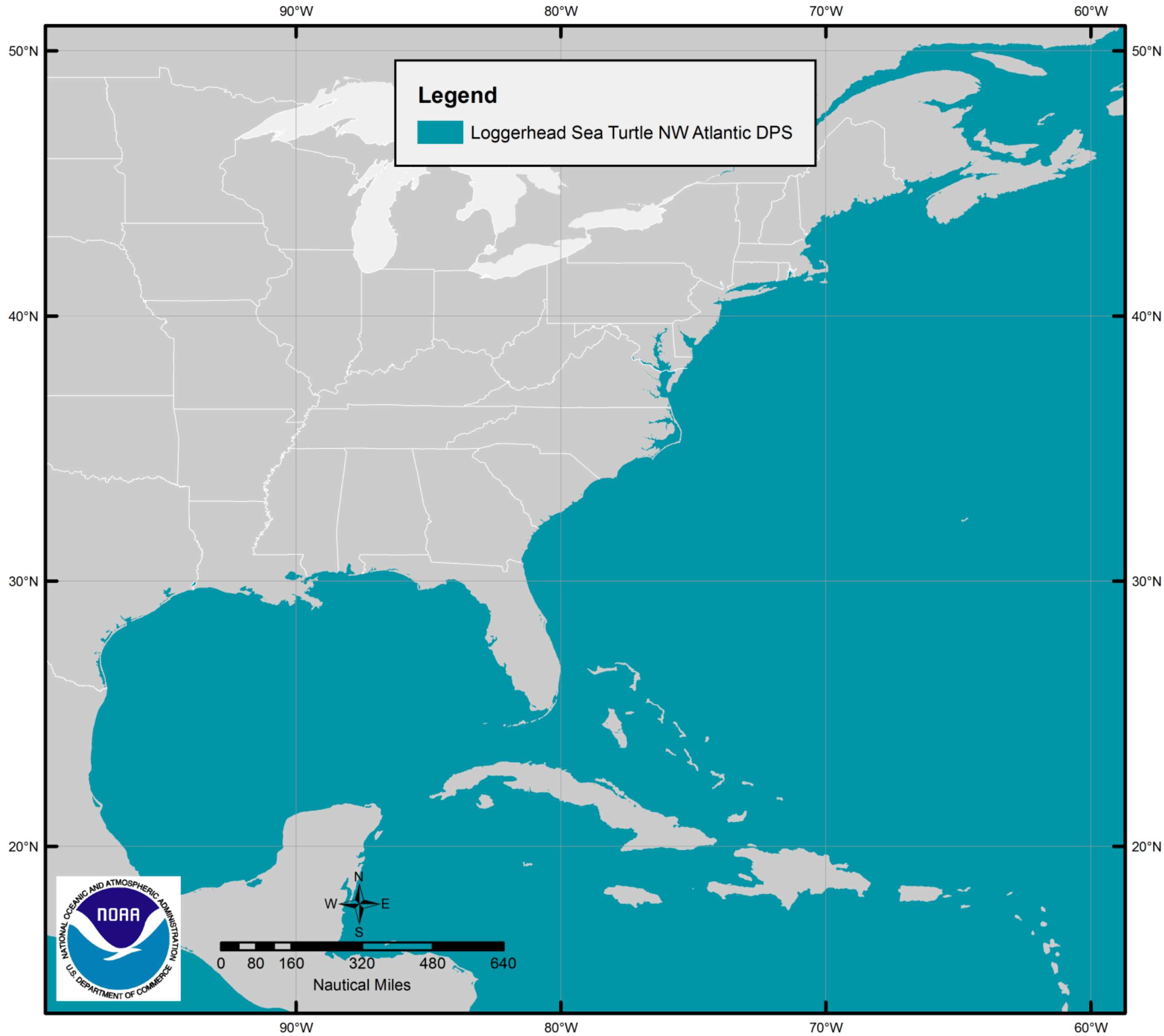

Figure A1. Loggerhead Sea Turtle NWA DPS Range

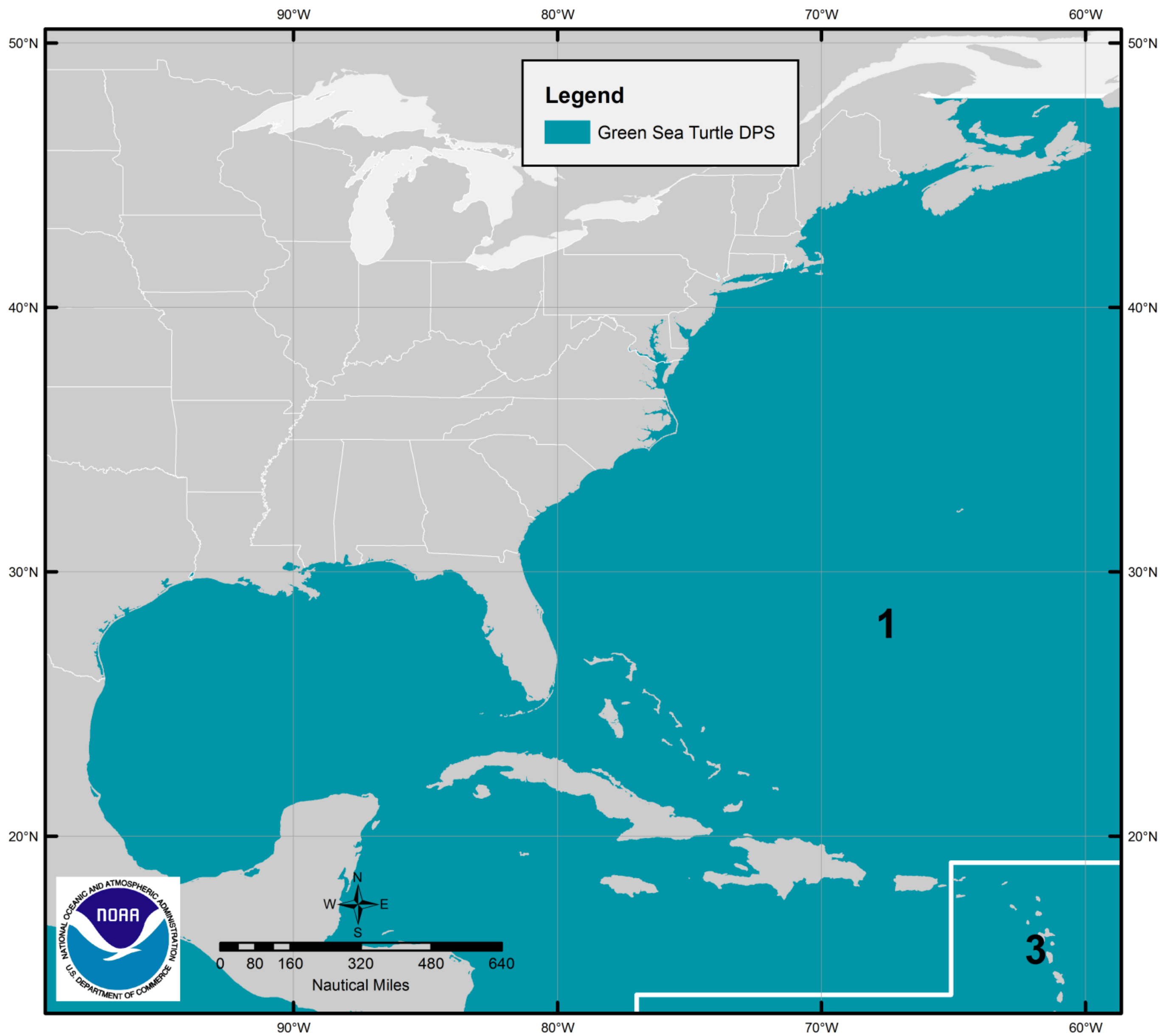

Figure A2. Green Sea Turtle DPS Range (1 = North Atlantic DPS, 3 = South Atlantic DPS)

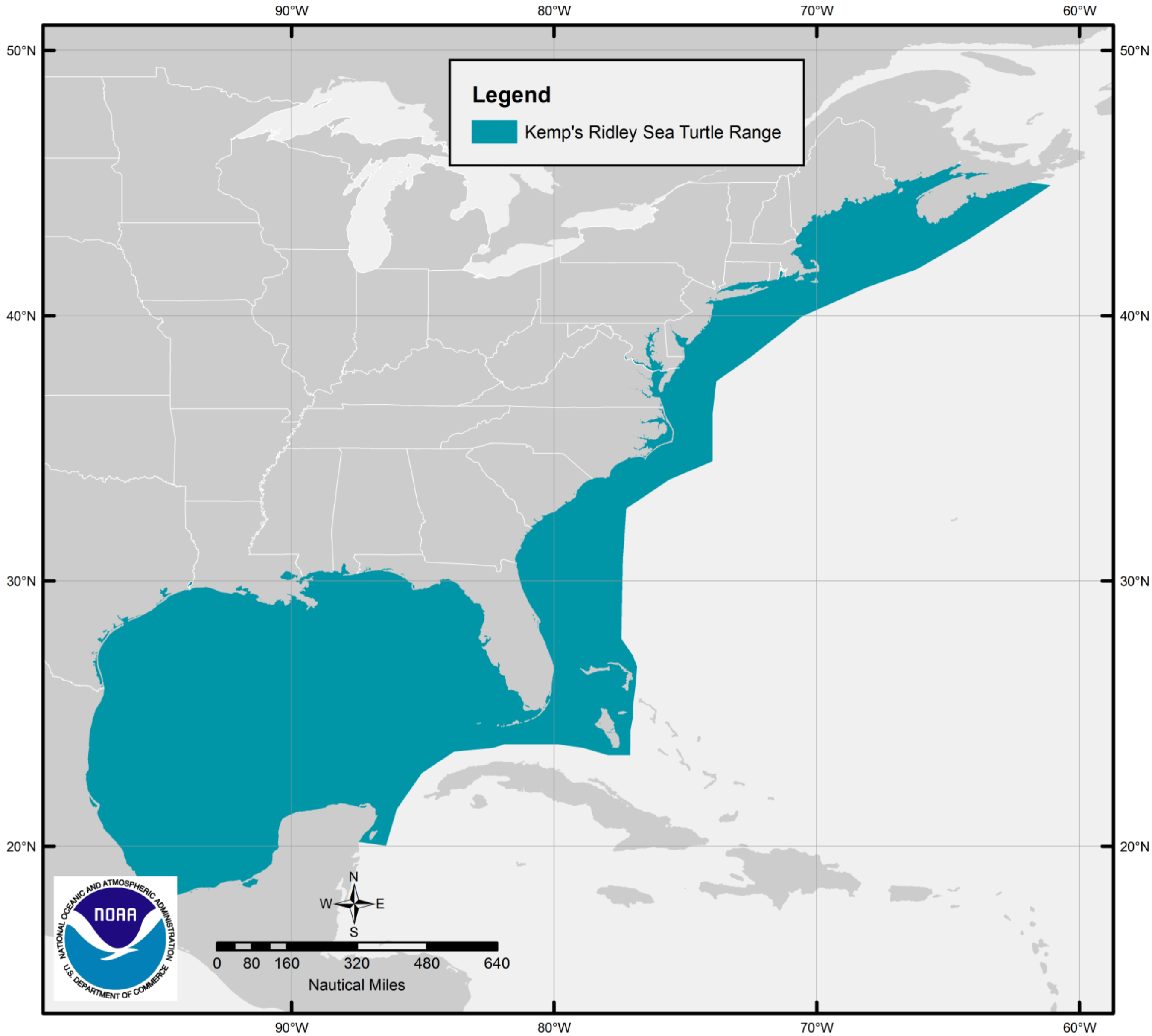

Figure A3. Kemp's Ridley Sea Turtle Range

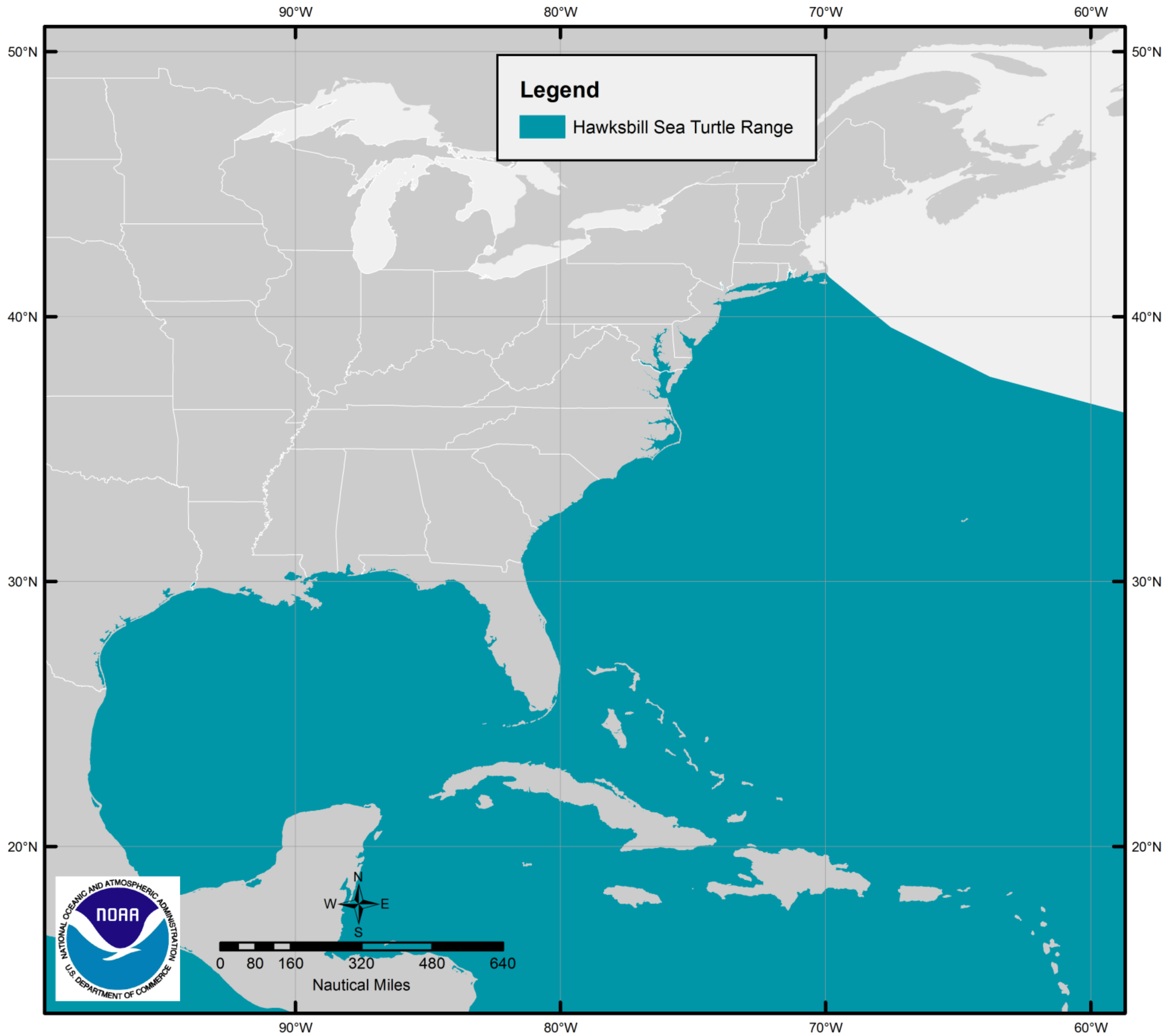

Figure A4. Hawksbill Sea Turtle Range

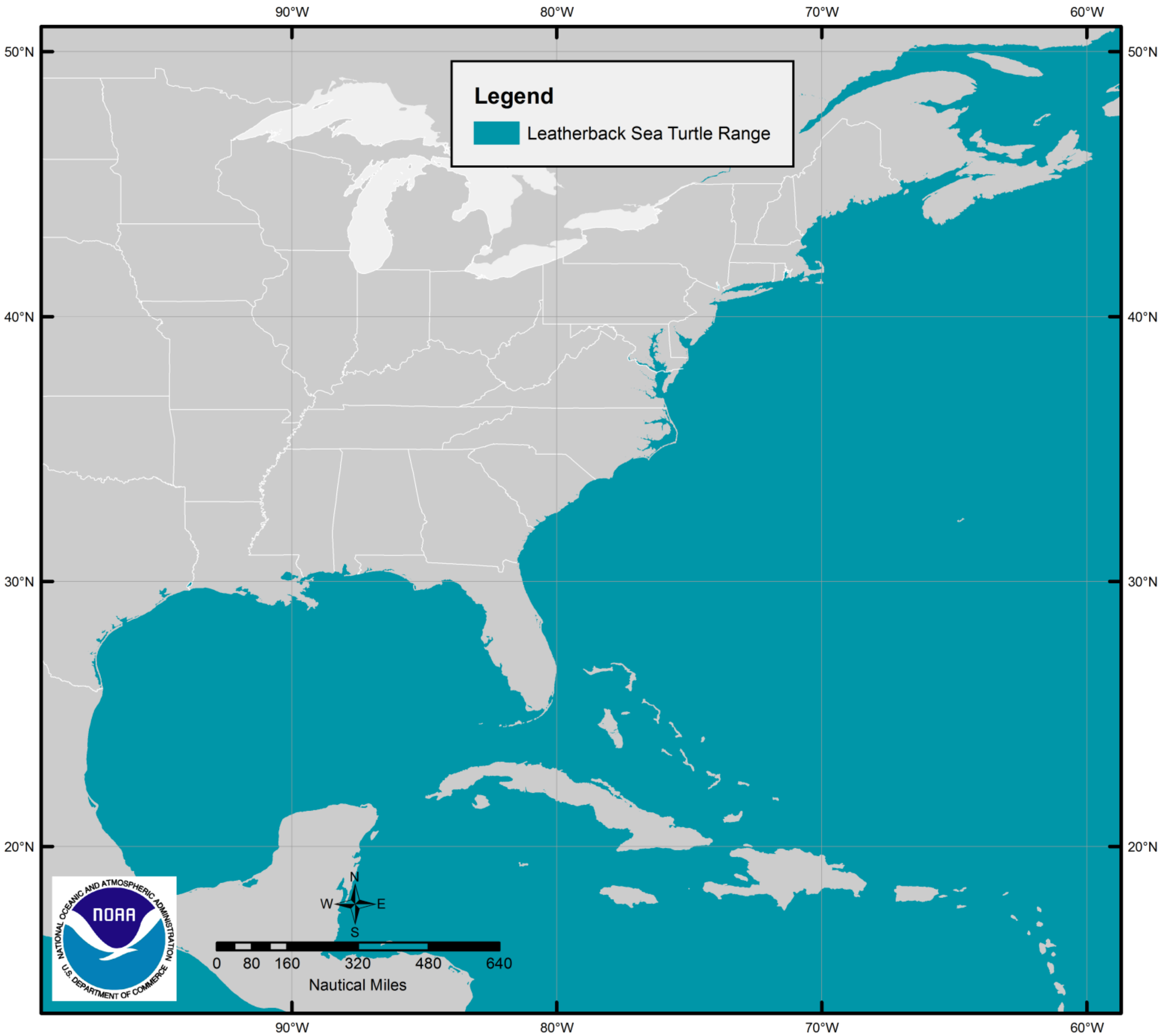

Figure A5. Leatherback Sea Turtle Range

Appendix B: Sources to Assist the Biologists

1) **ESA Section 7 Mapper for NOAA Fisheries Southeast Regional Office (beta version)**

https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=b184635835e34f4d904c6fb741cfb00d

This map tool is designed to aid Federal action agencies in their Section 7 consultation responsibilities under the Endangered Species Act (ESA). Using these data layers, action agencies can better determine whether the activities they plan to authorize, fund, or carry out may affect listed species or designated critical habitat under SERO's jurisdiction.

2) **FWC Statewide Atlas of Sea Turtle Nesting Occurrence and Density**

http://myfwc.com/research/wildlife/sea-turtles/nesting/nesting-atlas/

This map tool may be used to investigate species nesting, stranding, critical habitats, etc.

Map specific link: http://ocean.floridamarine.org/SeaTurtle/nesting/FlexViewer/

3) **FWC Sea Turtle Monitoring: SNBS and INBS Programs**

http://myfwc.com/research/wildlife/sea-turtles/nesting/monitoring/

Explains the two different data collection programs in conjunction with appropriate maps. Caveat: totals from these programs are always reported separately, never combined, thus know your project area as it may encompass both Statewide Nesting Beach Survey (SNBS) and Index Nesting Beach Survey (INBS) beaches.

4) **Developing a Statewide Program of In-water Monitoring of Sea Turtles in Florida**

https://www.fisheries.noaa.gov/resource/document/water-sea-turtle-monitoring-and-research-florida-review-and-recommendations

This report provides an overview of historical and current research and monitoring projects investigating the occurrence, distribution, abundance, and representation of life stages of sea turtles in Florida waters. The report presents a framework for a cooperative network from which regional-population estimates could be produced.

5) **NOAA Gulf of Mexico Data Atlas**

https://www.ncddc.noaa.gov/website/DataAtlas/atlas.htm

May be used for numerous queries, not just sea turtles.

6) **USFWS Loggerhead Sea Turtle Terrestrial Critical Habitat for the Northwest Atlantic Ocean**

https://www.fws.gov/northflorida/SeaTurtles/2014_Loggerhead_CH/Terrestrial_critical_habitat_loggerhead.html

Fed Reg notice, index maps, UTM coordinates for each CH location, shapefiles, etc. Caveat: USFWS thus land-based data, but useful as a tool to determine what may be occurring in the water. Federal agencies typically do not collect all of the raw data compiled in databases. Other entities may only report a statistically representative sample thus there may be data gaps depending on the question you are trying to answer.

7) **State of the World's Sea Turtles (SWOT) Ocean Biogeographical Information System - Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP)**

http://seamap.env.duke.edu/swot
SWOT interactive map features the most comprehensive global leatherback, loggerhead, hawksbill, flatback, olive ridley and Kemp's ridley nesting data in existence. Maps consists of nesting, in-water, satellite tagging data, etc. Caveat: not all agencies/entities allow independent reporting thus data is only available from voluntary reporting, where permissible.

8) **SeaTurtle.Org**

http://www.seaturtle.org/
Under the Resources tab, there are links to nesting and satellite data. Caveat: only specific, individual projects report data to this site so there may be data gaps or only representative of specific years, research interests, etc.

9) **Marine Turtle Newsletter**

http://www.seaturtle.org/mtn/
An excellent source of scientific information and studies.

10) **NOAA Sea Turtle Stranding and Salvage Network (STSSN)**

https://www.sefsc.noaa.gov/species/turtles/strandings.htm
General explanations and links to stranding related info. You'll want to become familiar with the statistical zone maps prior to conducting a query. Caveat: these databases are updated at irregular intervals so data may be lacking for specific queries.

11) **NOAA-specific Stranding Databases**

Sea Turtle Stranding by Zone Report
https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportI.do?action=reportquery
Sea Turtle Stranding Narrative Report
https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportII.do?action=reportIIqueryp

Factors Affecting Reporting and Deductions:
Please be mindful that, although data may not indicate a particular species is present in the project area, there are numerous reasons for the lack of data. For example:

- Not every sea turtle patroller is familiar with all crawl types thus there is risk of misidentifying species responsible for crawl, nest, etc.
- Sea turtles are highly migratory species and utilize various foraging grounds at different stages and seasons thus a species could be in or near a project area at a various life stage that may have been historically overlooked
- Leatherbacks are routinely sighted offshore throughout SERO's coastal region and are regularly found as far north as Newfoundland
- Keep in mind currents – turtles are notorious for taking the ocean "highway" thus hatchlings that emerged in the Caribbean could very easily be found in a project area within the Gulf of Mexico and/or the eastern seaboard, as well as other life stages.

- All species, as hatchlings and post-hatchlings, have been found within the Intracoastal Waterway throughout Florida. As a special note to reiterate keeping a broad perspective on various life stages, juvenile Kemp's are regularly sighted and found cold-stunned within Cape Cod, Massachusetts annually. This species hatched from Mexico, Texas, and Florida before taking the current "highway".
- Breeding can occur at any time, water-temperature dependent, not just during nesting season. Thus, both males and females, can be sighted in both offshore and nearshore waters. Not all turtles leave their neritic location to mate.
- Majority of information known about sea turtles is skewed to nesting females, as these are the easiest to study since they return to their natal beach and emerge from the ocean. Males are data deficient in many areas or correlations have been made from limited data that remains to be solidly determined. For example, it is commonly reported that females are the only ones who leave the water, which is not the case in Hawaii and Texas where members of both sexes leave the water to bask. Sub-adult and adults bask in Hawaii and juveniles bask in Texas. All known cases of basking, at this point, are limited to the green sea turtle.