UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

08/10/2020

F/SER31:DMB
SERO-2020-01119

Larissa Hyatt
Supervisory Environmental Protection Specialist
U.S. Department of Homeland Security
Federal Emergency Management Agency, Region IV
3003 Chamblee Tucker Road
Atlanta, Georgia 30341-4112

Ref: City of Oak Hill, Oak Hill Fishing Pier Repair, PA-04-FL-4337-PW-3989; PA-04-FL-4337-PW-4293; PA-04-FL-4283-PW-00722, Oak Hill, Volusia County, Florida

Dear Larissa:

The enclosed Biological Opinion (Opinion) was prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7(a)(2) of the Endangered Species Act. The Opinion considers the effects of a proposal by the Federal Emergency Management Agency (FEMA) to fund the repair of a public fishing pier in Volusia County, Florida. We base our Opinion on project-specific information provided in the consultation package as well as NMFS's review of published literature. Herein, we analyze the potential for the project to affect the following species and designated critical habitat: green sea turtle (North Atlantic and South Atlantic distinct population segments [DPSs]), Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), hawksbill sea turtle, and smalltooth sawfish (United States DPS).

The Oak Hill Fishing Pier Repair project has been assigned the tracking number SERO-2020-01119 in our new NMFS Environmental Consultation Organizer (ECO). Please reference the ECO tracking number in all future inquiries and reports regarding this Opinion. We look forward to future cooperation with FEMA on other projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this Opinion, please contact Dana M. Bethea, Consultation Biologist, by phone at 727-209-5974, or by email at Dana.Bethea@noaa.gov.

Sincerely,

CRABTREE.ROY.E.DR.1365849559
Digitally signed by CRABTREE.ROY.E.DR.1365849559
Date: 2020.08.10 14:12:15 -04'00'

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure: Biological Opinion
File: 1514-22.o

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: Federal Emergency Management Agency

Applicant: City of Oak Hill

Activity: Oak Hill Fishing Pier Repair

PA-04-FL-4337-PW-3989; PA-04-FL-4337-PW-4293; PA-04-FL-4283-PW-00722

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Tracking Number: SERO-2020-01119

Approved by: CRABTREE.ROY.E.DR.1365849559 Digitally signed by CRABTREE.ROY.E.DR.1365849559 Date: 2020.08.10 14:13:04 -04'00'

Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: 08/10/2020

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

ADA	Americans with Disabilities Act
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPUE	Catch per unit effort
CR	Conservation Recommendations
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved Oxygen
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*
DTRU	Dry Tortugas Recovery Unit
ESA	Endangered Species Act
FGBNMS	Flower Garden Banks National Marine Sanctuary
MSFP	Fibropapillomatosis disease
FR	Federal Register
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
IPCC	Intergovernmental Panel on Climate Change
ISED	International Sawfish Encounter Database
ITS	Incidental Take Statement
LED	Light Emitting Diode
MHW	Mean High Water
NA	North Atlantic
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Association
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
Opinion	Biological Opinion
PCB	Polychlorinated Biphenyls
PFC	Perfluorinated Chemicals
PFRU	Peninsular Florida Recovery Unit
PRD	NMFS Protected Resources Division
PRM	Post-release mortality
RPMs	Reasonable and Prudent Measures
SA	South Atlantic
SCDNR	South Carolina Department of Natural Resources
SCL	Straight Carapace length
SERO	NMFS Southeast Regional Office
STSSN	Sea Turtle Stranding and Salvage Network
T&Cs	Terms and Conditions
TED	Turtle Exclusion Device

TEWG	Turtle Expert Working Group
U.S.	United States of America
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

Units of Measure

°C	Degrees Celsius
cm	Centimeter(s)
°F	Degrees Fahrenheit
ft	Foot/feet
g	Gram(s)
in	Inch(es)
kg	Kilogram(s)
lb	Pound(s)
m	Meter(s)
mm	Millimeter(s)
oz	Ounce(s)

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a protected species or its critical habitat, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or the United States Fish and Wildlife Service (USFWS), depending upon the protected species or critical habitat that may be affected.

Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS. Consultations are concluded after NMFS determines the action is not likely to adversely affect listed species or critical habitats, or issues a Biological Opinion (Opinion) that determines whether a proposed action is likely to jeopardize the continued existence of a federally listed species, or destroy or adversely modify federally designated critical habitat. The Opinion also states the amount or extent of listed species incidental take that may occur and develops nondiscretionary measures that the action agency must take to reduce the effects of said anticipated/authorized take. The Opinion may also recommend discretionary conservation measures. No incidental destruction or adverse modification of critical habitat may be authorized. The issuance of an Opinion detailing NMFS's findings concludes ESA Section 7 consultation.

This document represents NMFS's Opinion based on our review of effects associated with the Federal Emergency Management Agency's (FEMA's) proposed action to fund the repairs to a public fishing pier in the City of Oak Hill, Volusia County, Florida. This Opinion analyzes the proposed actions' effects on threatened and endangered species and designated critical habitat in accordance with Section 7 of the ESA. We based our Opinion on information provided by FEMA, the Sea Turtle Stranding and Salvage Network (STSSN), and the published literature cited herein.

1. CONSULTATION HISTORY

The following is the consultation history for NMFS Environmental Consultation Organizer tracking number SERO-2020-01119 Oak Hill Fishing Pier Repair. On May 5, 2020, NMFS received a request for consultation under Section 7 of the ESA from FEMA in a letter dated May 5, 2020. NMFS requested additional information on May 21 and June 11, 2020. NMFS received FEMA's final response on June 24, 2020, and initiated consultation that day. We requested additional information on July 23, 2020, during our internal review process, and received response on July 27, 2020.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Proposed Action

FEMA proposes to fund the repair of damages to the Oak Hill Fishing Pier that occurred during Hurricane Irma in 2017. The pier has been closed since sustaining damages. Repairs will bring the structure back to its original structure and function. Approximately 2-5 people fish from the pier each day, which is open to the public from dawn to dusk all year.

The repair work will include replacing decking and stringers on the entire pier and installing up to 122 new10-inch (in) diameter wood piles within the same footprint. Existing piles will be removed by a small, shallow draft barge-mounted crane. No jetting is required to remove the existing piles. The new piles will be driven by an impact hammer; however, the contractor may opt to use a pneumatic hammer to drive piles. A maximum of 10 piles will be driven per day. The original wood decking will be replaced with a flow-through grate material. The spacing between the decking panels will be between 1/32 and 1/16 in. No boat slips are proposed. The work will be in an open, not confined, water space. Work will only occur during daylight hours. The applicant has agreed to follow the NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions,*[1] including the use of turbidity curtains. Implementation to project completion is expected to take 6 weeks. No lighting will be installed, the pier is not attended, and there are no fish-cleaning stations proposed. All materials removed during repair work will be properly disposed of at a permitted landfill or other designated upland area. Repairs will not result in the permanent removal of mangroves; however, several small diameter branches that have grown across the existing pier will be trimmed. The proposed project will be conditioned to obtain a permit from Florida Department of Environmental Protection for mangrove trimming.

To minimize potential impacts to ESA-listed species, FEMA will add the following conditions to the grant (adopted from U.S. Army Corps of Engineers Jacksonville District's Programmatic Biological Opinion (JAXBO)[2]) to be followed during construction:

[1]NMFS. 2006. Sea Turtle and Smalltooth Sawfish Construction Conditions revised March 23, 2006. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, Saint Petersburg, Florida. http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/sea_turtle_and_smalltooth_sawfish_construction_conditions_3-23-06.pdf, accessed June 2, 2017.

[2]Biological Opinion on the Authorization of Minor In-Water Activities throughout the Geographic Area of Jurisdiction of the U.S. Army Corps of Engineers Jacksonville District, including Florida and the U.S. Caribbean (SER-2015-17616), issued November 20, 2017.

- Prior to the onset of construction activities, the applicant, or designated agent, will conduct a meeting with all construction staff to discuss field identification of sea turtles, marine mammals, and sturgeon, their protected status, what to do if any are observed within the project area, and applicable penalties that may be imposed if State or Federal regulations are violated. All personnel shall be made aware that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species or marine mammals.

- All activities must be completed during daylight hours. Night work is not permitted.

- The applicant, or designated agent, will be required to obtain all applicable federal, state, and local permits and will comply with conditions set forth in each. These requirements include all State of Florida and USACE permits. Failure to obtain permits or comply with these conditions may jeopardize the applicant's receipt of FEMA funding.

- All construction personnel must watch for and avoid collision with ESA-listed species. Vessel operators must avoid potential interactions with protected species and operate in accordance with the following protective measures:
  - All vessels associated with the construction project shall operate at "Idle Speed/ No Wake" at all times while operating in water depths where the draft of the vessel provides less than a 4-foot (ft) clearance from the bottom, and in all depths after a protected species has been observed in and has departed the area.
  - All vessels will follow marked channels and routes using the maximum water depth whenever possible.
  - Operation of any mechanical construction equipment, including vessels, shall cease immediately if a listed species is observed within a 50-ft radius of construction equipment and shall not resume until the species has departed the area of its own volition.
  - If the detection of species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.

- Any collision(s) with or injury to any ESA-listed sea turtle, marine mammal, or sturgeon occurring during the construction shall be reported immediately to NMFS's Protected Resources Division (PRD) at (1-727-824-5312) or by email to takereport.nmfsser@noaa.gov.

To minimize potential impacts to ESA-listed species, FEMA will add the following best management practices to the grant to be followed by the applicant post-construction:

- The applicant will coordinate an agreement with the Florida Coordinator for the STSSN to assist, as needed, with the rehabilitation of recreational hook-and-line sea turtle captures. Contact information for the State Coordinators for the STSSN are found at the following website: https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network

- Fishing line recycling receptacles and trashcans with lids will be placed along the pier in order to prevent fishing lines from being disposed of in the ocean or on the beaches. Receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.

- Upon completion of the pier, educational signs must be posted in a visible location(s), alerting users of listed species in the area. The applicant will post the 'Save Dolphins, Sea Turtles and Manta Rays' sign, which is available for download at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.

- The applicant will conduct in-water and out-of-water pier cleanup on an annual basis.

2.2 Proposed Action Area

The Oak Hill Fishing Pier, originally constructed in 2008, is located on the east coast of Florida in Mosquito Lagoon, which is part of the Indian River Lagoon and the Atlantic Intracoastal Waterway. Turner Flats and South Atlantic Avenue separate Mosquito Lagoon from the Atlantic Ocean (Latitude 28.87262, Longitude -80.83935). The nearest inlet to the Atlantic Ocean is Ponce de Leon Inlet, approximately 15.8 miles (mi) north of the pier. There is no secondary outlet to the Mosquito Lagoon; it dead-ends 19.3 mi south of the pier. According to the City of Oak Hill, there have been no reported takes of ESA-listed species from previous fishing activities on the fishing pier.

The Oak Hill Fishing Pier is approximately 555-feet (ft)-long, has an area of 3,330 square feet (ft^2), and is positioned west-southwest to east-northeast (Figure 1). Substrate in the action area is medium dense, silty sand with fragmented shell. The water in the area is classified as Class III Marine with an average depth of 3.5 ft. A benthic survey of the surrounding area has not been conducted nor provided. According to the Seagrass Habitat Mapper in Florida[3], the pier does not have any seagrass mapped in the area (neither continuous nor patchy). An area of black mangroves, approximately 124 ft^2, is situated adjacent to the landward end of the pier. The pier does not occur on or adjacent to any known nesting sea turtle beaches.

The action area is defined by regulation as all areas to be affected by the Federal action and not merely the immediate area involved in the action (50 Code of Federal Regulations [CFR] 402.02). The action area for the pier repair project is equivalent to the maximum radius of behavioral noise effects due to the installation of 10-in wood piles via impact hammer, or 705 ft (215 meters [m]) (Figure 1).

[3] http://geodata.myfwc.com/datasets/seagrass-habitat-in-florida

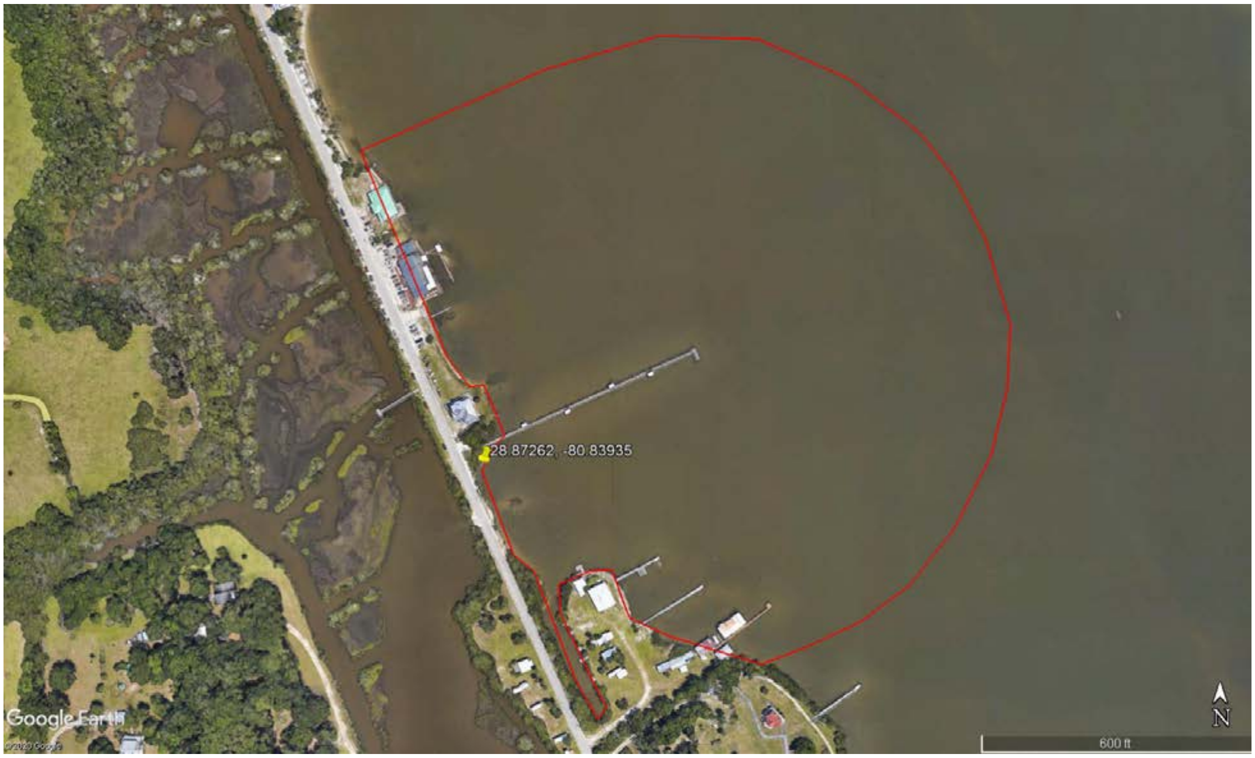

Figure 1. The Oak Hill Fishing Pier, surrounding area, and a 705-ft radius (in red) denoting the extent of the action area (©2020 Google Earth)

3. STATUS OF THE SPECIES

Table 1 provides the effect determinations for species the FEMA and NMFS believe may be affected by the proposed action.

Table 1. Effects Determinations for Species that May Be Affected by the Proposed Action

Species	ESA Listing Status[4]	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (North Atlantic [NA] distinct population segment [DPS])	T	LAA	LAA
Green (South Atlantic [SA] DPS)	T	LAA	LAA
Kemp's ridley	E	NLAA	NLAA
Leatherback	E	NLAA	NE
Loggerhead (Northwest Atlantic [NWA] DPS)	T	LAA	LAA
Hawksbill	E	NLAA	NE
Fish			
Smalltooth sawfish (U.S. DPS)	E	LAA	LAA

[4] E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; NE = no effect; NP = not present

To determine which sea turtle species were most likely to occur within the action area, we reviewed the available STSSN inshore stranding data (i.e., stranding data for all areas inside of protected waters) for Zone 28. Zone 28 extends from 28º to 29º North latitude along the east coast from approximately Palm Bay to New Smyrna Beach, Florida. Based on the data (Table 2), we believe only green sea turtle (NA and SA DPSs) and loggerhead sea turtle (NWA DPS) may be affected by construction effects as well as recreational fishing that will occur at the pier upon completion of the proposed action. Do to the lack of strandings we believe Kemp's ridley sea turtles are not likely to be captured during recreational fishing that will occur at the pier upon completion of the proposed action. While hawksbill sea turtle is represented in the dataset, the 2 stranding records are categorized as "unknown." We do not believe this species is likely to be in the action area or caught on or entangled in recreational hook and line gear at the pier. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas, which are not located within the action area, feeding primarily on encrusting sponges and not baits typically fished from pier. We also do not believe leatherback sea turtles will be in the action area or caught on or entangled in recreational hook and line gear at the pier. Leatherback sea turtles are not typically found inshore and tend to be pelagic feeders, feeding on jellyfish and not baits typically fished from piers.

Table 2. Summary of Available STSSN Offshore Data for Zone 28 (2007-2015)

Species	**Stranding Data (All Activities)**	**Gear Entanglements Only**	**Recreational Hook-and-line Captures Only**
Green sea turtle	362	69	4
Hawksbill sea turtle	2	0	0
Kemp's ridley sea turtle	0	0	0
Leatherback sea turtle	0	0	0
Loggerhead sea turtle	113	7	3
Unidentified	6	0	0
Total	**483**	**76**	**7**

3.1 Potential Routes of Effect Not Likely to Adversely Affect Listed Species

Sea turtles and smalltooth sawfish may be injured if struck by equipment or materials during construction activities. However, we believe that such route of effect is extremely unlikely to occur. These species are expected to exhibit avoidance behavior by moving away from physical disturbances. The applicants' implementation of NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk to these species. If, at any point, a listed sea turtle species or smalltooth sawfish is observed within 50 ft of the work site, all construction or operation of any mechanical equipment will cease until the listed species has departed the project area on its own volition.

Sea turtles and smalltooth sawfish may be injured due to entanglement in improperly discarded fishing gear upon completion of the proposed action. We believe this such route of effect is extremely unlikely to occur. The applicant will maintain fishing line recycling receptacles and trashcans with lids at regular intervals along the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when disposal bins are available.

The receptacles will be clearly marked and will be emptied regularly to ensure they are not overfilled and that fishing lines are disposed of properly. Further, the applicant has agreed to annual in and out-of-water clean ups.

Noise created by pile driving activities can physically injure animals or change animal behavior in the affected areas. Injurious effects can occur in 2 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 animals migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to listed species as a result of noise created by construction activities is based on the analysis prepared in support of the Opinion for SAJ-82.[5] The noise analysis in this consultation evaluates effects to ESA-listed fish and sea turtles identified by NMFS as potentially affected in the table above.

Based on our noise calculations, the installation of wood piles by impact hammer will not cause single-strike or peak-pressure injury to sea turtles or ESA-listed fish. The cumulative sound exposure level (cSEL) of multiple pile strikes over the course of a day may cause injury to ESA-listed fishes and sea turtles at a radius of up to 30 ft (9 m). Due to the mobility of sea turtles and ESA-listed fish species, we expect them to move away from noise disturbances. Because we anticipate the animal will move away, we believe that an animal's suffering physical injury from noise is extremely unlikely to occur. Even in the unlikely event an animal does not vacate the daily cumulative injurious impact zone, the radius of that area is smaller than the 50-ft radius that will be visually monitored for listed species. Construction personnel will cease construction activities if an animal is sighted per NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions.* Thus, we believe the likelihood of any injurious cSEL are highly unlikely. An animal's movement away from the injurious impact zone is a behavioral response, with the same effects discussed below.

Based on our noise calculations, impact hammer pile installation could also cause behavioral effects at radii of 151 ft (46 m) for sea turtles and 705 ft (215 m) for ESA-listed fishes. Due to the mobility of sea turtles and ESA-listed fish species, we expect them to move away from noise disturbances. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an individual chooses to remain within the behavioral response zone, it could be exposed to behavioral noise impacts during pile installation. Since installation will occur only during the day, these species will be able to resume normal activities during quiet periods between pile installations and at night. Therefore, we anticipate any behavioral effects will be insignificant.

NMFS educational signs will be installed in visible locations upon completion of the pier. We believe the placement of signs is a beneficial effect. Signs will not reduce the potential risk of recreational hook-and-line interaction with these species, but they will help reduce the severity of injury to incidentally captured animals by providing information to the public on how to handle

[5] NMFS. Biological Opinion on Regional General Permit SAJ-82 (SAJ-2007-01590), Florida Keys, Monroe County, Florida. June 10, 2014.

and encounters with sea turtle species and smalltooth sawfish. The signs also encourage anglers to report interactions, thus providing valuable data to researchers and resource managers.

3.2 Potential Route of Effect Likely to Adversely Affect Listed Species

NMFS has determined that recreational hook-and-line interactions from the completed pier are likely to adversely affect green sea turtle (NA and SA DPSs), Kemp's ridley sea turtle, and loggerhead sea turtle (NWA DPS), and smalltooth sawfish. We provide greater detail on the potential effects of entanglement, hooking, and trailing line to sea turtles and smalltooth sawfish in the Effects of the Action section below.

3.3 Status of Sea Turtles

Section 3.3.1 addresses the general threats that confront all sea turtle species. Sections 3.3.2 – 3.3.4 address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle likely to be adversely affected by the proposed action.

3.3.1 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 are either the same or similar in nature for all ESA-listed sea turtle species. The threats 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 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 and USFWS 1991a; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008; NMFS et al. 2011). 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. Refer to the Environmental Baseline for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). 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.

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 renourishment, 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 that are drawn away from the water (Witherington and Bjorndal 1991). 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 *Deepwater Horizon* (DWH) oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015a). 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 sublethal 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. The National Oceanic and Atmospheric Association's (NOAA's) climate information portal provides basic background information on these and other measured or anticipated effects (see 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 2007b). 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 degrees Celsius (°C) (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007b).

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 2007c). 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 [DO] levels, nutrient distribution, etc.) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc.) 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.

3.3.2 Status of Green Sea Turtle – North Atlantic and South Atlantic DPSs

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 DPSs (81 FR 20057 2016) (Figure 2). The Mediterranean, Central West Pacific, and Central South Pacific DPSs were listed as endangered. The NA, SA, Southwest Indian, North Indian, East Indian-West Pacific, Southwest Pacific, Central North Pacific, and East Pacific DPSs were listed as threatened. For the purposes of this consultation, only the SA DPS and NA DPS will be considered, as they are the only two DPSs with individuals occurring in the Atlantic and Gulf of Mexico waters of the United States.

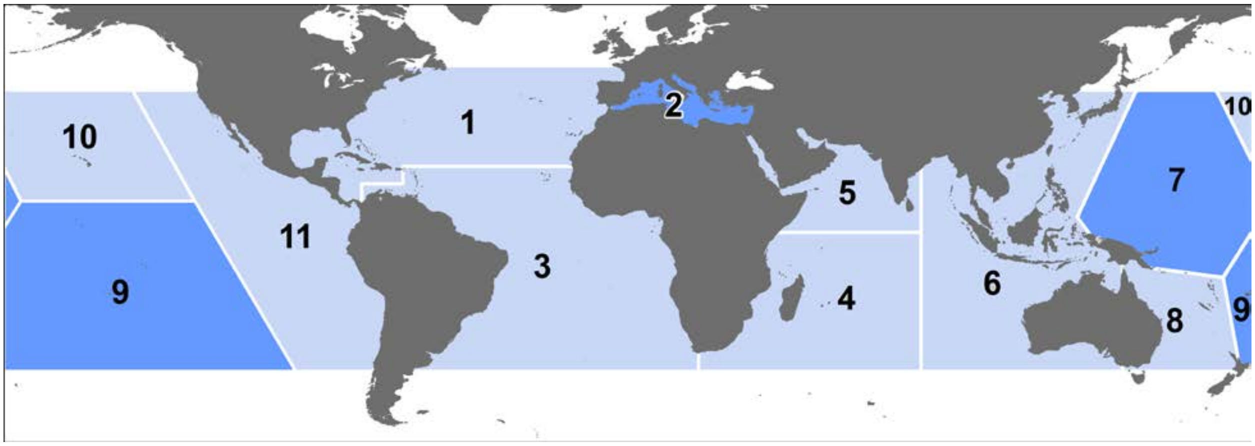

Figure 2. Threatened (light) and endangered (dark) green turtle DPSs: 1. NA, 2. Mediterranean, 3. SA, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Species Description and Distribution

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 pound (lb) (159 kilogram [kg]) with a straight carapace length (SCL) of greater than 3.3 ft (1 m). Green sea turtles have a smooth carapace with 4 pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface, although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica (part of the NA DPS), and Raine Island, on the Pacific coast of Australia along the Great Barrier Reef.

Differences in mitochondrial DNA properties of green sea turtles from different nesting regions indicate there are genetic subpopulations (Bowen et al. 1992; FitzSimmons et al. 2006). Despite the genetic differences, sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. Within U.S. waters individuals from both the NA and SA DPSs can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, two small-scale studies provide an insight into the degree of mixing on the foraging grounds. An analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). On the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the SA DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles. Available information on green turtle migratory behavior indicates that long distance dispersal is only seen for juvenile turtles. This suggests that larger adult-sized turtles return to forage within the region of their natal rookeries, thereby limiting the potential for gene flow across larger scales (Monzón-Argüello et al. 2010). While all of the mainland U.S. nesting individuals are part of the NA DPS, the U.S. Caribbean nesting assemblages are split between the NA and SA DPS. Nesters in Puerto Rico are part of the NA DPS, while those in the U.S. Virgin Islands are part of the SA DPS. We do not currently have information on what percent of individuals on the U.S. Caribbean foraging grounds come from which DPS.

North Atlantic DPS Distribution

The NA DPS boundary is illustrated in Figure 2. Four regions support nesting concentrations of particular interest in the NA DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of NA DPS green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991a). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard south through Broward counties.

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are distributed throughout inshore and nearshore waters from Texas to Massachusetts. Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984; Hildebrand 1982; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon system in Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992). The summer developmental habitat for green sea turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997). Additional important foraging areas in the western Atlantic include the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean coast of Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatán Peninsula.

South Atlantic DPS Distribution

The SA DPS boundary is shown in Figure 2, and includes the U.S. Virgin Islands in the Caribbean. The SA DPS nesting sites can be roughly divided into four regions: western Africa, Ascension Island, Brazil, and the South Atlantic Caribbean (including Colombia, the Guianas, and Aves Island in addition to the numerous small, island nesting sites).

The in-water range of the SA DPS is widespread. In the eastern South Atlantic, significant sea turtle habitats have been identified, including green turtle feeding grounds in Corisco Bay, Equatorial Guinea/Gabon (Formia 1999); Congo; Mussulo Bay, Angola (Carr and Carr 1991); as well as Principe Island. Juvenile and adult green turtles utilize foraging areas throughout the Caribbean areas of the South Atlantic, often resulting in interactions with fisheries occurring in those same waters (Dow et al. 2007). Juvenile green turtles from multiple rookeries also frequently utilize the nearshore waters off Brazil as foraging grounds as evidenced from the frequent captures by fisheries (Lima et al. 2010; López-Barrera et al. 2012; Marcovaldi et al. 2009). Genetic analysis of green turtles on the foraging grounds off Ubatuba and Almofala, Brazil show mixed stocks coming primarily from Ascension, Suriname and Trindade as a secondary source, but also Aves, and even sometimes Costa Rica (North Atlantic DPS)(Naro-Maciel et al. 2007; Naro-Maciel et al. 2012). While no nesting occurs as far south as Uruguay and Argentina, both have important foraging grounds for South Atlantic green turtles (Gonzalez Carman et al. 2011; Lezama 2009; López-Mendilaharsu et al. 2006; Prosdocimi et al. 2012; Rivas-Zinno 2012).

Life History Information

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches and along migratory routes. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989b). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is approximately 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989b). Eggs incubate for approximately 2 months before hatching. Hatchling green sea turtles are approximately 2 in (5 centimeters [cm]) in length and weigh approximately 0.9 ounces (oz) (25 grams [g]). Survivorship at any particular nesting site is greatly influenced by the level of man-made stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campell and Lagueux 2005; Chaloupka and Limpus 2005).

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007a). Green sea turtles exhibit particularly slow growth rates of about 0.4-2 in (1-5 cm) per year (Green 1993), which may be attributed to their largely herbivorous, low-net energy diet (Bjorndal 1982). At approximately 8-10 in (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Growth studies using skeletochronology indicate that green sea turtles in the western Atlantic shift from the oceanic phase to nearshore developmental habitats after approximately 5-6 years (Bresette et al. 2006; Zug and Glor 1998). Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel 1974), although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). Green sea turtles mature slowly, requiring 20-50 years to reach sexual maturity (Chaloupka and Musick 1997; Hirth 1997).

While in coastal habitats, green sea turtles exhibit site fidelity to specific foraging and nesting grounds, and it is clear they are capable of “homing in” on these sites if displaced (McMichael et al. 2003). Reproductive migrations of Florida green sea turtles have been identified through flipper tagging and/or satellite telemetry. Based on these studies, the majority of adult female Florida green sea turtles are believed to reside in nearshore foraging areas throughout the Florida Keys and in the waters southwest of Cape Sable, and some post-nesting turtles also reside in Bahamian waters as well (NMFS and USFWS 2007a).

Status and Population Dynamics

Accurate population estimates for marine turtles do not exist because of the difficulty in sampling turtles over their geographic ranges and within their marine environments. Nonetheless, researchers have used nesting data to study trends in reproducing sea turtles over time. A summary of nesting trends and nester abundance is provided in the most recent status review for the species (Seminoff et al. 2015), with information for each of the DPSs.

<u>North Atlantic DPS</u>

The NA DPS is the largest of the 11 green turtle DPSs, with an estimated nester abundance of over 167,000 adult females from 73 nesting sites. Overall this DPS is also the most data rich. Eight of the sites have high levels of abundance (i.e., <1000 nesters), located in Costa Rica, Cuba, Mexico, and Florida. All major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015).

Quintana Roo, Mexico, accounts for approximately 11% of nesting for the DPS (Seminoff et al. 2015). In the early 1980s, approximately 875 nests/year were deposited, but by 2000 this increased to over 1,500 nests/year (NMFS and USFWS 2007d). By 2012, more than 26,000 nests were counted in Quintana Roo (J. Zurita, CIQROO, unpublished data, 2013, in Seminoff et al. 2015).

Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015). Nesting at Tortuguero appears to have been increasing since the 1970’s, when monitoring began. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 nesting females per year (NMFS and USFWS 2007a). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica population's growing at 4.9% annually.

In the continental U.S., green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al. 1995). Green sea turtle nesting is documented annually on beaches of North Carolina, South Carolina, and Georgia, though nesting is found in low quantities (up to tens of nests) (nesting databases maintained on www.seaturtle.org).

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015). In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 3). According to data collected from Florida's index nesting beach survey from 1989-2019, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 40,911 in 2019. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011, and a return to the trend of biennial peaks in abundance thereafter (Figure 3). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9% at that time. Increases have been even more rapid in recent years.

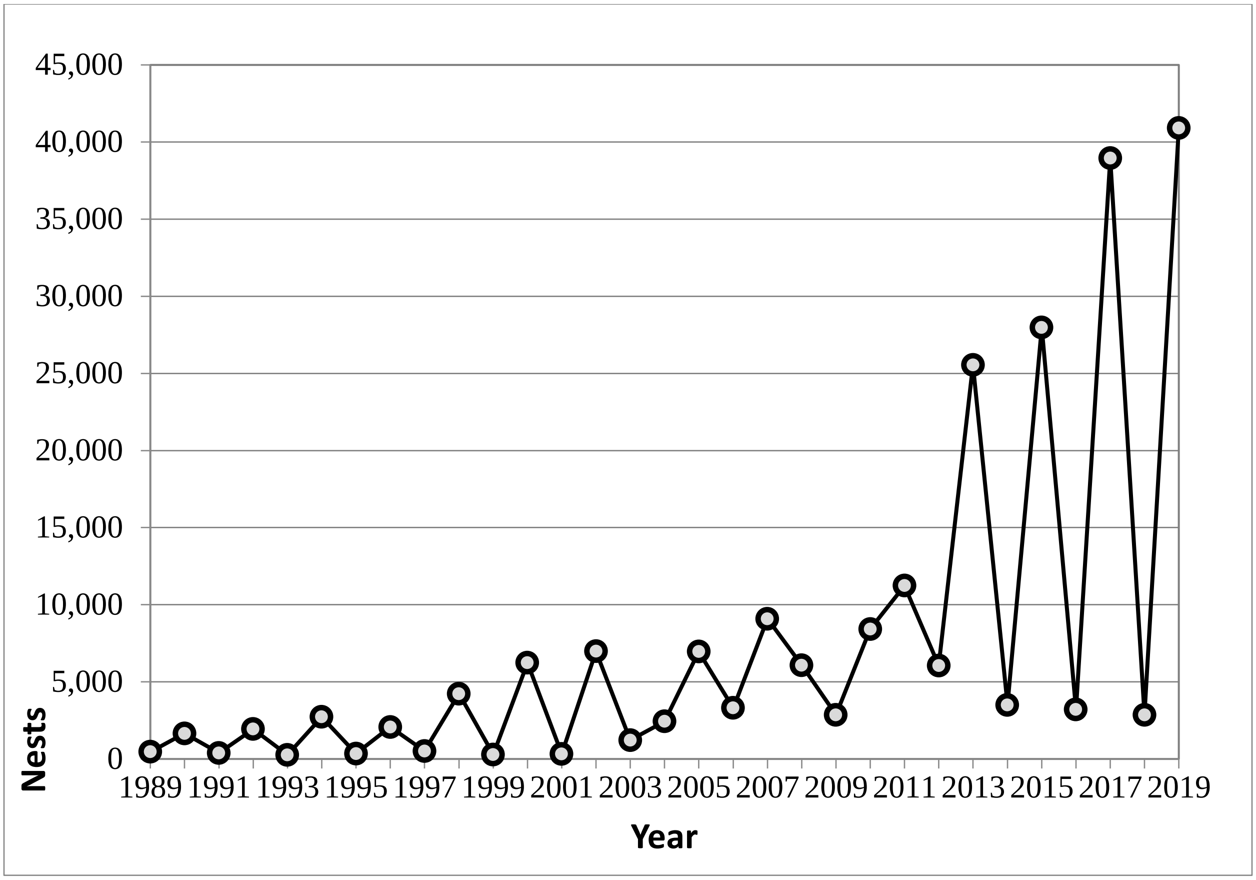

Figure 3. Green sea turtle nesting at Florida index beaches since 1989

Similar to the nesting trend found in Florida, in-water studies in Florida have also recorded increases in green turtle captures at the Indian River Lagoon site, with a 661 percent increase over 24 years (Ehrhart et al. 2007), and the St Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26 years (3,557 green turtles total; M. Bressette, Inwater Research Group, unpublished data; (Witherington et al. 2006).

South Atlantic DPS

The SA DPS is large, estimated at over 63,000 nesters, but data availability is poor. More than half of the 51 identified nesting sites (37) did not have sufficient data to estimate number of nesters or trends (Seminoff et al. 2015). This includes some sites, such as beaches in French Guiana, which are suspected to have large numbers of nesters. Therefore, while the estimated number of nesters may be substantially underestimated, we also do not know the population trends at those data-poor beaches. However, while the lack of data was a concern due to increased uncertainty, the overall trend of the SA DPS was not considered to be a major concern as some of the largest nesting beaches such as Ascension Island (United Kingdom), Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão (Guinea-Bissau) and the rest of Guinea-Bissau seem to be stable or do not have sufficient data to make a determination. Bioko (Equatorial Guinea) appears to be in decline but has less nesting than the other primary sites (Seminoff et al. 2015).

In the U.S., nesting of SA DPS green turtles occurs on the beaches of the U.S. Virgin Islands, primarily on Buck Island. There is insufficient data to determine a trend for Buck Island nesting, and it is a smaller rookery, with approximately 63 total nesters utilizing the beach (Seminoff et al. 2015).

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern U.S., green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3.1.

In addition to general threats, green sea turtles are susceptible to natural mortality from Fibropapillomatosis disease (FP). FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 in (0.1 cm) to greater than 11.81 in (30 cm) in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). FP is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 46.4-50 degrees Fahrenheit (°F) (8-10°C) turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989a). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, and hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, while approximately 1,030 turtles were rehabilitated and released. During this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

Whereas oil spill impacts are discussed generally for all species in Section 3.3.1, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juvenile greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fates of which are unknown) (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources, which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

While green turtles regularly use the northern Gulf of Mexico, they have a widespread distribution throughout the entire Gulf of Mexico, Caribbean, and Atlantic, and the proportion of the population using the northern Gulf of Mexico at any given time is relatively low. Although it is known that adverse impacts occurred and numbers of animals in the Gulf of Mexico were reduced as a result of the DWH oil spill, the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event, as well as the impacts being primarily to smaller juveniles (lower reproductive value than adults and large juveniles), reduces the impact to the overall population. It is unclear what impact these losses may have caused on a population level, but it is not expected to have had a large impact on the population trajectory moving forward. However, recovery of green turtle numbers equivalent to what was lost in the northern Gulf of Mexico as a result of the spill will likely take decades of sustained efforts to reduce the existing threats and enhance survivorship of multiple life stages (DWH Trustees 2015b).

3.3.3 Status of Loggerhead Sea Turtle – Northwest Atlantic DPS

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a Final Rule which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) NWA (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The NWA DPS is the only one that occurs within the action area, and therefore it is the only one considered in this Opinion.

Species Description and Distribution

Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 cm) long, measured as a SCL, and weigh approximately 255 lb (116 kg) (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd Jr. 1988).

The loggerhead sea turtle inhabits continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd Jr. 1988). Habitat uses within these areas vary by life stage. Juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd Jr. 1988). Subadult and adult loggerheads are primarily found in coastal waters and eat benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990). For the NWA DPS, most nesting occurs along the coast of the United States, from southern Virginia to Alabama. Additional nesting beaches for this DPS are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Moncada Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the U.S. Atlantic, Gulf of Mexico, and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches. Aerial surveys suggest that loggerheads as a whole are distributed in U.S. waters as follows: 54% off the southeast U.S. coast, 29% off the northeast U.S. coast, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Within the NWA DPS, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf Coast of Florida. Previous Section 7 analyses have recognized at least 5 western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29ºN; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez M. 1990; TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS 2001).

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the Northern Recovery Unit (NRU; Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (PFRU; Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (DTRU; islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (NGMRU; Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit (GCRU; Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the NWA DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the NWA DPS.

Life History Information

The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone[6]), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings are 1.5-2-in-long and weigh about 0.7 oz (20 g).

As post-hatchlings, loggerheads hatched on U.S. beaches enter the "oceanic juvenile" life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009; Witherington 2002). Oceanic juveniles grow at rates of 1-2 in (2.9-5.4 cm) per year (Bjorndal et al. 2003; Snover 2002) over a period as long as 7-12 years (Bolten et al. 1998) before moving to more coastal habitats. Studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic juveniles, followed by permanent settlement into benthic environments (Bolten and Witherington 2003; Laurent et al. 1998). These studies suggest some turtles may either remain in the oceanic habitat in the North Atlantic longer than hypothesized, or they move back and forth between oceanic and coastal habitats interchangeably (Witzell 2002). Stranding records indicate that when immature loggerheads reach 15-24 in (40-60 cm) SCL, they begin to reside in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002).

[6] Neritic refers to the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters.

After departing the oceanic zone, neritic juvenile loggerheads in the Northwest Atlantic inhabit continental shelf waters from Cape Cod Bay, Massachusetts, south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Estuarine waters of the United States, including areas such as Long Island Sound, Chesapeake Bay, Pamlico and Core Sounds, Mosquito and Indian River Lagoons, Biscayne Bay, Florida Bay, as well as numerous embayments fringing the Gulf of Mexico, comprise important inshore habitat. Along the Atlantic and Gulf of Mexico shoreline, essentially all shelf waters are inhabited by loggerheads (Conant et al. 2009).

Like juveniles, non-nesting adult loggerheads also use the neritic zone. However, these adult loggerheads do not use the relatively enclosed shallow-water estuarine habitats with limited ocean access as frequently as juveniles. Areas such as Pamlico Sound, North Carolina, and the Indian River Lagoon, Florida, are regularly used by juveniles but not by adult loggerheads. Adult loggerheads do tend to use estuarine areas with more open ocean access, such as the Chesapeake Bay in the U.S. mid-Atlantic. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 2009).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007) Georgia Department of Natural Resources [GADNR], unpublished data; South Carolina Department of Natural Resources [SCDNR], unpublished data). Satellite telemetry has identified the shelf waters along the west Florida coast, The Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in The Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the U.S., and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

A number of stock assessments and similar reviews (Conant et al. 2009; Heppell et al. 2003; NMFS-SEFSC 2009; NMFS 2001; NMFS and USFWS 2008; TEWG 1998; TEWG 2000; TEWG 2009) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

Numbers of nests and nesting females can vary widely from year to year. Nesting beach surveys, though, can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of female loggerhead sea turtles, as long as such studies are sufficiently long and survey effort and methods are standardized (e.g., (NMFS and USFWS 2008). NMFS and USFWS (2008) concluded that the lack of change in 2 important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population.

Peninsular Florida Recovery Unit

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2017 was 96,912 nests (FWRI nesting database).

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (FWRI) uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. This provides a better tool for understanding the nesting trends (Figure 4). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2017; http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/). Over that time period, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but nonsignificant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018, and then to 53,507 in 2019, which is the 3rd highest total since 2001. However, it is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019).

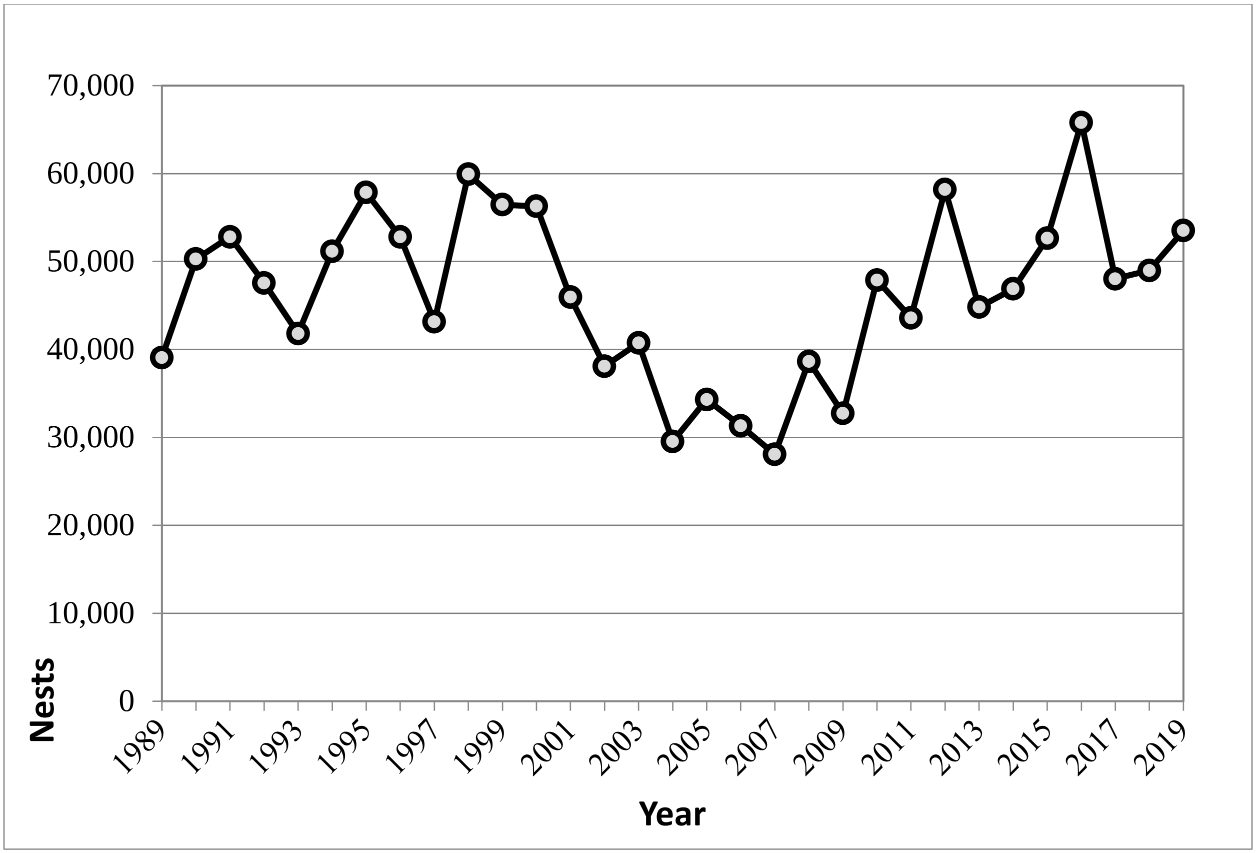

Figure 4. Loggerhead sea turtle nesting at Florida index beaches since 1989

<u>Northern Recovery Unit</u>

Annual nest totals from beaches within the NRU averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GADNR unpublished data, North Carolina Wildlife Resources Commission [NCWRC] unpublished data, SCDNR unpublished data), and represent approximately 1,272 nesting females per year, assuming 4.1 nests per female (Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually from 1989-2008. Nest totals from aerial surveys conducted by SCDNR showed a 1.9% annual decline in nesting in South Carolina from 1980-2008. Overall, there are strong statistical data to suggest the NRU had experienced a long-term decline over that period of time.

Data since that analysis (Table 3) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 and 2015, but then bounced back in 2019, breaking records for each of the three states and the overall Recovery Unit.

Table 3. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Year	Georgia	South Carolina	North Carolina	Totals
2008	1,649	4,500	841	**6,990**
2009	998	2,182	302	**3,472**
2010	1,760	3,141	856	**5,757**
2011	1,992	4,015	950	**6,957**
2012	2,241	4,615	1,074	**7,930**
2013	2,289	5,193	1,260	**8,742**
2014	1,196	2,083	542	**3,821**
2015	2,319	5,104	1,254	**8,677**
2016	3,265	6,443	1,612	**11,320**
2017	2,155	5,232	1,195	**8,582**
2018	1,735	2,762	765	**5,262**
2019	3,945	8,774	2,291	**15,010**

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2013, with a subsequent steep drop in 2014. Nesting then rebounded in 2015 and 2016, setting new highs each of those years. Nesting in 2017 dropped back down from the 2016 high, but was still the second highest on record (Figure 5).

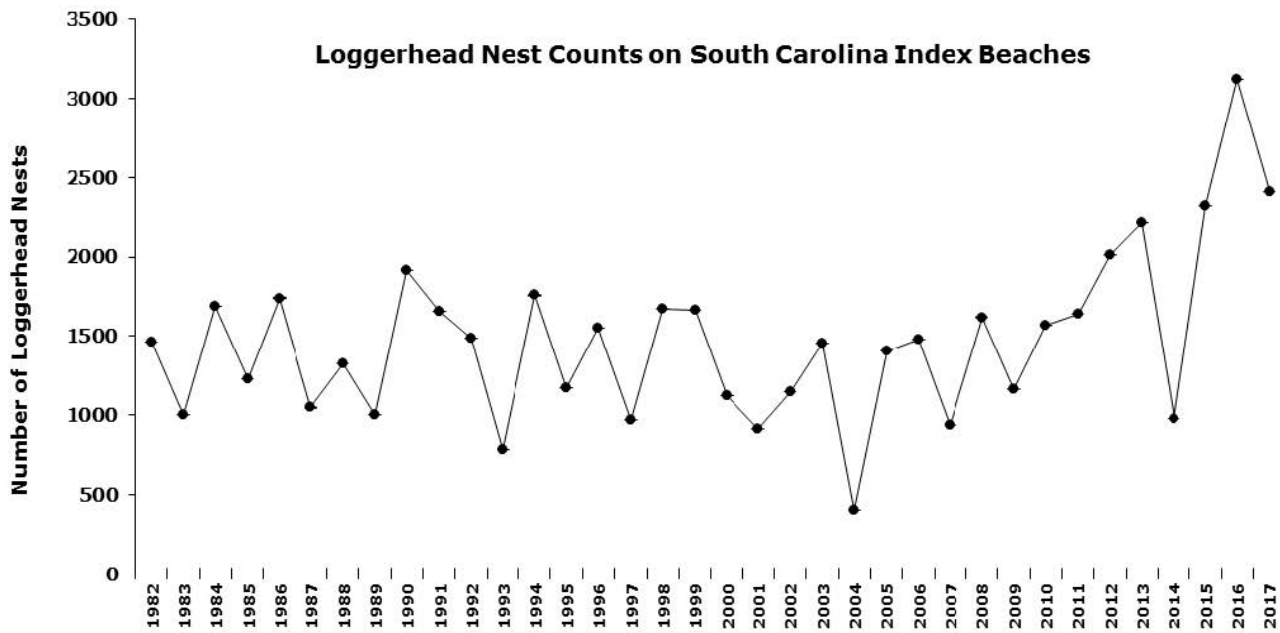

Figure 5. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: http://www.dnr.sc.gov/seaturtle/nest.htm)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units—DTRU, NGMRU, and GCRU—are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

Nesting data are the best current indicator of sea turtle population trends, but in-water data also provide some insight. In-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in catch per unit effort (CPUE) (Arendt et al. 2009; Ehrhart et al. 2007; Epperly et al. 2007). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, although it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005), cited in NMFS and USFWS (2008), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). In-water studies throughout the eastern United States, however, indicate a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads, a pattern corroborated by stranding data (TEWG 2009).

Population Estimate

The NMFS Southeast Fisheries Science Center developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009). The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Resulting trajectories of model runs for each individual recovery unit, and the western North Atlantic population as a whole, were found to be very similar. The model run estimates from the adult female population size for the western North Atlantic (from the 2004-2008 time frame), suggest the adult female population size is approximately 20,000-40,000 individuals, with a low likelihood of females' numbering up to 70,000 (NMFS-SEFSC 2009). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009). A preliminary regional abundance survey of loggerheads within the northwestern Atlantic continental shelf for positively identified loggerhead in all strata estimated about 588,000 loggerheads (interquartile range of 382,000-817,000). When correcting for unidentified turtles in proportion to the ratio of identified turtles, the estimate increased to about 801,000 loggerheads (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

Threats (Specific to Loggerhead Sea Turtles)

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 3.3.1. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009).

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine contaminants; they have the highest organochlorine concentrations (Storelli et al. 2008) and metal loads (D'Ilio et al. 2011) in sampled tissues among the sea turtle species. It is thought that dietary preferences were likely to be the main differentiating factor among sea turtle species. Storelli et al. (2008) analyzed tissues from stranded loggerhead sea turtles and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991).

While oil spill impacts are discussed generally for all species in Section 4.2.1, specific impacts of the DWH oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridleys, the majority of nesting for the Northwest Atlantic Ocean loggerhead DPS occurs on the Atlantic coast, and thus loggerheads were impacted to a relatively lesser degree. However, it is likely that impacts to the NGMRU of the NWA loggerhead DPS would be proportionally much greater than the impacts occurring to other recovery units. Impacts to nesting and oiling effects on a large proportion of the NGMRU recovery unit, especially mating and nesting adults likely had an impact on the NGMRU. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the NFMRU), the Trustees estimated that approximately 20,000 loggerhead hatchlings were lost due to DWH oil spill response activities on nesting beaches. Although the long-term effects remain unknown, the DWH oil spill event impacts to the Northern Gulf of Mexico Recovery Unit may result in some nesting declines in the future due to a large reduction of oceanic age classes during the DWH oil spill event. Although adverse impacts occurred to loggerheads, the proportion of the population that is expected to have been exposed to and directly impacted by the DWH oil spill event is relatively low. Thus, we do not believe a population-level impact occurred due to the widespread distribution and nesting location outside of the Gulf of Mexico for this species.

Specific information regarding potential climate change impacts on loggerheads is also available. Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100% female offspring. Such highly skewed sex ratios could undermine the reproductive capacity of the species. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most nests, leading to egg mortality (Hawkes et al. 2007). Warmer sea surface temperatures have also been correlated with an earlier onset of loggerhead nesting in the spring (Hawkes et al. 2007; Weishampel et al. 2004), short inter-nesting intervals (Hays et al. 2002), and shorter nesting seasons (Pike et al. 2006).

3.4 Status of Smalltooth Sawfish

The U.S. DPS of smalltooth sawfish was listed as endangered under the ESA effective May 1, 2003 (68 FR 15674; April 1, 2003).

Species Description and Distribution

The smalltooth sawfish is a tropical marine and estuarine elasmobranch. It is a batoid with a long, narrow, flattened, rostral blade (rostrum) lined with a series of transverse teeth along either edge. In general, smalltooth sawfish inhabit shallow coastal waters of the Atlantic Ocean (Dulvy et al. 2016) and feed on a variety of fish (e.g., mullet, jacks, and ladyfish)(Poulakis et al. 2017; Simpfendorfer 2001).

Although this species is reported throughout the tropical Atlantic, NMFS identified smalltooth sawfish from the Southeast U.S. as a DPS due to the physical isolation of this population from others, the differences in international management of the species, and the significance of the U.S. population in relation to the global range of the species (see 68 FR15674). Within the U.S., smalltooth sawfish have historically been captured in estuarine and coastal waters from North Carolina southward through Texas, although peninsular Florida has been the region of the U.S.

with the largest number of recorded captures (NMFS 2018). Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Florida Keys, which is also the last U.S. stronghold for the species (Poulakis and Seitz 2004; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2005). Water temperatures (no lower than 8-12°C) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. Most specimens captured along the Atlantic coast north of Florida are large juveniles or adults (over 10 ft) that likely represent seasonal migrants, wanderers, or colonizers from a historical Florida core population to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953).

Life History Information

Smalltooth sawfish mate in the spring and early summer (Grubbs unpublished data; Poulakis unpublished data). Fertilization is internal and females give birth to live young. Evidence suggests a gestation period of approximately 12 months and females produce litters of 7-14 young (Feldheim et al. 2017)(Gelsleichter unpublished data). Females have a biennial reproductive cycle (Feldheim et al. 2017) and parturition (act of giving birth) occurs nearly year round though peaking in spring and early summer (March – July) (Poulakis et al. 2011)(Carlson unpublished data). Smalltooth sawfish are approximately 26-31 in (64-80 cm) at birth (Bethea et al. 2012; Poulakis et al. 2011) and may grow to a maximum length of approximately 16 ft (500 cm) ((Brame et al. 2019). Simpfendorfer et al. (2008) report rapid juvenile growth for smalltooth sawfish for the first 2 years after birth, with stretched total length increasing by an average of 25-33 in (65-85 cm) in the first year and an average of 19-27 in (48-68 cm) in the second year. Uncertainty remains in estimating post-juvenile growth rates and age at maturity; yet, recent advances indicate maturity at 7-11 years (Carlson and Simpfendorfer 2015) at lengths of approximately 340 cm for males and 350-370 cm for females (Gelsleichter unpublished data).

There are distinct differences in habitat use based on life history stage as the species shifts use through ontogeny. Juvenile smalltooth sawfish less than 220 cm, inhabit the shallow euryhaline waters (i.e., variable salinity) of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). These juveniles are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Hollensead et al. 2016; Hollensead et al. 2018; Poulakis et al. 2011; Poulakis et al. 2013; Simpfendorfer 2001; Simpfendorfer 2003; Simpfendorfer et al. 2010). (Simpfendorfer et al. 2010) indicated the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used the shallowest water (depths less than 0.5 m [1.64 ft]), had small home ranges (4,264-4,557 square meters), and exhibited high levels of site fidelity. Although small juveniles exhibit high levels of site fidelity for specific nursery habitats for periods of time lasting up to 3 months (Wiley and Simpfendorfer 2007), they do undergo small movements coinciding with changing tidal stages. These movements often involve moving from shallow sandbars at low tide to within red mangrove prop roots at higher tides (Simpfendorfer et al. 2010)—behavior likely to reduce the risk of predation (Simpfendorfer

2006). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer et al. 2010; Simpfendorfer et al. 2011), eventually moving to more offshore habitats where they likely feed on larger prey as they continue to mature.

Researchers have identified several areas within the Charlotte Harbor Estuary that are disproportionately more important to juvenile smalltooth sawfish, based on intra- or inter-annual (within or between year) capture rates during random sampling events within the estuary (Poulakis et al. 2011; Poulakis 2012). These high-use areas were termed “hotspots” and also correspond with areas where public encounters are most frequently reported. Use of these “hotspots” can vary within and among years based on the amount and timing of freshwater inflow. Juvenile smalltooth sawfish use hotspots further upriver during high salinity conditions (drought) and areas closer to the mouth of the Caloosahatchee River during times of high freshwater inflow (Poulakis et al. 2011). At this time, researchers are unsure what specific biotic or abiotic factors influence this habitat use, but they believe a variety of conditions in addition to salinity, such as temperature, dissolved oxygen, water depth, shoreline vegetation, and food availability, may influence habitat selection (Poulakis et al. 2011).

The juvenile “hotspots” may be of further significance following the findings of female philopatry (Feldheim et al. 2017). More specifically, Feldheim et al. (2017) found that female sawfish return to the same parturition (birthing) sites over multiple years (parturition site fidelity). NMFS expects that these parturition sites align closely with the juvenile “hotspots” given the high fidelity shown by the smallest size/age classes of sawfish to specific nursery areas. Therefore, disturbance of these nursery areas could have wide-ranging effects on the sawfish population if it were to disrupt future parturition.

While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts. Poulakis and Seitz (2004) noted that nearly half of the encounters with adult-sized smalltooth sawfish in Florida Bay and the Florida Keys occurred in depths from 200-400 ft (70-122 m) of water. Similarly, Simpfendorfer and Wiley (2005) reported encounters in deeper waters off the Florida Keys, and observations from both commercial longline fishing vessels and fishery-independent sampling in the Florida Straits report large smalltooth sawfish in depths up to 130 ft (~40 m)(ISED 2014). Yet, current field studies show adult smalltooth sawfish also use shallow estuarine habitats within Florida Bay and the Everglades (Grubbs unpublished data). Further, NMFS expects that females return to shallow estuaries during parturition (when adult females return to shallow estuaries to give birth).

Status and Population Dynamics

Based on the contraction of the species’ geographic range, we expect that the population to be a fraction of its historical size. However, few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Despite the lack of scientific data, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. population is currently reproducing (Feldheim et al. 2017; Seitz and Poulakis 2002; Simpfendorfer 2003). The abundance of juveniles publically encountered by anglers and boaters, including very small individuals, suggests that the population remains viable (Simpfendorfer and Wiley 2004), and data analyzed from Everglades

National Park as part of an established fisheries-dependent monitoring program (angler interviews) indicated a slightly increasing trend in juvenile abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). Similarly, preliminary results of juvenile smalltooth sawfish sampling programs in both ENP and Charlotte Harbor indicate the juvenile population is at least stable and possibly increasing (Poulakis unpublished data, Carlson unpublished data).

Using a demographic approach and life history data for smalltooth sawfish and similar species from the literature, (Simpfendorfer 2000) estimated intrinsic rates of natural population increase for the species at 0.08-0.13 per year and population doubling times from 5.4-8.5 years. These low intrinsic rates[7] of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades. Carlson and Simpfendorfer (2015) constructed an age-structured Leslie matrix model for the U.S. population of smalltooth sawfish, using updated life history information, to determine the species' ability to recover under scenarios of variable life history inputs and the effects of bycatch mortality and catastrophes. As expected, population growth was highest (λ=1.237 year-1) when age-at-maturity was 7 year and decreased to 1.150 year-1 when age-at-maturity was 11 year. Despite a high level of variability throughout the model runs, in the absence of fishing mortality or catastrophic climate effects, the population grew at a relatively rapid rate approaching carrying capacity in 40 years when the initial population was set at 2,250 females or 50 years with an initial population of 600 females. Carlson and Simpfendorfer (2015) concluded that smalltooth sawfish in U.S. waters appear to have the ability to recover within the foreseeable future based on a model relying upon optimistic estimates of population size, lower age-at-maturity and the lower level of fisheries-related mortality. Another analysis was less optimistic based on lower estimates of breeding females in the Caloosahatchee River nursery (Chapman unpublished data). Assuming similar numbers of females among the 5 known nurseries, that study would suggest an initial breeding population of only 140-390 females, essentially half of the initial population considered by Carlson and Simpfendorfer (2015). A smaller initial breeding population would extend the time to reach carrying capacity.

Threats

Past literature indicates smalltooth sawfish were once abundant along both coasts of Florida and quite common along the shores of Texas and the northern Gulf coast (NMFS 2010). Based on recent comparisons with these historical reports, the U.S. DPS of smalltooth sawfish has declined over the past century (Simpfendorfer 2001; Simpfendorfer 2002). The decline in smalltooth sawfish abundance has been attributed to several factors including bycatch mortality in fisheries, habitat loss, and life history limitations of the species (NMFS 2010).

<u>Bycatch Mortality</u>

Bycatch mortality is cited as the primary cause for the decline in smalltooth sawfish in the U.S. (NMFS 2010). While there has never been a large-scale directed fishery, smalltooth sawfish easily become entangled in fishing gears (gill nets, otter trawls, trammel nets, and seines) directed at other commercial species, often resulting in serious injury or death (NMFS 2009).

[7] The rate at which a population increases in size if there are no density-dependent forces regulating the population.

This has historically been reported in Florida (Snelson and Williams 1981), Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, one fisherman interviewed by Evermann and Bean (1897) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. In another example, smalltooth sawfish landings data gathered by Louisiana shrimp trawlers from 1945-1978, which contained both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units), indicated declines in smalltooth sawfish landings from a high of 34,900 lbs in 1949 to less than 1,500 lbs in most years after 1967. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters"[8] (FLA. CONST. art. X, § 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., South Atlantic shrimp fishery, Gulf of Mexico shrimp fishery, federal shark fisheries of the South Atlantic, and the Gulf of Mexico reef fish fishery), though anecdotal information collected by NMFS port agents suggest smalltooth sawfish captures are now rare.

In addition to incidental bycatch in commercial fisheries, smalltooth sawfish have historically been and continue to be captured by recreational anglers. Encounter data (ISED 2014) and past research (Caldwell 1990) document that rostra are sometimes removed from smalltooth sawfish caught by recreational anglers, thereby reducing their chances of survival. While the current threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992, bycatch in recreational fisheries remains a potential threat to the species.

Habitat Loss

Modification and loss of smalltooth sawfish habitat, especially nursery habitat, is another contributing factor in the decline of the species. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the U.S. (Dahl and Johnson 1991). Since then, rates of loss have decreased, but habitat loss continues. From 1998-2004, approximately 64,560 acres of coastal wetlands were lost along the Atlantic and Gulf coasts of the U.S., of which approximately 2,450 acres were intertidal wetlands consisting of mangroves or other estuarine shrubs (Steadman and Dahl 2008). Further, Orlando et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 mi of navigation channels and 9,844 mi of shoreline with modifications. In Florida, coastal development often involves the removal of mangroves and the armoring of shorelines through seawall construction. Changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water control devices have had other impacts: altered the temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Reddering 1988; Whitfield and Bruton 1989). While these modifications of habitat are not the primary reason for the decline of

[8] "nearshore and inshore Florida waters" means all Florida waters inside a line 3 mi seaward of the coastline along the Gulf of Mexico and inside a line 1 mi seaward of the coastline along the Atlantic Ocean.

smalltooth sawfish abundance, it is likely a contributing factor and almost certainly hampers the recovery of the species. Juvenile sawfish and their nursery habitats are particularly likely to be affected by these kinds of habitat losses or alternations, due to their affinity for shallow, estuarine systems. Prohaska et al. (2018) showed that juvenile smalltooth sawfish within the anthropogenically altered Charlotte Harbor estuary have higher metabolic stress compared to those collected from more pristine nurseries in the Everglades. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

Life History Limitations

The smalltooth sawfish is also limited by its life history characteristics as a relatively slow-growing, late-maturing, and long-lived species. Animals using this life history strategy are usually successful in maintaining small, persistent population sizes in constant environments, but are particularly vulnerable to increases in mortality or rapid environmental change (NMFS 2000). The combined characteristics of this life history strategy result in a very low intrinsic rate of population increase (Musick 1999) that make it slow to recover from any significant population decline (Simpfendorfer 2000).

Stochastic Events

Although stochastic events such as aperiodic extreme weather and harmful algal blooms are expected to affect smalltooth, we are currently unsure of their impact. A strong and prolonged cold weather event in January 2010 resulted in the mortality of at least 15 juvenile and 1 adult sawfish (Poulakis et al. 2011; Scharer et al. 2012), and led to far fewer catches in directed research throughout the remainder of the year (Bethea et al. 2011). Another less severe cold front in 2011 did not result in any known mortality but did alter the typical habitat use patterns of juvenile sawfish within the Caloosahatchee River. Since surveys began, 2 hurricanes have made direct landfall within the core range of US sawfish. While these storms denuded mangroves along the shoreline and created hypoxic water conditions, we are unaware of any direct effects to sawfish. Just prior to the passage of the most recent hurricane (Hurricane Irma), acoustically tagged sawfish moved away from their normal shallow nurseries and then returned within a few days (Poulakis unpublished data; Carlson unpublished data). Harmful algal blooms have occurred within the core range of smalltooth sawfish and affected a variety of fauna including sea turtles, fish, and marine mammals, but to date no sawfish mortalities have been reported.

Current Threats

The 3 major factors that led to the current status of the U.S. DPS of smalltooth sawfish – bycatch mortality, habitat loss, and life history limitations – continue to be the greatest threats today. All the same, other threats such as the illegal commercial trade of smalltooth sawfish or their body parts, predation, and marine pollution and debris may also affect the population and recovery of smalltooth sawfish on smaller scales (NMFS 2010). We anticipate that all of these threats will continue to affect the rate of recovery for the U.S. DPS of smalltooth sawfish.

In addition to the anthropogenic effects mentioned previously, changes to the global climate are likely to be a threat to smalltooth sawfish and the habitats they use. The Intergovernmental Panel on Climate Change (IPCC) has stated that global climate change is unequivocal and its impacts to coastal resources may be significant (IPCC 2007; IPCC 2013). Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, changes in the amount and timing of precipitation, and changes in air and water temperatures (EPA 2012; NOAA 2012). The impacts to smalltooth sawfish cannot, for the most part, currently be predicted with any degree of certainty, but we can project some effects to the coastal habitats where they reside. Red mangroves and shallow, euryhaline waters will be directly impacted by climate change through sea level rise, which is expected to increase 0.45 to 0.75 m by 2100 (IPCC 2013). Sea level rise will impact mangrove resources, as sediment surface elevations for mangroves will not keep pace with conservative projected rates of elevation in sea level (Gilman et al. 2008). Sea level increases will also affect the amount of shallow water available for juvenile smalltooth sawfish nursery habitat, especially in areas where there is shoreline armoring (e.g., seawalls). Further, the changes in precipitation coupled with sea level rise may also alter salinities of coastal habitats, reducing the amount of available smalltooth sawfish nursery habitat.

4. ENVIRONMENTAL BASELINE

By regulation (50 CFR 402.02), the environmental baseline for an Opinion refers to the condition of the listed species without the consequences to the listed species caused by the proposed action.. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to the listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Focusing on the current state of a species is important because some species will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be to other species or in other areas, or may have been exposed to unique or disproportionate stresses. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

4.1 Status of Species within the Action Area

There are no reported recreational hook-and-line captures of sea turtles at the City of Oak Hill according to STSSN data for the years 2007-2015. Based on STSSN recreational hook-and-line capture and entanglement data (Table 2), we believe green sea turtle (NA and SA DPSs) and loggerhead sea turtle (NWA DPS) may be affected by recreational hook-and-line fishing that will occur at the pier upon completion of the repairs. These species of sea turtle are migratory, traveling to forage grounds or for reproduction purposes. The waters within the action area may be used by these species of sea turtle for developmental and foraging habitat. NMFS believes that no individual sea turtle is likely to be a permanent resident of the action area, although some individuals may be present at any given time and may be adversely affected by recreational fishing occurring at the pier. These same individuals will migrate into offshore waters of the North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico at certain times of the year, and thus may be affected by activities occurring there. Therefore, the statuses of the sea turtle species in the action area are considered to be the same as those discussed in Sections 3.3.1-3.3.3.

Smalltooth sawfish are documented throughout the state of Florida; however, the majority of encounters occur in Lee, Charlotte, and Monroe counties. Since the species was listed in 2003, NMFS PRD has documented 9 smalltooth sawfish encounters in Volusia County, Florida (A. Brame, NOAA NMFS Southeast Regional Office [SERO] PRD, to consulting biologist on June 25, 2020). Of those, 5 were due to recreational fishing. NMFS believes that no individual smalltooth sawfish is likely to be a permanent resident of the action area, although some individuals may be present at any given time and may be adversely affected by recreational fishing that will occur at the pier. These same individuals will migrate into coastal and offshore waters of the Gulf of Mexico and potentially areas of the North Atlantic Ocean, and thus may be affected by activities occurring there. Therefore, the status of smalltooth sawfish in the action area is considered to be the same as those discussed in Section 3.4. While the International Sawfish Encounter Database (ISED) contains several recreational hook-and-line captures of smalltooth sawfish from fishing piers in the state of Florida from 2003-2017, there have been no reported recreational hook-and-line captures of a smalltooth sawfish at the Oak Hill Fishing Pier.

4.2 Factors Affecting Species within the Action Area

4.2.1 Federal Actions

In August of 2007, NMFS issued a regulation (72 FR 43176, August 3, 2007) to require any fishing vessels subject to the jurisdiction of the U.S. to take observers upon NMFS's request. The purpose of this measure is to learn more about ESA-listed species interactions with fishing operations, to evaluate existing measures to reduce take, and to determine whether additional measures to address prohibited takes may be necessary. Fishing vessels subject to the jurisdiction of the U.S. could operate in the action area, and therefore, could be required to take a NMFS observer.

Other than the proposed action, no other federally permitted projects are known to have occurred within the action area, as per a review of the NMFS SERO PRD's completed ESA Section 7 consultation database by the consulting biologist on June 25, 2020.

4.2.2 State or Private Actions

Recreational Fishing

Recreational fishing as regulated by the State of Florida can affect sea turtles and smalltooth sawfish or their habitats within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue.

Observations of state recreational fisheries have shown that loggerhead sea turtles are known to bite baited hooks and frequently ingest the hooks. Overall, hooked sea turtles have been reported to the STSSN by the public fishing from boats, piers, and beach, banks, and jetties and from commercial anglers fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to Kemp's ridley and loggerhead sea turtles can be found in the Turtle Expert Working Group (TEWG) reports (1998; 2000).

Though anglers are not targeting smalltooth sawfish, but instead capturing them incidentally, recreational fishing is currently a major activity that directly interacts with smalltooth sawfish throughout most of its range. Smalltooth sawfish occur as bycatch in the recreational hook-and-line fishery, mostly by shark, red drum (*Sciaenops ocellatus*), snook (*Centropomus undecimalis*), and tarpon (*Megalops atlanticus*) fishers (Wiley and Simpfendorfer 2010), which may operate within the action area.

The Oak Hill Fishing Pier, originally constructed in 2008, is located on the east coast of Florida in Mosquito Lagoon in the Indian River Lagoon system. Approximately 2-5 people fish from the pier each day, which is open to the public from dawn to dusk all year. As stated above, there have been no reported captures of sea turtles or smalltooth sawfish at the pier (STSSN data 2007-2015, ISED data 2003-2017). We have no way of knowing how many unreported captures of sea turtles or smalltooth sawfish may have occurred at the pier in the past.

4.2.3 Marine Debris and Acoustic Impacts

A number of activities that may affect ESA-listed sea turtle species and smalltooth sawfish in the action area include anthropogenic marine debris and acoustic effects. The effects from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to these species from these sources.

4.2.4 Marine Pollution and Environmental Contamination

Sources of pollutants along the coastal areas include atmospheric loading of PCBs, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges (Vargo et al. 1986). In addition, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, and boat traffic can degrade marine habitats used by sea turtles and smalltooth sawfish. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated. The development of marinas and docks in inshore waters can negatively affect nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles within the action area.

4.2.5 Stochastic Events

Stochastic (i.e., random) events, such as hurricanes or cold snaps, occur in Florida and can affect sea turtles and smalltooth sawfish in the action area. These events are unpredictable and their effect on the recovery of these ESA-listed species is unknown; yet, they have the potential to directly impede recovery if animals die as a result or indirectly if important habitats are damaged.

5. EFFECTS OF THE ACTION

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

5.1 Effects of Hook-and-Line Captures to Listed Species

As discussed above in Section 3, we believe hook-and-line gear commonly used by recreational anglers fishing from the Oak Hill Fishing Pier (‘the consultation pier’ throughout the remainder of this Opinion) can adversely affect sea turtles and smalltooth sawfish. Here we provide more detail on the potential effects of entanglement, hooking, and trailing line to those species.

5.1.1 Entanglement

Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that hook-and-line gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If the sea turtle is entangled when young, the fishing line becomes tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage. Sea turtles have been found entangled in many different types of hook-and-line gear. Entangling gear can interfere with a sea turtle’s ability to swim or impair its feeding, breeding, or migration. Entanglement may even prevent surfacing and cause drowning.

Due to their toothed rostra, smalltooth sawfish can become entangled in fishing gears such as gill nets, otter trawls, trammel nets, cast nets and seines that are directed at other species (NMFS 2009). Entanglement in recreational fishing line can cause effects to smalltooth sawfish including injury to fins and rostra (FWC unpublished data).

5.1.2 Hooking

Sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some depending on the foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally in the flippers, head, shoulders, armpits, or beak, or internally inside the mouth or when the animal has swallowed the bait (Balazs et al. 1995). Swallowed hooks are of the greatest threat. A sea turtle's esophagus (throat) is lined with strong conical papillae directed towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a sea turtle's mouth, especially if the hooks have been deeply ingested. Because of a sea turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A sea turtle's esophagus is also firmly attached to underlying tissue; thus, if a sea turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the sea turtle's esophagus or stomach and can pull organs from its connective tissue. These injuries can cause the sea turtle to bleed internally or can result in infections, both of which can kill the sea turtle. If an ingested hook does not lodge into, or pierce, a sea turtle's digestive organs, it can pass through the digestive system entirely (Aguilar et al. 1995; Balazs et al. 1995) with little damage (Work 2000). For example, a study of loggerheads deeply hooked by the Spanish Mediterranean pelagic longline fleet found ingested hooks could be expelled after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a sea turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle.

At present, the ISED contains several recreational hook-and-line captures of smalltooth sawfish from fishing piers (A. Brame, NOAA NMFS SERO PRD, to consulting biologist on May 15, 2020). Based on this data, smalltooth sawfish do not appear to be actively attracted to piers or to habituate to piers as a forage source. We believe smalltooth sawfish captures are largely a function of co-occurrence in space and time rather than triggered by the presence of the pier. While hooking interactions within the recreational fishery are numerous, the level of mortality is likely low when smalltooth sawfish are handled and released properly. Further, the threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992. Longer fights on recreational hook-and-line gear as opposed to commercial bottom longlines may elevate lactate and HCO_3 levels (Prohaska et al. (2018); however, smalltooth sawfish appear resilient and, when considered in conjunction with information from ongoing tagging and telemetry studies, post-release survival is expected to be high ((Brame et al. 2019).

5.1.3 Trailing Line

Trailing line (i.e., line left on a sea turtle after it has been captured and released) poses a serious risk to sea turtles. Line trailing from a swallowed hook is also likely to be swallowed, which may irritate the lining of the digestive system. The line may cause the intestine to twist upon itself until it twists closed, creating a blockage ("torsion"), or may cause a part of the intestine to slide into another part of intestine like a telescopic rod ("intussusception") which also leads to blockage. In both cases, death is a likely outcome (Watson et al. 2005). The line may also prevent or hamper foraging, eventually leading to death. Trailing line may also become snagged on a floating or fixed object, further entangling a turtle and potentially slicing its appendages and affecting its ability to swim, feed, avoid predators, or reproduce. Sea turtles have been found trailing gear that has been snagged on the sea floor, or has the potential to snag, thus anchoring them in place (Balazs 1985). Long lengths of trailing gear are more likely to entangle the sea turtle, eventually leading to impaired movement, constriction wounds, and potentially death.

The effects to smalltooth sawfish from trailing line are the same as those discussed above under Entanglements.

5.2 Estimating Total Captures of Sea Turtles

5.2.1 Estimating Reported Captures of Sea Turtles

As previously stated, there are no reported captures of sea turtles at consultation pier.

In the available STSSN data for Zone 28 (2007-2015), there are 5 reported captures of sea turtles at 2 similar pubic fishing structures. Because these 2 fishing structures are in a similar habitat and location (i.e., inshore in Zone 28), we assume sea turtle behavior, density, and species composition are the same at each location. Because these 2 fishing structures are of a similar size, they likely have similar angler effort. Further, we assume anglers fishing from these 2 structures use similar baits, equipment, and fishing techniques. Therefore, the potential for interactions with sea turtles is likely the same at both of these fishing structures. Whether those potential interactions are reported varies depending on a number of factors, including whether there are educational signs encouraging reporting and angler behavior; sometimes anglers do not report encounters with ESA-listed species due to concerns over their personal liability or public perception at the time of the capture even if there are posted signs. Given this variability, it is difficult to estimate reporting behavior; however, we assume that similar fishing structures within the same zone would have similar reporting rates. Therefore, even though the historic reported captures may be different between these structures, the potential for reported captures is the same across them all.[9] Thus, we believe the best available data to estimate the number of expected reported captures at the consultation pier in the future can be determined by taking the average of the historic reported sea turtle captures across the 2 similar fishing structures in Zone 28 for which we have data (i.e., we do not include zeros [i.e., piers that have no reported interactions] in the average). Averaging the historic reported capture data across the 2 fishing structures helps smooth variability among the locations and over time, providing for a more accurate overall estimate of future reported captures at the consultation pier

To calculate the average number of reported hook-and-line captures across the 4 similar fishing structures in Zone 28 over all the years of available data, we use the following equation:

$$
\begin{aligned}
&Average\ Reported\ Captures\ Per\ Structure\ in\ 9\ years \\
&= Sum\ of\ \ Reported\ Captures\ at\ 2\ Structures\ in\ 9\ years \div 2\ Locations \\
&= 5 \div 2 \\
&= 2.5\ per\ structure\ in\ 9\ years
\end{aligned}
$$

To calculate the estimated expected annual number of reported recreational hook-and-line captures of sea turtles at the consultation pier, we refer to the information on the similar structures above and use the following equation:

[9] Historic reported captures of sea turtle species is the best available data to estimate the potential for future reported captures of those species in light of the 20-year trend in increased nesting. There is no other data available to estimate taking of those species at fishing piers.

$$\begin{aligned}&Expected\ Annual\ Reported\ Captures\\&= Average\ Reported\ Captures\ Per\ Structure\ in\ 9\ years \div 9\ years\\&= 2.5 \div 9\\&= 0.2778\ per\ year\ (Table\ 4, Line\ 1)\end{aligned}$$

5.2.2 Estimating Unreported Captures of Sea Turtles

While we believe the best available information for estimating expected reported captures at the consultation pier is the reported captures at public fishing structures in the surrounding area, we also recognize the need to account for unreported captures. In the following section, we use the best available data to estimate the number of unreported recreational hook-and-line-captures that may occur. To the best of our knowledge, only 2 fishing pier surveys aimed at collecting data regarding unreported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast. One is from Charlotte Harbor, Florida, and the other is from Mississippi.

The fishing pier survey in Charlotte Harbor, Florida, was conducted at 26 fishing piers in smalltooth sawfish critical habitat (Hill 2013). During the survey, 93 anglers were asked a series of open-ended questions regarding captures of sea turtles, smalltooth sawfish, and dolphins, including whether or not they knew these encounters were required to be reported and if they did report encounters. The interviewer also noted conditions about the pier including if educational signs regarding reporting of hook-and-line captures were present at the pier. Hill (2013) found that only 8% of anglers would have reported a sea turtle hook-and-line capture (i.e., 92% of anglers would not have reported a sea turtle capture).

NMFS conducted the fishing pier survey in Mississippi that interviewed 382 anglers. This survey indicated that approximately 60% of anglers who incidentally captured a sea turtle on hook-and-line reported it (i.e., 40% of anglers would not have reported a sea turtle capture) (Cook et al. 2014). It is important to note that in 2012 educational signs were installed at all fishing piers in Mississippi, alerting anglers to report accidental hook-and-line captures of sea turtles. After the signs were installed, there was a dramatic increase in the number of reported sea turtle hook-and-line captures. Though this increase in reported captures may not solely be related to outreach efforts, it does highlight the importance of educational signs on fishing piers. The STSSN in Mississippi indicated that inconsistency in reporting of captures may also be due to anglers' concerns over their personal liability, public perception at the time of the capture, or other consequences from turtle captures (M. Cook, STSSN, pers. comm. to N. Bonine, NMFS SERO PRD, April 17, 2015). Since there may be a perception that it is always illegal to harm an endangered species, anglers are often afraid to admit the incidental capture.

Below, we will address unreported captures by assuming that the expected annual reported captures of 0.2778 sea turtles per year at the consultation pier represents 8% of the actual captures and 92% of sea turtle captures will be unreported. We believe it is most conservative and reasonable to use the unreported rate in the Hill (2013) fishing pier study to estimate the future unreported captures because the study and the consultation pier occur in Florida. To calculate the expected annual number of unreported recreational hook-and-line captures of sea turtles, we use the equation:

$$
\begin{aligned}
&Expected\ Annual\ Unreported\ Captures \\
&= (Expected\ Annual\ Reported\ Captures \div 8\%) \times 92\% \\
&= (0.2778\ \div 0.08) \times 0.92 \\
&=\ 3.1847\ per\ year\ (Table\ 4, Line\ 2)
\end{aligned}
$$

5.2.3 Calculating Total Captures of Sea Turtles

The number of captures in any given year can be influenced by sea temperatures, species abundances, fluctuating salinity levels in estuarine habitats where piers may be located, and other factors that cannot be predicted. For these reasons, we believe basing our future capture estimate on a 1-year estimated capture is largely impractical. Using our experience monitoring other fisheries, a 3-year time period is appropriate for meaningful evaluation of future impacts and monitoring. The triennial takes are set as 3-year running sums (i.e., 2020-2022, 2021-2023, 2022-2024, and so on) and not for static 3-year periods (i.e., 2020-2022, 2023-2025, 2025-2027, and so on). This approach reduces the likelihood of reinitiation of the ESA consultation process because of inherent variability in captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. Table 4 shows the projected total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual reported and unreported captures.

Table 4. Summary of Expected Captures of Sea Turtles

Captures	Total
1. Expected Annual Reported	0.2778
2. Expected Annual Unreported	3.1947
Annual Total	3.4725
Triennial (3-year) Total	10.4175

5.3 Estimating Total Post Release Mortality of Sea Turtles

5.3.1 Estimating Post Release Mortality for Reported Captures of Sea Turtles

Almost all sea turtles that are captured, landed, and reported to the STSSN are evaluated by a trained veterinarian to determine if they can be immediately released alive or require a rehabilitation facility; exceptions may happen if the sea turtle breaks free before help can arrive. Sea turtles that are captured and reported to the STSSN may die onsite, may be evaluated, released alive, and subsequently suffer post-release mortality (PRM) later, or may be evaluated and taken to a rehabilitation facility. Those taken to a rehabilitation facility may be released alive at later date or be kept in rehabilitation indefinitely (either due to serious injury or death). We consider those that are never returned to the wild population to have suffered PRM because they will never again contribute to the population. The risk of PRM to sea turtles from reported hook-and-line captures will depend on numerous factors, including how deeply the hook is embedded, whether or not the hook was swallowed, whether the sea turtle was released with trailing line, how soon and how effectively the hooked sea turtle was de-hooked or otherwise cut loose and released, and other factors which are discussed in more detail below.

We believe available STSSN dataset for inshore hook and line captures and entanglements in Zone 28 is the most accurate representation of PRM for sea turtles in the action area because this dataset pertains specifically to Florida where the future reported captures are anticipated to occur. Table 5 provides a breakdown of final disposition of the 83 sea turtles caught or entangled in recreational hook-and-line gear in the STSSN dataset for Zone 28.

Table 5. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in Zone 28 (Inshore), 2007-2015 (n=83)

	Dead or Died Onsite	**Released Alive Immediately (Not Evaluated)**	**Released Alive, Immediately (Evaluated)**	**Taken to Rehab, Released Alive Later**	**Taken to Rehab, Kept or Died in Rehab**
Number of Records	34	3	9	18	19
Percentage	41%	3.6%	10.8%	21.7%	22.9%

Of the 83 sea turtles reported captured on recreational hook-and-line or entangled in gear in Zone 28, 63.9% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal captures, 41.0 + 22.9) and 36.1% were released alive back into the wild population (i.e., non-lethal captures, 3.6 + 10.8 + 21.7).

To calculate the annual estimated lethal captures of reported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}
&Annual\ Lethal\ Reported\ Captures\\
&= Expected\ Annual\ Reported\ Captures\ [Table\ 4, Line\ 1]\\
&\qquad \times Lethal\ Captures\ [calculated\ from\ Table\ 5]\\
&= 0.2778 \times 63.9\%\\
&= 0.1774\ per\ year\ (Table\ 9, Line\ 1A)
\end{aligned}$$

To calculate the estimated annual non-lethal captures of reported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}
&Annual\ Non-lethal\ Reported\ Captures\\
&= Expected\ Annual\ Reported\ Captures\ [Table\ 4, Line\ 1] \times Non\\
&\qquad - lethal\ Captures\ [calculated\ from\ Table\ 5]\\
&= 0.2778 \times 36.1\%\\
&= 0.1004\ per\ year\ (Table\ 9, Line\ 1B)
\end{aligned}$$

5.3.2 Estimating Post-Release Mortality for Unreported Captures of Sea Turtles

Sea turtles that are captured and not reported to the STSSN may be released alive and subsequently suffer PRM. The risk of PRM to sea turtles from hook-and-line captures will depend on numerous factors, including how deeply the hook is embedded, whether or not the hook was swallowed, whether the sea turtle was released with trailing line, how soon and how effectively the hooked sea turtle was de-hooked or otherwise cut loose and released, and other factors which are discussed in more detail below. While the preferred method to release a hooked sea turtle safely is to bring it ashore and de-hook/disentangle it there and release it immediately, that cannot always be accomplished. The next preferred technique is to cut the line as close as possible to the sea turtle's mouth or hooking site rather than attempt to pull the sea turtle up to the pier. Some incidentally captured sea turtles are likely to break free on their own and escape with embedded/ingested hooks and/or trailing line. Because of considerations such as the tide, weather, and the weight and size of a hooked captured sea turtle, some will not be able to be de-hooked, and will be cut free by anglers and intentionally released. These sea turtles will escape with embedded or swallowed hooks, or trailing varying amounts of fishing line, which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery based on the severity of injury. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the Southeast Fisheries Science Center updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury (NMFS2012a). Table 6 describes injury categories for hardshell sea turtles captured on hook-and-line gear and the associated PRM estimates for sea turtles released with hook and trailing line greater than or equal to half the length of the carapace (i.e., Release Condition B as defined in (NMFS 2012). We use these criteria when estimating the PRM for unreported captures of sea turtles because it accounts for the expected differences in handling and care of reported versus unreported sea turtles.

Table 6. Estimated Post Release Mortality Based on Injury Category for Hardshell Sea Turtles Captured via Hook-and-Line and Released in Release Condition B (NMFS 2012).

Injury Category	Description	Post-release Mortality
I	Hooked externally with or without entanglement	20%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca (i.e., beak), but not any other jaw/mouth tissue parts	30%
III	Hooked in cervical esophagus, glottis, jaw joint, soft palate, tongue, and/or other jaw/mouth tissue parts not categorized elsewhere, with or without entanglement—includes all events where the insertion point of the hook is visible when viewed through the mouth.	45%
IV	Hooked in esophagus at or below level of the heart with or without entanglement—includes all events where the insertion point of the hook is not visible when viewed through the mouth	60%
V	Entangled only, no hook involved	50%*
VI	Comatose/Resuscitated	60%**

*There is no PRM estimate of Release Condition B for Injury Category V. For Injury Category V, we believe it is prudent to use the PRM for Release Condition A (Released Entangled) because we know the sea turtle was released entangled without a hook, but we do not know how much line was remaining.
**For Injury Category 6, we believe it is prudent to use the PRM Release Condition D (Released with All Gear Removed) because we believe that if a fisher took the time to resuscitate the sea turtle, then it is likely the fisher also took the time to disentangle the animal completely before releasing it back into the wild

PRM varies based on the initial injury the animal sustained and the amount of gear left on the animal at the time of release. Again, we will rely on the STSSN dataset we used in Section 5.3.1 because this data includes on what part of the body the sea turtle was hooked for 79 of the 81 interactions (Table 7).

Table 7. Category of Injury of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in Zone 28 (Inshore), 2007-2015 (n=79)

Injury Category*	I	II	III	IV	V	VI
Number	11	0	2	7	59	0
Percentage	13.9	0.0	2.5	8.9	74.7	0.0

*SERO PRD assigned an Injury Category of 0 to all records with unknown hooking and entanglement locations. We exclude Injury Category 0 these from the calculation because we are unsure of the location and therefore cannot assign a corresponding PRM. In this case, there are 4 interactions with an unknown hooking/entanglement location in the dataset.

Like above, we assume that 8% of the sea turtles captured at the pier will be reported, and that reported turtles will be sent to rehabilitation if needed. To estimate the fate of the 92% of sea turtles expected to go unreported at the consultation pier, and therefore un-evaluated or rehabilitated, we use the estimated PRM for the injury categories in Table 6 along with the percentage of captures in each injury category in Table 7 to calculate the weighted PRM for each injury category. We then sum the weighted PRMs across all injury categories to determine the overall PRM for these turtles (Table 8). This overall rate helps us account for the varying severity of future injuries and varying PRM associated with these injuries. Based on the assumptions we have made about the percentage of sea turtles that will be released alive without rehabilitation, the hooking location, and the amount of fishing gear likely to remain on an animal released immediately at the pier, we estimate a total weighted PRM of 46.6% for the 92% of sea turtles captured, unreported, and released immediately at the consultation pier.

Table 8. Estimated Weighted and Overall Post Release Mortality for Sea Turtles Released Immediately

Injury Category	PRM (%) [from Table 6]	Percentage [from Table 7]	% Weighted PRM*
I	20	13.9	2.8
II	30	0.0	0.0
III	45	2.5	1.1
IV	60	8.9	5.3
V	50	74.7	37.3
VI	60	0.0	0.0
		Total % Weighted PRM	46.6

*% Weighted PRM = % PRM × % Captures for each category

To calculate the estimated annual lethal captures of unreported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}&Annual\ Unreported\ Lethal\ Captures\\&= Annual\ Unreported\ Captures\ [Table\ 4, Line\ 2] \times Total\ Weighted\ PRM\ [Table\ 8]\\&= 3.1947 \times 46.6\%\\&= 1.4882\ per\ year\ (Table\ 9, Line\ 2A)\end{aligned}$$

If the equation for calculating annual lethal captures of unreported sea turtles multiplies the annual unreported captures by the total weighted PRM of 46.6%, then the equation for calculating annual non-lethal captures of unreported sea turtles would multiply the annual unreported captures by 53.4% (100% – 46.6%). Therefore, to calculate the estimated annual non-lethal captures of unreported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}&Annual\ Unreported\ Non-lethal\ Captures\\&= Annual\ Unreported\ Captures\ [Table\ 4, Line\ 2] \times 53.4\%\\&= 3.1947 \times 53.4\%\\&= 1.7060\ per\ year\ (Table\ 9, Line\ 2B)\end{aligned}$$

5.3.3 Calculating Total Post Release Mortality of Sea Turtles

As we discussed above, we use a 3-year running total to evaluate future impacts to sea turtles due to PRM. Table 5 shows the total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual lethal and non-lethal reported and unreported captures.

Table 9. Summary of Post Release Mortality of Sea Turtles

Captures	A. Lethal	B. Non-lethal
1. Annual Reported Captures	0.1774	0.1004
2. Annual Unreported Captures	1.4882	1.7060
Annual Total	1.6656	1.8064
Triennial (3-year) Total	4.9968	5.4192

5.4 Estimating Captures by Species

5.4.1 Estimating Captures of Sea Turtles by Species

Of the sea turtles in the STSSN offshore stranding data for Zone 28 identifiable to species and which may be adversely affected by the proposed action (n=83), 88% were green (n=73) and 12% were loggerhead sea turtles (n=10) (Table 2). We will assume the same species composition for future captures at the consultation pier because this is the only available data regarding captures of sea turtles in the area. Table 10 estimates the number of lethal and non-lethal captures by sea turtles species for any consecutive 3-year period based on our calculations from Sections 5.2.1 and 5.3.2. To be conservative to the individual species, numbers of captures are rounded up to the nearest whole number. While this results in an increase in the total number of sea turtles, compared to what is presented in the non-species-specific total estimates in Table 9, this approach is most conservative to the species, ensures that we are adequately analyzing the effects of the proposed action on whole animals, and that impacts from the proposed action can be more easily tracked. The impacts of future captures to the individual green sea turtle DPSs are discussed in the Jeopardy Analysis (Section 7) and presented in the Incidental Take Statement (Section 9).

Table 10. Estimated Captures of Sea Turtle Species for Any Consecutive 3-Year Period

Species	Lethal Captures	Non-lethal Captures	Total Captures
Green sea turtle (NA or SA DPS)	5 (4.9968 × 88% = 4.3948)	5 (5.4192 × 88% = 4.7663)	10
Loggerhead sea turtle (NWA DPS)	1 (4.9968 × 12% = 0.6020)	1 (5.4192 × 12% = 0.6529)	2

5.4.2 Estimating Captures of Smalltooth Sawfish

As previously stated, NMFS PRD has documented 5 smalltooth sawfish recreational hook-and-line encounters in Volusia County since the species was listed in 2003 (A. Brame, NOAA NMFS SERO PRD, to consulting biologist on June 25, 2020). Of those, 2 are reported captures from fishing structures, which equals 0.10 encounters per year (2 encounters ÷ 21 years; Table 11, Line 1). Because we lack any other information for estimating the percentages, like above for sea turtles, we will address unreported captures of smalltooth sawfish by assuming: 1) the likelihood of capturing a smalltooth sawfish is the same across all structures in the area and 2) the annual reported captures per year at these fishing structures represents only 8% of the actual captures and 92% will go unreported (Hill 2013). To calculate the expected annual number of unreported recreational hook-and-line captures of smalltooth sawfish from fishing structures in the area, we use the equation:

$$
\begin{aligned}
&\mathit{Expected\ Annual\ Unreported\ Captures} \\
&= (\mathit{Expected\ Annual\ Reported\ Captures} \div 8\%) \times 92\% \\
&= (0.10 \div 0.08) \times 0.92 \\
&= \ 1.10\ \mathit{per\ year}\ (\mathit{Table}\ 11, \mathit{Line}\ 2)
\end{aligned}
$$

Table 11. Summary of Expected Captures of Smalltooth Sawfish

Captures	**Total**
1. Expected Annual Reported	0.10
2. Expected Annual Unreported	1.10
Annual Total	1.20
Triennial (3-year) Total	3.60

As previously discussed, we believe using a 3-year period is appropriate for meaningful monitoring. We round 3.60 up to 4 to account for the capture of whole animals and to be the most conservative to the species. Therefore, we estimate that up to 4 smalltooth sawfish could be caught at the consultation pier during any consecutive 3-year period. Due to this species' low stress response when captured on longlines (Prohaska et al. (2018), we believe that all recreational hook-and-line encounters with smalltooth sawfish from a fishing pier will be non-lethal.

6. CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating its Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion (50 CFR 402.02). At this time, we are not aware of any other non-federal actions being planned or under development in the action area. Within the action areas, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action areas are expected to continue at the present levels of intensity in the near future.

7. JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action is likely to jeopardize the continued existence of green sea turtle (NA and SA DPS), loggerhead sea turtle (NWA DPS), and smalltooth sawfish (U.S. DPS). In the Effects of the Action, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible based on the best available data. Now, we assess each of these species' responses to this impact, in terms of overall population effects, and whether those effects of the proposed actions, when considered in the context of the Status of the Species, the Environmental Baseline, and the Cumulative Effects, are likely to jeopardize the continued existence of ESA-listed species in the wild. To "jeopardize the continued existence of" means to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Thus, in making this determination for each species, we must look at whether the proposed actions directly or indirectly reduce the reproduction, numbers, or distribution of a listed species. Then, if there is a reduction in 1 or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

The NMFS and USFWS's ESA Section 7 Handbook (USFWS and NMFS 1998) defines survival and recovery, as they apply to the ESA's jeopardy standard. Survival means "the species' persistence . . . beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." Survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. Recovery means "improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

The status of each listed species likely to be adversely affected by the proposed action is reviewed in the Status of the Species. For any species listed globally, a jeopardy determination must find that the proposed actions will appreciably reduce the likelihood of survival and recovery at the global species range (i.e., in the wild). For any species listed as DPSs, a jeopardy determination must find that the proposed actions will appreciably reduce the likelihood of survival and recovery of that DPS.

7.1 Green Sea Turtles (NA and SA DPSs)

Within U.S. waters, individuals from both the NA and SA DPS of green sea turtle can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, a study on the foraging grounds off Hutchinson Island (Florida, Atlantic coast) found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the SA DPS (Bass and Witzell 2000).. This information suggests that the vast majority of the anticipated captures in the U.S. Atlantic Ocean are likely to come from the NA DPS. However, it is possible that animals from the SA DPS could be captured during the proposed action. For these reasons, we will act conservatively and conduct 2 jeopardy analyses (1 for each DPS). The NA DPS analysis will assume based on Bass and Witzell (2000) that 95% of green sea turtles adversely affected from the proposed action are from that DPS. The SA DPS analysis will assume that 5% of the green sea turtles adversely affected by the proposed actions are from that DPS.

Applying the above percentages to our estimated 10 total captures of green sea turtles (5 lethal, 5 non-lethal) during any consecutive 3-year period, we estimate the following:

- Up to 10 green sea turtles will come from the NA DPS ($10 \times 0.95 = 9.5$, rounded up to 10), of which 5 will be lethal and 5 will be non-lethal.
- Up to 1 green sea turtle will come from the SA DPS ($10 \times 0.05 = 0.5$, rounded up to 1), which could be lethal or non-lethal.

We note rounding when splitting the take into the two DPSs results in a slightly higher combined total than the 3-year total (i.e., 11 instead of 10). While we use the higher number for purposes of analyzing the likelihood of jeopardy to the DPSs (Section 7.1.1 and 7.1.2), we do not expect more than 10 green sea turtle captures at the consultation pier during any consecutive 3-year period.

7.1.1 NA DPS of Green Sea Turtle

Survival

The proposed action is expected to result in capture of up to 10 green sea turtles (5 lethal, 5 non-lethal) from the NA DPS over any consecutive 3-year period. Any potential non-lethal capture during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass only a tiny portion of the overall range/distribution of green sea turtles within the NA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of NA DPS green sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of NA DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential lethal captures would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with a mean clutch size of 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity. All potential lethal captures are expected to occur in a small, discrete area and green sea turtles in the NA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce the species likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the NA DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we outlined the past and present impacts of all state, federal, or private actions and other human activities in or having effects in the action area that have affected and continue to affect the NA DPS. In the Cumulative Effects, we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3.2.2, we summarized the available information on number of green sea turtle nesters and nesting trends at NA DPS beaches; all major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015). Therefore, nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the Status of the Species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Since the nesting abundance trend information for the NA DPS of green sea turtle is clearly increasing, we believe the lethal take during any consecutive 3-year period will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle NA DPS in the wild.

Recovery

The NA DPS of green sea turtles does not have a separate recovery plan at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the NA DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan, specific to the NA DPS, is developed. The Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

According to data collected from Florida's index nesting beach survey from 1989-2018, green sea turtle nest counts across Florida index beaches have increased substantially from a low of approximately 267 in the early 1990s to a high of almost 41,000 in 2019 (See Figure 3), and indicate that the first listed recovery objective is being met. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have increased, which is consistent with the criteria of the second listed recovery objective.

The potential lethal captures during any consecutive 3-year period will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the recovery objectives and trends noted above, even when considered in the context of the of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NA DPS green sea turtles' recovery in the wild.

Conclusion

The combined lethal and non-lethal captures during any consecutive 3-year period of green sea turtles from the NA DPS associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NA DPS of green sea turtle in the wild.

7.1.2 SA DPS of Green Sea Turtle

Survival

The proposed action is expected to result in the capture of up to 1 green sea turtle, which could be lethal or non-lethal, from the SA DPS over any consecutive 3-year period. Any potential non-lethal captures during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass only a tiny portion of the overall range/distribution of green sea turtles within the SA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of SA DPS green sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of SA DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential lethal captures would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with a mean clutch size of 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity. All potential lethal captures are expected to occur in a small, discrete area and green sea turtles in the SA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action areas that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action areas.

In Section 3.3.2, we summarized available information on number of green sea turtle nesters and nesting trends at SA DPS beaches; some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Therefore, is likely that nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the nesting abundance trend information for green sea turtles appears to be increasing, we believe lethal capture during any consecutive 3-year period attributed to recreational fishing at the consultation pier will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the SA DPS of green sea turtle in the wild.

Recovery

Like the NA DPS, the SA DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the SA DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan, specific to the SA DPS, is developed. In our analysis for the NA DPS, we stated that the Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

Because the first objective listed above is specific to nesting in Florida, it is specific to the NA DPS, but demonstrates the importance of increases in nesting to recovery. As previously stated, nesting at the primary SA DPS nesting beaches appears to have been increasing over the course of the decades. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the likely increases in nesting, and likely correlation between increased nesting and increased overall population, it is likely that numbers on foraging grounds also have increased.

The potential lethal capture during any consecutive 3-year period will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the trends noted above, even when considered in context with the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the recreational fishing from the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the SA DPS of green sea turtles' recovery in the wild.

Conclusion

The combined lethal and non-lethal captures during any consecutive 3-year period of green sea turtles associated with the propose action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the SA DPS of green sea turtle in the wild.

7.2 NWA DPS of Loggerhead Sea Turtle

Survival

The proposed action is expected to result in the capture of up to 2 loggerhead sea turtles (1 lethal, 1 non-lethal) from the NWA DPS during any consecutive 3-year period. Any potential non-lethal captures during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass only a tiny portion of the overall range/distribution of loggerhead sea turtles within the NWA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of NWA DPS of loggerhead sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of NWA logerhead sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential lethal captures would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, an adult female loggerhead sea turtle can lay approximately 4 clutches of eggs every 3-4 years, with 100-126 eggs per clutch. Thus, the loss of adult females could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. However, the potential lethal take during any consecutive 3-year period is expected to occur in a small, discrete area and loggerhead sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action areas that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action areas.

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Abundance estimates in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). In Section 3.3.4, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. Additionally, in-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing.

While the potential lethal capture of a loggerhead sea turtle during any consecutive 3-year period will affect the population, in the context of the overall population's size and current trend, we do not expect this loss to result in a detectable change to the population numbers or increasing trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtle in the wild.

Recovery

The recovery plan for the for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2009) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current NWA DPS and is therefore, the best information on recovery criteria and goals for the DPS. It lists the following recovery objectives that are relevant to the effects of the proposed actions:

- Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females
- Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes

Recovery is the process of removing threats so self-sustaining populations persist in the wild. The proposed actions would not impede progress on carrying out any aspect of the recovery program or achieving the overall recovery strategy. The recovery plan estimates that the population will reach recovery in 50-150 years following implementation of recovery actions. The minimum end of the range assumes a rapid reversal of the current declining trends; the higher end assumes that additional time will be needed for recovery actions to bring about population growth.

Nesting trends have been significantly increasing over several years. The lethal capture attributed to the consultation pier is so small in relation to the overall population, that it would be hardly detectable, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations. The non-lethal from the NWA DPS would not affect the adult female nesting population, number of nests per nesting season, or juvenile in-water populations. Thus, recreational fishing at the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NWA DPS of loggerhead sea turtles' recovery in the wild.

Conclusion

The combined lethal and non-lethal captures during any consecutive 3-year period of loggerhead sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NWA DPS of the loggerhead sea turtle in the wild.

7.3 U.S. DPS of Smalltooth Sawfish

The proposed action is expected to result in the capture of up to 4 smalltooth sawfish over any consecutive 3-year period. We expect all captures to be non-lethal.

Survival

The non-lethal capture of smalltooth sawfish over any consecutive 3-year period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals captured are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since these captures may occur in the small, discrete action area and would be released within the general area where caught, no change in the distribution of smalltooth sawfish is anticipated.

Recovery

The following analysis considers the effects of non-lethal capture on the likelihood of recovery in the wild. The recovery plan for the smalltooth sawfish (NMFS 2009) lists 3 main objectives as recovery criteria for the species. The 2 objectives and the associated sub-objectives relevant to the proposed action are:

Objective - Minimize Human Interactions and Associated Injury and Mortality
Sub-objective:

- Minimize human interactions and resulting injury and mortality of smalltooth sawfish through public education and outreach targeted at groups that are most likely to interact with sawfish (e.g., fishermen, divers, boaters).
- Develop and seek adoption of guidelines for safe handling and release of smalltooth sawfish to reduce injury and mortality associated with fishing.
- Minimize injury and mortality in all commercial and recreational fisheries.

Objective - Ensure Smalltooth Sawfish Abundance Increases Substantially and the Species Reoccupies Areas from which it had Previously Been Extirpated
Sub-objective:

- Sufficient numbers of juvenile smalltooth sawfish inhabit several nursery areas across a diverse geographic area to ensure survivorship and growth and to protect against the negative effects of stochastic events within parts of their range.
- Adult smalltooth sawfish (> 340 cm) are distributed throughout the historic core of the species' range (both the Gulf of Mexico and Atlantic coasts of Florida). Numbers of adult smalltooth sawfish in both the Atlantic Ocean and Gulf of Mexico are sufficiently large that there is no significant risk of extirpation (i.e., local extinction) on either coast.
- Historic occurrence and/or seasonal migration of adult smalltooth sawfish are reestablished or maintained both along the Florida peninsula into the South-Atlantic Bight, and west of Florida into the northern and/or western Gulf of Mexico.

NMFS is currently funding several actions identified in the Recovery Plan for smalltooth sawfish: adult satellite tagging studies, the ISED, and monitoring take in commercial fisheries to name a few. Additionally, NMFS has developed safe-handling guidelines for the species. Despite the ongoing threats from recreational fishing, we have seen a stable or slightly increasing trend in the population of this species. Thus, the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of the U.S. DPS of smalltooth sawfish's recovery in the wild. NMFS must continue to monitor the status of the population to ensure the species continues to recover.

The non-lethal capture of smalltooth sawfish will not affect the population of reproductive adult females. Thus, the recreational fishing effects from the consultation pier will not result in an appreciable reduction in the likelihood of smalltooth sawfish recovery in the wild.

Conclusion

The non-lethal capture of smalltooth sawfish over any consecutive 3-year period associated with propose action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the U.S. DPS of smalltooth sawfish in the wild.

8. CONCLUSION

After reviewing the Status of the Species, the Environmental Baseline, the Effects of the Action, and the Cumulative Effects using the best available data, it is NMFS's Opinion that the proposed action are not likely to jeopardize the continued existence of the NA or SA DPS of green sea turtle, the NWA DPS of loggerhead sea turtle, and the U.S. DPS of smalltooth sawfish.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption.

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. *Incidental take* is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that would otherwise be considered prohibited under Section 9 or Section 4(d), but which is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the reasonable and prudent measures and the terms and conditions of the Incidental Take Statement (ITS) of the Opinion.

9.1 Anticipated Amount or Extent of Incidental Take

The take estimates shown in Table 12 are our best estimates of the total amount of sea turtle and smalltooth sawfish take expected over any consecutive 3-year period due to recreational fishing from the consultation pier.

As described in Section 5 above, some sea turtle and smalltooth sawfish captures are expected to go unreported. The take limits prescribed in this Opinion that will trigger the requirement to reinitiate consultation must be based on the amount of take that we expect to be *reported* as it will be impossible to count the incidents that go unreported. We believe the best available information for estimating the future level of reporting of captured sea turtles and smalltooth sawfish at the consultation pier is the data collected from the Hill (2013) fishing pier study.

In Section 5.2.1, we developed an estimate of the total number of sea turtle captures expected to be reported annually (0.2778; Table 4, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures (0.2778 × 3 = 0.8333). We then apply that number to the species breakdown reported in the STSSN data for recreational hook-and-line captures and gear entanglement in Zone 28 (from Section 5.4.1) to obtain the 3-year reported total estimate of each species of sea turtle. For those estimates that come out to be less than 1, we round up to 1 to reach a whole number that can be used as the take limit.

In Section 5.4.2, we developed an estimate of the total number of smalltooth sawfish captures expected to be reported annually (0.10; Table 11, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported smalltooth sawfish captures (0.10 × 3 = 0.30). We round 0.30 to 1 to reach a whole number that can be used as the take limit.

Table 12. Incidental Take Limits by Species for Any Consecutive 3-Year Period

Species	Total Estimated Reported Captures	Incidental Take Limits
Green sea turtle (NA or SA DPS)	0.8333 × 88% = 0.7329, rounded up to 1	No more than 1 reported capture*
Loggerhead sea turtle (NWA DPS)	0.8333 × 12% = 0.1004, rounded up to 1	No more than 1 reported capture
Smalltooth sawfish (U.S. DPS)	0.10 × 3 = 0.30, rounded up to 1	No more than 1 reported capture

*We do not expect, and do not authorize, more than 1 green sea turtle take during any consecutive 3-year time period, which may come from either the NA or the SA DPS.

It is important to note that the mortality rates estimated above for captured turtles are not likely to be detected in the initial reporting of captures, as most turtles are expected to live for some period following capture. Some of these individuals may be sent to rehabilitation facilities and later die in those facilities, or may be released and die in the wild from undetected injuries, as discussed in our PRM analysis in Section 5.3.1 above. While it is also possible that some sea turtles may die immediately from severe injuries related to hook and line capture or entanglement (which will be included in the annual reports discussed below [Terms & Conditions (T&Cs)]), we do not expect that result (as discussed in Section 5.1). At the time of the interaction, we expect the sea turtle take in the ITS to be non-lethal. As discussed in Section 5.3.1, up to 63.9% of this take could be lethal as a result of PRM, and reports of such PRM are consistent with the analysis in this Opinion and this ITS.

9.2 Effect of Take

NMFS has determined that the anticipated incidental take is not likely to jeopardize the continued existence of the green sea turtle (NA and SA DPS), loggerhead sea turtle (NWA DPS), or smalltooth sawfish (U.S. DPS).

9.3 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on a listed species, which results from an agency action otherwise found to comply with Section 7(a)(2) of the ESA. It also states that the Reasonable and Prudent Measures (RPMs) necessary to minimize the impacts of take and the T&Cs to implement those measures must be provided and must be followed to minimize those impacts. Only incidental taking by the federal action agency or applicant that complies with the specified T&Cs is authorized.

The RPMs and T&Cs are specified as required by 50 CFR 402.14(i)(1)(ii) and (iv) to document the incidental take by the proposed action and to minimize the impact of that take ESA-listed species. These measures and terms and conditions are nondiscretionary, and must be implemented by the federal action agency in order for the protection of Section 7(o)(2) to apply. If the applicant fails to adhere to the T&Cs of this ITS through enforceable terms, and/or fails to retain oversight to ensure compliance with these T&Cs, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the applicant must report the progress of the action and its impact on the species to NMFS as specified in this ITS [50 CFR 402.14(i)(3)].

NMFS has determined that the following RPMs and associated T&Cs are necessary and appropriate to minimize impacts of the incidental take of ESA-listed species related to the proposed action:

1. The federal action agency must ensure that the applicant provides take reports regarding all interactions with ESA-listed species at the fishing piers.
2. The federal action agency must ensure that the applicant minimizes the likelihood of injury or mortality to ESA-listed species resulting from hook-and-line capture or entanglement by activities at the fishing piers.
3. The federal action agency must ensure that the applicant reduces the impacts to incidentally captured ESA-listed species.
4. The federal action agency must ensure that the applicant coordinates periodic fishing line removal (i.e., cleanup) events with non-governmental or other local organizations.

9.4 Terms and Conditions

The following T&Cs implement the above RPMs:

1. To implement RPM 1, the federal action agency must ensure that the applicant reports all known angler-reported hook-and-line captures of ESA-listed species and any other takes of ESA-listed species to the NMFS SERO PRD.
    a. When the applicant becomes aware of any known reported capture, entanglement, stranding, or other take, the applicant must notify NMFS SERO PRD by email: takereport.nmfsser@noaa.gov.
        i. Emails must reference this Opinion by the NMFS tracking number (SERO-2020-01119 Oak Hill Fishing Pier) and date of issuance.
        ii. The email must state the species, date and time of the incident, general location and activity resulting in capture (e.g., fishing from the pier by hook-and-line), condition of the species (i.e., alive, dead, sent to rehabilitation), size of the individual, behavior, identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken.
    b. Every year, the applicant must submit a summary report of capture, entanglement, stranding, or other take of ESA-listed species to NMFS SERO PRD by email: takereport.nmfsser@noaa.gov.
        i. Emails and reports must reference this Opinion by the NMFS tracking number (SERO-2020-01119 Oak Hill Fishing Pier) and date of issuance.
        ii. The report will contain the following information: the total number of ESA-listed species captures, entanglements, strandings, or other take that was reported at or adjacent to the piers included in this Opinion.
        iii. The report will contain all information for any sea turtles taken to a rehabilitation facility holding an appropriate USFWS Native Endangered and Threatened Species Recovery permit. This information can be obtained from the appropriate State Coordinator for the STSSN (https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network)
        iv. The first report will be submitted by January 31, 2021, and will cover the time period from pier opening until December 31, 2020. The second report will be submitted by January 31, 2022, and will cover calendar year 2021 and the information in the first report. The third report will be submitted by January 31, 2023, and will cover the prior two calendar years (calendar years 2022 and 2021) and the information from the first report. The next report will be submitted by January 31, 2024 and will cover the prior three calendar years (calendar years 2023, 2022, and 2021). Thereafter, reports will be prepared every year, covering the prior rolling three-year time period, and emailed no later than January 31 of any year.
        v. Reports will include current photographs of signs and bins required in T&Cs 2, below, and records of the clean-ups required in T&C 3 below.

2. To implement RPMs 2 and 3, the federal action agency must ensure that the applicant must:
    a. Install and maintain the following NMFS Protected Species Educational Sign: 'Save Dolphins, Sea Turtles, Sawfish, and Manta Ray.'
        i. Signs will be posted at least at the entrance to and terminal end of the pier.
        ii. Signs will be installed prior to opening the pier for public use.
        iii. Photographs of the installed signs will be emailed to NMFS's Southeast Regional Office (takereport.nmfsser@noaa.gov) with the NMFS tracking number (SERO-2020-01119 Oak Hill Fishing Pier) and date of issuance.
        iv. Sign designs and installation methods are provided at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.
        v. Current photographs of the signs will be included in each report required by T&C 1, above.
    b. Install and maintain fishing line recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.
        i. Fishing line recycling bins and trash receptacles will be installed prior to opening the pier for public use.
        ii. Photographs of the installed bins will be emailed to NMFS's Southeast Regional Office by email (takereport.nmfsser@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2020-01119 Oak Hill Fishing Pier) and date of issuance.
        iii. The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
        iv. Additionally, current photographs of the bins will be included in each report required by T&C 1, above.

3. To implement RPMs 2, 3, and 4, the federal action agency must ensure that the applicant must:
    a. Perform at least 1 annual underwater cleanup to remove derelict fishing line and associated gear from around the pier structure.
    b. Submit a record of each cleaning event in the report required by T&C 1 above.

10. CONSERVATION RECOMMENDATIONS

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

NMFS believes the following CRs further the conservation of the listed species that will be affected by the proposed action. NMFS strongly recommends that these measures be considered and implemented by the federal action agency:

Sea Turtles:

- Conduct or fund research that investigates ways to reduce and minimize mortality of sea turtles in the recreational hook-and-line fishery.
- Conduct or fund outreach designed to increase the public's knowledge and awareness of ESA-listed sea turtle species.

Smalltooth sawfish:

- Conduct or fund outreach designed to increase the public's knowledge and awareness of smalltooth sawfish.

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

11. REINITIATION OF CONSULTATION

As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of take specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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